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SUSTAINABLE OPERATIONS:
LEED certification for Ames, Iowa | 80

HEARTS AND MINDS:
Water Museum in Laredo, Texas | 16

IN MY WORDS:
Toward a new era of water reuse | 22

Lori Stenzel,
Senior Water Quality and Environmental Compliance Specialist,
Belleville, Ill.

Always the Challenge

LORI STENZEL DOESN'T STAND STILL. SHE GROWS AS A PROFESSIONAL BY STRIVING TO DO MORE. | 18

SPECIAL FEATURE:
PLANT PROFICIENCIES
PAGE 32

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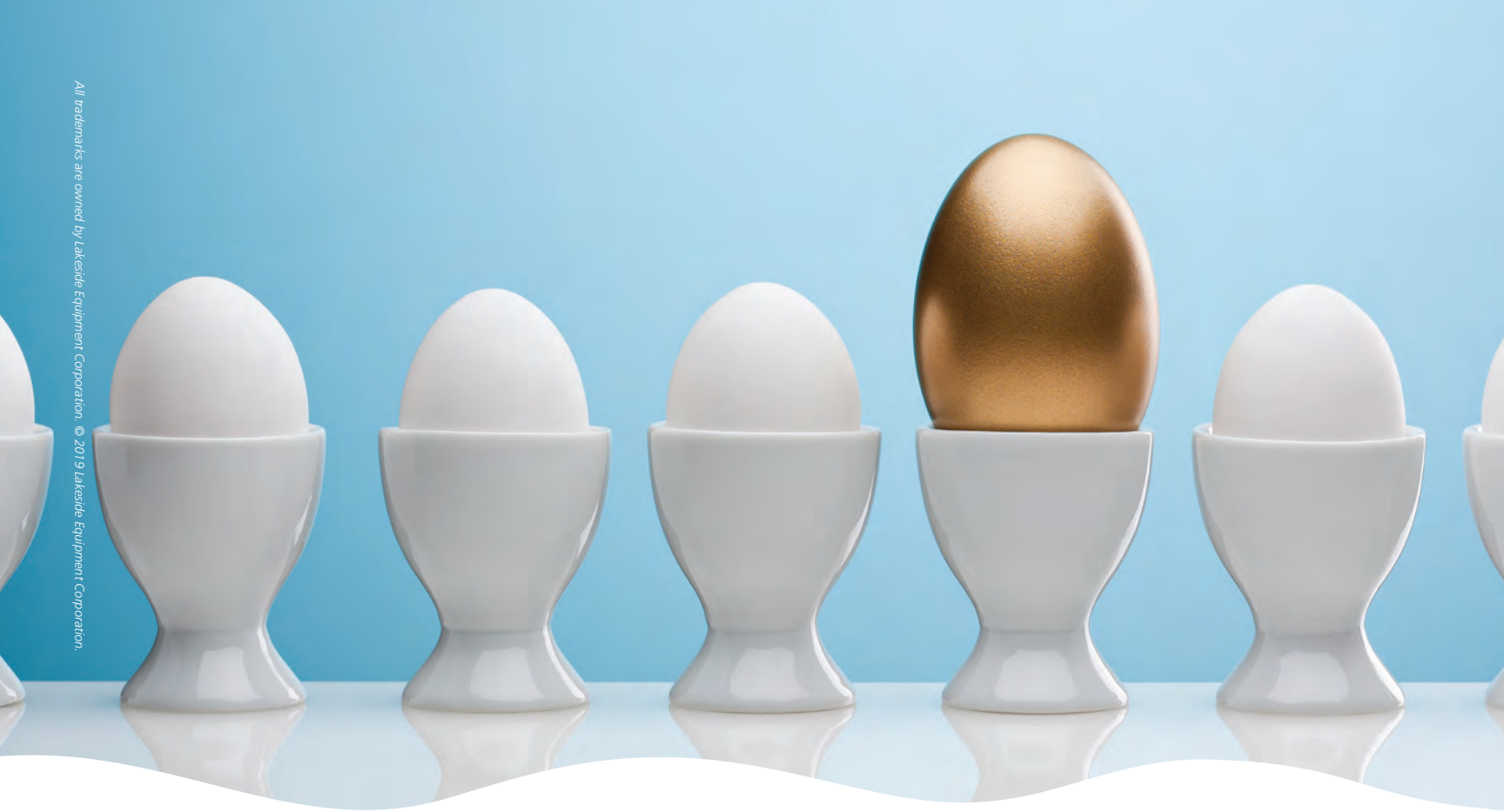

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contents

December 2019

plant PROFICIENCIES 32

top performers

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» Let's Be Clear: A look at the state of energy management » Top Performers: Tom Myers, Siloam Springs, Arkansas | Winchester (Virginia) Water Treatment Plant | Water savings in Mount Prospect, Illinois | Louisa County (Virginia) Water Authority, Zion Crossroads Wastewater Treatment Plant » How We Do It: Real-time BOD monitoring on Prince Edward Island » Sustainable Operations: Broad initiatives at Spartanburg Water » In My Words: Trends in energy management in wastewater treatment » PlantScapes: Splash pool in Danville, Kentucky » Hearts and Minds: Patty Potty preaches, "No wipes in the pipes" » Technology Deep Dive: Getting a handle on filamentous bacteria

tpo TREATMENT PLANT OPERATOR

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A Bigger Step Than You Imagine?

MOVING FROM FRONT-LINE OPERATIONS TO LEADERSHIP IS A MAJOR CHALLENGE — IN WAYS MANY NEWLY MINTED LEADERS DON'T EXPECT

By Ted J. Rulseh, Editor

One of the toughest challenges of my professional career came when I was promoted from account executive to account supervisor at the public relations firm where I was working.

I loved being promoted, the prestige that went with it, the sense of accomplishment and of course the pay raise. But I soon found out I wasn't ready to be other people's boss. There were skills I needed that I just didn't have.

I'd been a high-performing account executive, but that didn't mean I would automatically be a good or even mediocre supervisor. I struggled so much at first that I was tempted to ask to slide back into my previous role. Only pride and persistence kept me from actually doing so.

I know that many *Treatment Plant Operator* readers are facility operators or maintenance people who want someday to be a supervisor, plant superintendent or plant manager. There's more to reaching those levels, and succeeding, than being a superb performer and passing more licensing exams. In that spirit, here are, from my experience and things I've read, some bits of advice for those looking to climb the career ladder.

It's now all about people. People skills always count, but especially when there are people you need to lead, coach and inspire. Early in my tenure as a supervisor, a colleague handed me a copy of Dale Carnegie's classic book, *How to Win Friends & Influence People.* In a way, it was like being given a bottle of mouthwash. Nonetheless, it was something I needed. The advice in that book is timeless, it helped me a lot, and I'm forever grateful to the guy who gave it to me.

To be a good leader, you need to know and understand your team members intimately.

Your role has changed — profoundly. I got promoted to account supervisor, but I still acted like an account executive. That is, I spent too much time on my own clients and not enough working with my team. My job was no longer to be a super account executive. It was to help my team members become super account executives — and maybe one day supervisors themselves. There is an enormous difference.

There's such a thing as being too hands-off. Supervisors are often counseled, rightly, not to micromanage. At first I took that advice too much to heart. I let my team members do their jobs, not realizing how much two of them, relatively new, needed help and guidance. As a result, they blew the budget on a project, got themselves and me into trouble, and almost cost the company a client. If I had done my job, that wouldn't have happened.

Some conversations are tough — but essential. When a team member is underperforming, it's tempting to let it go and hope things get better, or to be content with making polite suggestions for improvement. That's a huge mistake that I made more than once. Performance issues need to be addressed promptly and directly. Sure, that takes guts, but what's the alternative? In reality, a forthright discussion is the best gift you give a team member who's struggling. Candid talks that supervisors had with me were among my most valuable career experiences.

Your team members are not your pals. It's especially important to remember this if you now supervise people who were your co-workers, your peers. Maybe you all used to go out for a drink after work. That relationship has to change. For one thing, getting or remaining too friendly can make things touchy if at some point a person on your team needs to be disciplined.

People are complicated. To be a good leader, you need to know and understand your team members intimately. People have different personalities, wants, needs, motivations, goals. It's essential to know about their families, their hobbies, their backgrounds. What's happening with them at home, for good or ill, they will bring to work with them. Deep knowledge of each person can help you lead and coach with optimum effectiveness.

Feedback is a two-way street. Just as you should give team members honest and consistent feedback, you should welcome feedback coming your way. Nothing inspires more trust than listening as a team member points out where you made a mistake, where you could have done something better or, for that matter, where you did something he or she appreciated. Two-way feedback helps build strong teams.

There's much more to learn about becoming a leader, of course, and there are plenty of ways and places to learn it. I must say I strongly recommend Dale Carnegie's book and the human relations principle he considered the most important: "Become genuinely interested in other people." tpo

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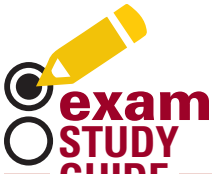


Licensing exams can be challenging. Our **Exam Study Guide** helps you prepare by presenting questions similar to those on an actual exam. You can find many more sample questions on the *TPO* website at www.tpomag.com/study.

WASTEWATER

By Rick Lallish

During an afternoon plant walk-through, you notice a thin, light-tan foam covering approximately 10% to 25% of the aeration basins. What condition does this indicate?

A. Normal conditions
B. Startup conditions
C. *Nocardia* filaments
D. Old sludge (long solids retention time, low food/microorganism ratio)

ANSWER: A. The ability to interpret visual conditions in an activated sludge facility is vital to successful operations. A thin, light-tan foam is normal. The startup condition is usually a thick, white, billowy foam; *Nocardia* typically appears as a thick, greasy and dark-tan foam. Old sludge usually presents thick, scummy and dark-brown foam. Knowing these conditions will help operators troubleshoot and operate an activated sludge facility efficiently and professionally. More information may be found in the Water Environment Federation textbook: *Wastewater Treatment Fundamentals I – Liquid Treatment*, Chapter 8.

DRINKING WATER

By Drew Hoelscher

What is the recommended location for a newly installed service line?

A. 45 degrees up from the bottom of the main
B. At the bottom of the main
C. At the top of the main
D. 45 degrees down from the top of the main

ANSWER: D. Tapping a water distribution main 45 degrees from the top helps eliminate any accumulated trapped air in the top portion of the main and any accumulated sediment in the bottom portion of the main from entering the service line. It is also important to install service lines below the deepest anticipated frost lines for that area and to provide a means of slack by laying the line in a downward S-curve formation from the tap.

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

Team members at the East Central Regional facility include, from left, Keenian Carswell, Martin Flores, Sunday Uzor and Tyler Joseph, operators; Jeff Antonellis, plant utilities coordinator; Clifford Sanders, plant manager; Shemeez Mosadee, operations and maintenance manager; Ed Shelton, maintenance superintendent; Tom Cavanaugh, shift supervisor; Frederick Miller, operator; Ivan Lopez, lead electrician; and Jeremy Derrick, operator.

A Plant on the Rise

THE CLEAN-WATER FACILITY IN WEST PALM BEACH IS GETTING A MAJOR UPGRADE WITH HELP FROM AN INVOLVED AND ENERGIZED OPERATIONS TEAM

STORY: **Ted J. Rulseh** | PHOTOGRAPHY: **Jason Nuttle**

Sometimes a clean-water plant that has performed reliably for years simply gets old and needs renewal. That's the case at the East Central Regional Water Reclamation Facility in West Palm Beach, Florida.

The facility is undergoing major upgrades of its biological treatment and biosolids processes. Meanwhile, the team at West Palm Beach Public Utilities has stepped up recruitment and training to ensure a highly capable operations workforce far into the future.

The East Central Regional facility (70 mgd design, 44 mgd average) sends about 50% of its effluent to deep injection wells. The balance goes to Florida Power & Light's West County Energy Center for use as power plant cooling tower water and to the Ballpark of the Palm Beaches, spring training home for the Houston Astros and Washington Nationals, for irrigation.

As part of the upgrade, the headworks will receive a new perforated screening system (Kusters Water, division of Kusters Zima Corp.), new venturi meters and grit collection system improvements.

The secondary treatment aeration basins are being outfitted with aeration diffusers and an upgraded blower system that will provide enhanced airflow control. The solids side is undergoing a switch from aerobic to anaerobic digestion with potential capture and beneficial use of biogas. The upgraded facility can potentially see a reduction in electricity usage of 1.35 million kWh per month, equivalent to 1,350 single-family homes.

"In the last year, we have really turned things around," notes Tom Cavanaugh, a plant shift supervisor. "We're doing very well with the process. We have a lot of energetic operators and just wonderful cross-training. We have a whole new attitude thanks to the guidance of Darren Hollifield, our assistant director."

UPGRADES IN PROGRESS

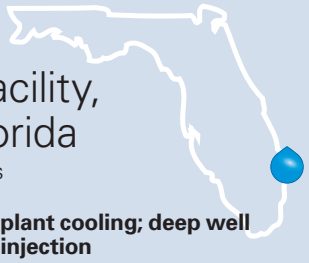
The East Central Regional facility treats wastewater from the cities of West Palm Beach, Riviera Beach and Lake Worth, plus parts of Palm Beach County and the town of Palm Beach. After the headworks, the flow passes through a set of grit channels, recently sandblasted and protected by specialty coatings.

The water then enters the aeration basins that include anoxic and aerated zones to aid in phosphorus removal. The first of those basins has been cleaned of accumulated grit and completely retrofitted with new concrete, fine-bubble diffusers

> "We're doing very well with the process. We have a lot of energetic operators and just wonderful cross-training. We have a whole new attitude."
> **TOM CAVANAUGH**

East Central Regional Water Reclamation Facility, West Palm Beach, Florida

www.wpb.org/departments/public-utilities



BUILT:
1970, latest upgrade 2015-19

SERVICE AREA:
Cities of West Palm Beach, Riviera Beach and Lake Worth; Palm Beach County; Town of Palm Beach

POPULATION SERVED:
600,000

FLOWS:
70 mgd design, 44 mgd average

EFFLUENT DISPOSITION:
Reuse for irrigation and power plant cooling; deep well injection

TREATMENT LEVEL:
Tertiary

TREATMENT PROCESS:
Activated sludge with biological nutrient removal

BIOSOLIDS:
Sent to contractor; dried for fertilizer production

ANNUAL OPERATING BUDGET:
$32 million

Piping carries air to one the facility's aeration basins, which are outfitted for biological nutrient removal.

The East Central Regional plant leadership team includes, from the top, Ed Shelton, maintenance superintendent; Shemeez Mosadee, operations and maintenance manager; Clifford Sanders, plant manager; and Jeff Antonellis, plant utilities coordinator.

(Sanitaire - a Xylem Brand), counter-rotating mixers, new walkways, and electronic meters for nitrate, ammonia, TSS, phosphate and dissolved oxygen (Hach).

The four aeration basins (8.9 million gallons) are to be upgraded in sequence. "We're making redundancy on all our systems so one unit can be taken down and serviced while the others are online," Cavanaugh says. The two primary basins are designed for luxury phosphorus uptake.

When the upgrades are complete, the flow will come into the racetrack-style basins and run counterclockwise in an anoxic selector zone with counter-rotating mixers.

"In this zone, phosphate accumulating organisms will grow," Cavanaugh says. "In anoxic conditions, they are stressed out and so will release phosphate. As they come around the basin, they will go through a swing zone that can be agitated with mixers or with air. The mixed liquor will move to an aerobic zone where the PAOs grab onto the phosphate that they released and onto additional phosphate."

The flow is then directed to two 8.9 million-gallon aerated treatment basins, also designated for upgrades in the very near future. From there, the flow proceeds to eight circular secondary clarifiers, through a chlorine contact chamber, and then to a pump station that sends the effluent to the injection wells and to the Palm Beach County Reclamation facility, which consists of six deep-bed sand filters (Leopold - a Xylem Brand). It is disinfected with sodium hypochlorite generated by a MIOX system for distribution to the ballpark and the West County Energy Center.

SOLIDS SIDE

The solids side is being upgraded with a new process designed by Hazen and Sawyer and built by general contractor Poole & Kent that's scheduled for commissioning in early 2020. Waste activated sludge will be pumped through Muffin Monster grinders (JWC Environmental), mechanically thickened to 5% solids using gravity belt thickeners and delivered to temperature-phased anaerobic digestion in four mesophilic and two thermophilic digesters. Hauled grease will be co-digested with primary and waste activated sludges.

TRAINED TO SUCCEED

While enjoying an influx of new, motivated and energetic operators, West Palm Beach Public Utilities is backing them up with a comprehensive training program.

"We have been cross-training all relevant employees across different areas of plantwide operations," says Shemeez Mosadee, operations and maintenance manager. "This includes but is not limited to operators, mechanics and administrative staff. By having more people knowledgeable about more areas of the process, we see more efficient treatment and less overtime.

"On the treatment side, more knowledgeable people have enabled process changes that lowered energy use. On the maintenance team, their progressive knowledge has led to greater mechanical efficiency in ways such as standardizing pumps and improving our computerized maintenance management program, which in turn improves the life span of equipment."

To help new hires through the transition to the East Central Regional facility, the utility has created a training program that lists everything new team members need to know and must accomplish within the first six months and in some cases the first year.

The utility has developed a rigorous trainee training program in which trainees must demonstrate their knowledge and competency with each process and associated equipment. This regimen requires that a supervisor or higher must sign off on each process area and the operation of associated equipment. Each trainee is required to complete and document this training and receive a state of Florida Class C operator's license prior to being promoted to operator one.

"It's a notebook guide where new hires also have access to the phone numbers of important city officials and to city policies," says Octavia Galloway, senior accounting clerk. "Managers can check the new hires' progress using benchmarks also included the guide. New team members have complimented the training program since its inception about a year and a half ago."

Zach Spara, operator, checks a clarifier sludge blanket with a Sludge Judge (Nasco).

> "Haulers come from all around ... to discharge at our facility. Being such a huge plant, we can accept these materials without upsetting our process."
>
> **TOM CAVANAUGH**

Finished biosolids will be dewatered through four centrifuges (Andritz Separation) to 23% solids. The cake will be sent to a contracted site for drying, pelletizing and sale as fertilizer. The utility and engineers intend to evaluate various options for use of captured biogas, including on-site cogeneration, production of renewable natural gas as vehicle fuel and production of pipeline-quality biomethane for export and sale. A final decision is pending.

STAFFING UP

Recruitment and training have been essential to the plant's renewal. Besides Cavanaugh, key members of the Public Utilities team under Poonam Kalkat, director, and Hollifield, assistant director, include: Clifford Sanders, plant manager; Shemeez Mosadee, operations and maintenance manager; Waldo Cruz, plant superintendent; Ed Shelton, maintenance superintendent; James Looney, electrical superintendent; Jeff Antonellis, plant utilities coordinator; and David Willis, plant supervisor.

To help combat the retirement wave, the utility promoted job opportunities broadly among licensed operators in Florida. Highly competitive pay and benefits attracted a number of experienced operators as well as trainees. Trainees are brought up to speed quickly and are encouraged to take part in the strategic process as they shadow experienced operators.

Operator Sunday Uzor analyzes samples.

East Central Regional Water Reclamation Facility PERMIT AND PERFORMANCE – FOR DEEP WELL INJECTION					
	Influent	**Daily effluent**	**Daily permit to deep wells**	**Daily reclaim effluent**	**Permit reclaim effluent**
BOD	194 mg/L	4.0 mg/L	60 mg/L	<2.0 mg/L	5 mg/L
TSS	383 mg/L	12 mg/L	60 mg/L	<2.0 mg/L	5 mg/L

Septage and FOG are accepted at the Raptor receiving station (Lakeside) and co-digested to produce biogas.

New team members are also encouraged to advance their skills and move up the licensing ladder. They're routinely sent to the University of Florida's Training, Research and Education for Environmental Occupations (TREEO) Center. "We send people there to attend classes and help further their knowledge and career with the city as it relates to wastewater treatment," Cavanaugh says.

"We've accessed training offered by the Florida Rural Water Association. We also have a lot of in-house training going on from Andritz, Alfa Laval and the other vendors that are installing equipment in the new biosolids facility."

Then there are the little things that go into creating a positive work environment and morale. "They take care of us really well," Cavanaugh says. "For example, there's a health center where our team members can get free prescriptions and get a physical."

PUSHING INNOVATION

The East Central Regional facility is certified under the ISO 14001 international standard for environmental management in a utilitywide initiative led by Virgilia Baird, environmental management system coordinator.

An engaged operations and maintenance team has produced a number of improvements in the plant. As one example, LED lighting for the outdoor spaces has made a dent in electricity consumption. On the mechanical side, the effluent pumps are being replaced and updated with new motors and variable-frequency drives. Most pumps are being standardized to help simplify preventive and corrective maintenance. Shelton has spearheaded a change to all food-grade oils.

"Our VTScada (Trihedral Engineering) is great because it enables us to trend almost anything — millions of gallons of influent flow, gallons of wasting, amps on motors and much more," Cavanaugh says. "With SCADA we can trend our aeration basin airflow, which is an indicator of dissolved oxygen. If our standard cubic feet per minute is going down, our ammonia is going to go up; and if our ammonia goes up, our nitrate is going to go down. If our nitrate goes up, which indicates good nitrification, our ammonia will go down. It's all a balancing act."

Cavanaugh cites "a huge moneymaker" in the Raptor receiving station (Lakeside) that accepts septage and the FOG that will be co-digested to produce biogas: "Haulers come from all around the tricounty area to discharge at our facility. Being such a huge plant, we can accept these materials without upsetting our process."

As the major aeration and biosolids upgrades proceed, more improvements are in store for the East Central Regional facility. The aeration blowers are most likely next in line, as the existing nine positive displacement blowers are approaching end of life. Also, under discussion is an upgrade of the circular secondary clarifiers to new, deeper clarifiers that have fewer mechanical parts, enhance efficiency and reduce maintenance.

All in all, it's a journey an energized and talented team will be glad to be part of for years to come. **tpo**

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CHANGING MINDS

Public Trust in Reuse

Getting ratepayers on board with water reuse may seem daunting, but those who have kept a finger on the pulse of public perception say times are changing, and people are becoming more accepting. Read about a few different ways your utility can approach outreach efforts and get people on board with direct potable reuse.

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OVERHEARD ONLINE

"Building a dynamic and diverse water workforce for the 21st century is absolutely vital to continuing to deliver on our sector's mission to protect public health and the environment."

Taking on Retirement Gap Is an Industry Priority

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BUILDING A DPR PLANT

Overcoming Drought Challenges

Drought has always been a challenge in El Paso, Texas. With an average total rainfall of about 9 inches a year, the city has learned to get creative when it comes to its drinking water supply. That's why it's adding a first-of-its-kind direct potable reuse (DPR) system to the mix.

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WOMEN IN WATER TREATMENT

Pioneering a Profession

When Pamela Rose wanted to join the Elizabethtown (Kentucky) Water Treatment Plant more than two decades ago, she was asked to prove that she could lift a 50-pound bag. She threw that bag over her shoulders and walked into a 24-year career in treatment plant operations. Read her story in this online exclusive.

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History, Technology and Conservation

THE LAREDO WATER MUSEUM INCORPORATES DEVICES FROM A HISTORIC WATER PLANT INTO A WIDE VARIETY OF EDUCATIONAL DISPLAYS FOR ALL AGES

By Pete Litterski

Most visitors to the Laredo (Texas) Water Museum are school-age children.

Just as in any community, the waterlines in Laredo, Texas, run underground, at least for the most part.

In one new city facility, though, they run above ground, some even overhead. And rather than water, they deliver education for visitors from students to curious adults and travelers.

Opened in May 2017, the Laredo Water Museum occupies about half the floor space in a new water division administration facility next to the city's Jefferson Water Treatment Plant. It is one of just three water museums in Texas.

Tony Moreno, superintendent of the Water Treatment Division, says the museum is a valuable tool for educating children from schools, scout troops and other organizations. The facility tells the complete water story, from the headwaters of the Rio Grande in Colorado to the outflow from the city's wastewater treatment system. Beyond that, it compares the quality and availability of freshwater locally to the challenges faced by people around the world.

INTO THE PIPE

The Rio Grande is the sole source of water for Laredo and many of the U.S. and Mexican cities on its banks. The museum emphasizes that point as it focuses on conservation.

A tour of the museum begins with a walk through a tunnel-like structure built of sheet metal and resembling a 72-inch pipe on the scale of the intake pipes that deliver murky, greenish river water to the city's two water treatment plants.

The walls of the pseudo pipeline are lined with interactive displays that show the steps followed to turn the river water into the crystal-clear product delivered to Laredo's 260,000 residents. The displays, like many in the museum, are mounted in stubs of PVC pipe. Visitors can push a button to get more in-depth information on each step in water treatment.

After the tunnel, visitors come to a display that shows how water travels from the city's two treatment plants through a network of pipes to homes and businesses. Here the designers made liberal use of panels, gauges and other equipment taken from a retired Laredo treatment plant that dated back to the early 20th century.

FINDING A DESIGNER

Project architect Eduardo Quiroga, owner of Metaform Studio Architects in Laredo, suggested the possibility of a museum during discussions of the new administration building. Moreno shared the idea with other city leaders. Quiroga was then asked to find a consultant to work with him on the museum design.

Interactive museum displays cover the entire story of water.

> "I tell people that if they have any questions, let me know and I'll bring one of the operators in to answer them."
> **MARIO ROMO**

What's Your Story?

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

They found Alan Krathaus, owner of CORE Design Studio in Houston. Krathaus had designed the Water-Works Education Center in Houston, and Moreno and Quiroga led a delegation from Laredo to tour that facility. A Laredo City Council member, the city manager and the utilities director joined the entourage.

Once they received a green light to proceed with museum plans, Moreno and Quiroga invited Krathaus to Laredo to learn about its water plants and the community. On an early trip, he toured the retired water plant and was intrigued that the old equipment was still there. "He came out here several times, and he took back equipment each time," Moreno says. "One major control panel caught his attention and he took the whole gear back in his trailer."

That panel is now part of the museum experience where visitors can learn about their water consumption and other factors important to water conservation. It is part of a design that takes the old equipment and merges it into modern displays covering water facts, Rio Grande history and more.

A display covers the history of the Rio Grande, source water for Laredo and other communities.

PREACHING CONSERVATION

Maria Romo, project specialist, who oversees day-to-day museum operation, says the majority of visitors are children in groups including classes on field trips, scout troops and extracurricular groups. Before taking responsibility for the museum, she worked in community outreach, mainly as a water conservation inspector spreading the message about using water wisely in Laredo's arid climate.

Romo says the need to educate students about conservation is greater than ever in a growing city that depends upon the Rio Grande for freshwater. Although pollution and water volume are key concerns along the river, another challenge may prove even greater in the future.

"The worst part is that we have salt water pushing up the river," from its mouth at the Gulf of Mexico, Romo says. When the river's flow is down, water from the Gulf can often push far upstream. That salt water is a problem for municipal water utilities and many of the large farms that need freshwater for irrigation.

Although Romo knows the water treatment process well, visitors still ask many questions better answered by operators. That's when it comes in handy to be next to one of Laredo's water plants. "I tell people that if they have any questions, let me know and I'll bring one of the operators in to answer them."

The museum is open 10 a.m. to 5 p.m. weekdays and from 1 to 5 p.m. one Saturday a month. Romo notes that the adults are often just as amazed by the displays as the children. **tpo**

Always the Challenge

LORI STENZEL DOESN'T LIKE TO STAND STILL IN HER PROFESSIONAL LIFE. SHE HAS GROWN IN HER CAREER BY CONSTANTLY STRIVING TO DO MORE.

STORY: **Scottie Dayton**
PHOTOGRAPHY: **David Torrence**

Wanting more has dominated Lori Stenzel's professional life.

As senior water quality and environmental compliance specialist for Illinois American Water in Belleville, she has always set goals she could reach through hard work.

Stenzel combines her effervescent personality and a love of people with motivation to expand her influence and reputation nationwide. At a time when records were mostly on paper, she embraced computers, then trained people to use them and the management software.

Operators rely on American Water's HORIZON laboratory information management system (LIMS). Stenzel trained the water-quality team and operators on the system computers and software.

Her dedication to the industry shows in the long list of offices she has held. Some current titles include 2018-19 chair of the Illinois Section American Water Works Association, 2019 president of the Southwest Central Water Plant Operators Association and secretary of the Southern Illinois Water Operators Association.

The Illinois Rural Water Association recognized Stenzel's leadership and passion for protecting public drinking water with the 2011 Person of the Year award. In 2008, Illinois Section AWWA named Stenzel its Water Professional of the Year.

In 2019, Stenzel received the inaugural Women in Water - Outstanding Woman Award from the Illinois Section AWWA. It honors contributions to the advancement of women through outreach programs. "I was floored when they called my name," Stenzel says. "I love helping people excel, especially when they are encouraged to see our industry as a promising future."

ELECTRONIC LEADER

While earning her degree in biology from Augustana College, Stenzel dreamed of working in a crime scene investigation lab, but her first job was in 1987 as a chemist with an extraction lab, now owned by PDC Laboratories.

"I loved it, but soon I wanted more," Stenzel says. Within four years, she was the drinking water project manager responsible for coordinating the paper-based

FUTURE GIFTS

Lori Stenzel sees the Illinois EPA Operator in Training course as a way to offset the approaching "silver tsunami" by offering disadvantaged kids the chance at a positive future. "Graduates have marketable skills and can replace retiring water and wastewater operators," says Stenzel, a senior water quality and environmental compliance specialist for Illinois American Water.

Besides promoting the course through the Illinois Section American Water Works Association Outreach Committee and at speaking engagements, Stenzel wants to launch a pilot program in southern Illinois. "That area lacks job opportunities for those without a college degree," she says. "The best way to attract applicants is to explain about the doors that will open if they enter this industry straight out of high school."

The online self-study course prepares students for the Illinois EPA Class D operator exam. The Illinois Section AWWA also arranges for internships at water plants and has a scholarship program. "If students meet all the criteria, their tuition will be refunded," Stenzel says.

Finding champions is challenging. Stenzel coordinates with Casey Johnson, Anna-Jonesboro Water Commission superintendent, to provide plant training in southern Illinois. Johnson's wife is trying to incorporate the course into the senior curriculum at the school where she works. To open the door even wider, Stenzel will sponsor Illinois Section AWWA student memberships to those who enroll.

"Now all we need is for everyone to say yes," she says.

> "I love finding solutions for people and making their jobs easier."
> **LORI STENZEL**

Lori Stenzel, senior water quality and environmental compliance specialist for Illinois American Water in Belleville.

Lori Stenzel, shown with research team member Susheera Pochiraju, manages scheduling and compliance for 43 state districts run by regional water quality supervisors and assembles data for consumer confidence reports.

Lori Stenzel, Illinois American Water, Belleville

POSITION:
Senior water quality and environmental compliance specialist

EXPERIENCE:
32 years in the industry

EDUCATION:
Bachelor's degrees in biology and psychology, Augustana College

CERTIFICATION:
Illinois noncommunity, nontransient water systems operator, Class A Water Operator in Training

MEMBERSHIPS:
Illinois Section American Water Works Association, Southwest Central Water Plant Operators Association, Southern Illinois Water Operators Association, Illinois Rural Water Association, Illinois Potable Water Supply Operators Association

GOALS:
Be the best in water compliance and regulatory requirements; promote water industry careers to youth

testing schedules. Driven by her love of computers, Stenzel took the four Microsoft Access database management system courses at Illinois Central College, then built the lab's drinking water management program.

To streamline the process and help plants remain compliant, Stenzel printed chain-of-custody forms and mailed them with sample bottles to some 200 state municipalities. All the operators had to do was fill the bottles, record the collection and relinquish date and times, and send the data to the Illinois EPA.

Stenzel's job also included developing a marketing strategy to increase the private lab's clientele. Her goal was to have more customers than the state lab, her company's biggest competitor. She worked with Mark Mueller, director of McHenry Analytical Water Laboratory, to invent the GuardDog management program; then they built it using Microsoft Access.

"The idea was to guard plants against violations by dogging their operators until they submitted the samples," Stenzel says. The $240 annual fee included a guarantee that no client would receive a notice of violation or miss a submission date. None ever did.

HELP FROM AN ASSISTANT

As clientele numbers rose, Stenzel received an assistant, Krystal Marks. "Her intense drive to learn and achieve made me feel insecure, until I realized that anyone can be a manager," Stenzel says. "Krystal was pushing me to want more, and that was to be a teacher and a leader."

Stenzel taught Marks about fluoride, then handed over the 350 clients requiring monthly fluoride tests. Marks was a quick study and loved computers. The match was perfect, and soon the sky was the limit. When Stenzel returned after a week's vacation that year, it was as if she had never left. "Krystal did my job flawlessly and taught me that I could teach," Stenzel says.

GuardDog increased the number of municipal users to 810, or 46% of the lab's total business. Toward the end of 2010, Stenzel learned that Illinois American Water had an opening for a drinking water and wastewater compliance and reporting manager. Seeing an opportunity to learn the operator's side of the industry, she applied for the position.

When offered the job in January 2011, Stenzel found a paper-based company. "Esther Dundore, the director and my boss at the time, tasked me with reducing paperwork," she says. "I assured her I could do it."

Although Stenzel's responsibilities are similar to those at PDC, they are on a smaller scale. She manages scheduling and compliance for 43 state districts run by regional water quality supervisors and assembles data for their consumer confidence reports. She troubleshoots issues and schedules extra testing at American Water's Central Laboratory when operators have treatment problems.

EMPOWERING OTHERS

However, there was a problem: Stenzel automated her job so well that she felt as if she were coasting. Wanting more, she jumped into learning all of American Water's HORIZON laboratory information management system (LIMS).

Then she trained the water-quality team and operators on the computers and software. When many struggled to upload their Bacti (total coliform/bacteriological) files, Stenzel eased them over their difficulties. Corporate rewarded her initiative by naming her the nationwide Bacti information technology person.

"I love finding solutions for people and making their jobs easier," Stenzel says. "I retain my Bacti certification to run samples if any of our labs need help or we have a crisis requiring extra hands."

With time available, Stenzel began pursuing a Class A (highest) Operator in Training certificate and became more involved with the Illinois Section AWWA, advancing from District 4 trustee to chair and now past chair.

She worked with the Midstate Water Plant Operators Group, Illinois Rural Water Association, and Southern Illinois Water Operators Association to make sure operators had continuing education. She also helped organize training sessions and spoke on topics essential to their jobs. "Staying involved

in the local water operator associations is key to keeping communications open and knowing what is going on in their plants," Stenzel says.

Operators weren't the only people to benefit from their memberships. At the 2019 Illinois Section AWWA conference, Stenzel's life changed. Keynote speaker Thanet Natisri, who oversaw the 2018 cave rescue in Thailand, said, "Opportunities are not a given, they are created, and timing is everything." Stenzel seized the nugget and applied it.

She attended a water quality summit of Midwestern states in 2019 and met people developing a Bacti app. Stenzel told them, "You need a liaison between the lab and the states to provide the expertise and training. I am that person." In July, she filled the position she had created.

SHADES OF GRAY

Avoiding violations is paramount in Stenzel's world, and she does it with straightforward communication and a strong working relationship with the Illinois EPA Compliance Assurance Section: "If you explain a situation honestly and ask for suggestions to solve it, regulators will work with you. They have your back because they want to avoid the mountain of paperwork associated with writing violations."

For example, an American Water plant was upgrading to a carbon system just when its three-year volatile water sample was due. The sample contained styrene. A second sample confirmed the first. A third sample pulled two weeks later was clean. Stenzel explained the situation to Andrea Rhodes of the Compliance Assurance Section, Public Water Supplies, at the Illinois EPA.

"Andrea told me that if I had called, she would have moved the three-year cycle," Stenzel says. "Now I tell operators never to sample during plant upgrades. Make that phone call and request moving the sample to next year." The contamination came from PVC weld solvents.

Stenzel avoided another violation when the state went to Stage 2 Disinfectants and Disinfection Byproducts Rules. Illinois monitored quarterly for the first year. A groundwater system operator did his first set of tests in December but forgot to sample in March.

When Stenzel looked at the LIMS to check compliance, a sample showed for the plant, but seeing the acquisition date required scrolling down the page. Stenzel and the regional water quality supervisor missed it. With only one sample recorded, the plant was in violation.

In an email to the Illinois EPA, Stenzel documented what had happened and the corrective action she would take. She also emailed a copy of the federal rules stating that groundwater systems of this type met the criteria for a waiver. She requested one and regulators moved the annual monitoring date to June of that year.

"This didn't happen because we were friends," Stenzel says. "It happened because I had facts and documentation. Furthermore, as long as humans are involved, errors will occur, but they are often fixable if caught early enough."

REACHING THE YOUNG

Always looking for ways to promote the water and wastewater industries, Stenzel found the perfect vehicle serving on the Illinois Section AWWA Outreach Committee. In 2015, the association received a grant to expand its Water Saver in a Box Classroom Toolbox.

It teaches the value of water and simple conservation methods in a fun and informative way to third through fifth graders.

Stenzel joined the subcommittee and named the toolbox Bridging the Gap, "as in the gap between students and operators. Our toolbox enables youngsters to build a sand filtration system as a classroom project."

The team designed the box to hold materials for the filter, assembly instructions, a jump drive with worksheets and lesson plans, toilet leak detection tablets and a water conservation wheel. "Ideally, the local water operator presents the customized PowerPoint on how his water system works, but teachers can also do it," Stenzel says. The toolkit was well received.

The Illinois American Water Mobile Education Center garnered more favorable reviews. Launched in 2014, it's an 18-foot custom-remodeled concession trailer that provides a platform for youth and adults to learn about the water industry. Videos, demonstrations and hands-on activities teach the water cycle, water quality, water conservation and the value of water.

In 2015, the Mobile Education Center won the Illinois Section AWWA Outreach Award and second place in the National Association of Water Companies Management Innovation Awards.

Stenzel is closing fast on earning her Class A water operator certification, but another goal already dangles in the distance. "I want to become an AWWA officer and continue my passion on the national level," she says.

For inspiration, Stenzel refers to a quotation on her office wall by motivational speaker Zig Ziglar: "Your smile is your logo. Your personality is your business card. How you leave others feeling after having an experience with you becomes your trademark." tpo

> "If you explain a situation honestly and ask for suggestions to solve it, regulators will work with you."
> **LORI STENZEL**

Lab team members include, from left, Tracy Scheibe, administration services specialist; Ashley Dickey, water quality and environmental compliance specialist II; Stenzel; and Adam Brimberry, laboratory technician.

Toward a Century of Reuse

WATEREUSE SYMPOSIUM KEYNOTE SPEAKER SEES A TREND AWAY FROM WATER DIVERSION PROJECTS AND A MOVEMENT TOWARD REUSE, DESALINATION AND CONSERVATION TO RESOLVE SCARCITY ISSUES

By Ted J. Rulseh

Water scarcity is a growing problem, both in North America and globally.

Traditionally, water-scarce areas of the U.S. have been supplied by diverting water from rivers such as the Colorado and the Rio Grande. Periodically, there have been proposals to send water from the Great Lakes to more arid regions.

Peter Annin has followed such issues closely as author of the book *The Great Lakes Water Wars*. He sees water reuse as a more sustainable way to keep communities supplied with safe and reliable drinking water.

Annin delivered the keynote address, at the 34th annual WateReuse Symposium held in San Diego last September and sponsored by the WateReuse Association. He explained why water reuse, along with desalination (powered by renewable energy) and conservation, constitute the "wave of the future." He took attendees on a historical journey of water diversions that serve as cautionary tales and illustrate the benefits of creating sustainable, locally controlled water supplies.

Annin is director of the Mary Griggs Burke Center for Freshwater Innovation at Northland College in Ashland, Wisconsin, and a former reporter for *Newsweek*. He talked about his vision for sustainable water management in an interview with *Treatment Plant Operator*.

tpo: Globally speaking, how would you describe the status of water supplies?

Annin: The United Nations projects that water demand globally will surge by more than 50% by the middle of this century and that two-thirds of the global population will be water-stressed by 2025. Most of these issues will be in the developing world, so it will be really important for the developed world to figure out water-supply technologies and have them exported, maybe through help from the U.N. and the World Bank.

> "I don't suggest we shut down diversions already in existence. I do suggest that when we're looking to solve problems in the future, reuse and conservation along with desalination for those in saltwater areas should be the top priorities."
> **PETER ANNIN**

tpo: How would you describe the thesis of your address to the WateReuse Symposium?

Annin: The first part described the history and the pressures, perceived and otherwise, of proposals to divert water from the Great Lakes — an illustrative story for all of us in the water industry. The second part raised the question of whether the era of long-range, large-scale diversions is over and suggested how reuse, desalination powered by renewable energy, and a much more vigorous push for conservation, especially in the agriculture sector, seem to be the new-century way of dealing with water supply.

Peter Annin

tpo: How would you assess the negative impacts of water diversions?

Annin: I don't suggest we shut down diversions already in existence. I do suggest that when we're looking to solve problems in the future, reuse and conservation along with desalination for those in saltwater areas should be the top priorities. When you look at diversion, can you think of one that didn't damage the originating water body? A hundred and fifty years ago, maybe those diversions made sense, but now we have these other technologies.

tpo: To what extent is the trend toward reuse linked to the melting of glaciers and snowpacks due to global climate change?

Annin: It's not so much related to that, although that is a part of it. It's just that when we talk about costs to taxpayers and the environment and the inevitable controversy and litigation related to major water diversions, it seems there should be more opportunity for desalination for people who live in coastal areas, and reuse both for those who do and who don't. And conservation is still the lowest-hanging fruit in many areas, especially in the agriculture sector.

tpo: Would you agree that communities in water-stressed areas are doing a pretty good job with reuse and conservation?

Annin: Yes, and that's why I am specifically calling out the agriculture sector. Parts of that sector are doing a good job, but Western water law doesn't always promote good conservation practices. Globally and continentally, agriculture consumes more water than any other sector. We're not going to solve the water crisis without engaging agriculture.

tpo: Given that the crops need what they need, how can the agriculture sector be more water efficient?

Annin: Some parts of the agriculture sector have adopted amazing water technologies in conservation and some parts haven't. For example, various forms of drip irrigation are well known. It's not as if the technologies are new; it's a matter of adoption. The returns on investment for farmers aren't always there, so there may be a need for some incentives. Some farms in the Southwest still use flood irrigation, which is one of the least-efficient methods.

tpo: Do you see significant progress in the various forms of water reuse?

Annin: I think it's really exploding. In 2018, about 600 to 700 people attended the WateReuse Symposium, and about 1,000 attended in 2019. It seems we may be entering a turning point in the water reuse movement. But that movement is still more or less regional. There's a fair amount of purple pipe in Florida and Texas and all over the Southwest, for example. But reuse is not very widely practiced in the Great Lakes region or the Northeast.

tpo: Are we still seeing proposals for water diversions to help water-scarce regions?

Annin: Pat Mulroy, former head of the Southern Nevada Water Authority, has proposed diverting Mississippi River floodwater to help resolve the drought in the Colorado River watershed. In 2012, the U.S. Bureau of Reclamation proposed diverting Missouri River water to Denver so that city could give up the water it has under the Colorado River Compact for the benefit of communities farther downstream. Diversion proposals persist even in an era when it seems to me that water reuse might be a better methodology for this century. The question is how we can help people live within the water means of their watershed.

> "The operator's corner in water systems has often been a quiet place. I don't think it's going to be anymore."
>
> **PETER ANNIN**

tpo: What would you say to people who claim that since we ship oil from place to place, we should be able to do the same with water?

Annin: Oil is very different from water. If you take oil out of an ecosystem, that doesn't dry it up and ruin it and change it permanently. But if you take water out, you will permanently transform that ecosystem. Rather than continue sending water hither and yon, we need to look at technological alternatives, and water reuse is one of the most prominent examples of that.

tpo: What is the potential for desalination in today's environment?

Annin: One of the big knocks on desalination is that the energy intensity makes it expensive and less sustainable. If we can move desalination onto renewables, that lowers the cost and the carbon footprint and makes it less of an issue, although the problem of brine disposal remains. Where the price point pencils out between desalination and reuse depends on where you are.

tpo: Do you see any particular signs of water reuse becoming very mainstream?

Annin: At the WateReuse Symposium, the U.S. EPA announced its Water Reuse Action Plan. The fact that a federal agency has released a plan for reuse is a pretty major turning point.

tpo: Apart from cost, what would you see as the major challenge facing widespread adoption of water reuse?

Annin: I would argue that there needs to be more outreach and communication about reuse. One resonant thing that's happening is a lot of brewing is being done by microbrewers with recycled water. That seems to be a possible access point to help the general public get over the fears they have. I see it as a really smart way to start breaking down the barriers.

tpo: So you would argue that technology is not a substantial obstacle?

Annin: At the WateReuse conference in San Diego, I asked people to stand if they had heard of a reuse project failing to get off the ground because of technology or engineering. No one stood. Then I asked people to stand if they knew of a reuse project that didn't make it because of bad public relations, and many people stood. That's a sign that there needs to be a larger investment in communication and outreach.

tpo: As you get away from areas that are water stressed, what argument would you make for water reuse being applied much more broadly?

Annin: As a theoretical example, consider communities in the Great Lakes region under the Great Lakes Compact. Those that have applied or will apply for a Great Lakes water diversion have to return the water after it's used and cleaned to Clean Water Act standards. That makes the diversion infrastructure often doubly expensive. Among communities thinking about requests for diversion, reuse isn't even on the menu of options they're thinking about. It just doesn't come up as much as it could or should. It's just not part of the conversation.

tpo: More broadly speaking, what about areas outside the Southwest and the Great Lakes region? Should they be looking at reuse?

Annin: I don't know why anyone wouldn't at least get a quote on reuse when looking at water options and use that as a baseline to work from. Of course, with reuse there's not only the cost of engineering, there's the cost of communication and public relations. It will be interesting to see how far, geographically speaking, reuse can move, and how fast, in North America.

tpo: Where conservation is concerned, how can we deal with the fact that utilities lose revenue when their customers conserve?

Annin: That is definitely a conundrum for water suppliers. Going forward, we have find ways to not punish water utilities for customers conserving their water.

tpo: Do you see progress in utilities conserving by clamping down on nonrevenue water, due to leakage or defective metering?

Annin: Yes. Especially in the eastern half of the country, we have problems with old infrastructure and leaky pipes. There are many areas where utilities can invest in infrastructure to help with conservation without running into that ratepayer issue, but somebody's got to pay for it. There's no way to get there without government funding and public-private partnerships. Ratepayers will have to take some of the responsibility as well.

tpo: What would you observe about the value of water as scarcity becomes more widespread?

Annin: Over time, the value of water, even in water-rich areas, is going to increase. We have left what I call the century of oil, and we have entered the century of water. I believe water is going to be the defining natural resource of this century. People will think more about where their water comes from. Water service is underpriced for the value it has. Utilities could charge a lot more for it, and should, so that people would appreciate it more and waste it less.

tpo: Where do water operators figure into this scenario?

Annin: The operator's corner in water systems has often been a quiet place. I don't think it's going to be anymore. More and more attention will be paid to water quality and quantity in coming decades. Operators know about these things, but they're usually not asked to talk about them to journalists, public officials and the public. I believe that is going to change. tpo

Driven by Data

THE WATER TREATMENT TEAM IN LOUISVILLE, COLORADO, THRIVES ON RELIABLE LAB INFORMATION AND A NEW SCADA SYSTEM TO MAKE SOUND OPERATING DECISIONS

STORY: **Steve Frank**
PHOTOGRAPHY: **Carl Scofield**

FACING PAGE: Louisville, Colorado, water plant operators (from left) Steven Daniels, Matt Fromandi and Jeff Owens, monitor the facility's new SCADA system.

Jocelyn Brink, operator, takes water samples from the influent water basins. Changes in the operation have helped the facility rectify problems with algae in the source water.

Data increasingly guides water and wastewater treatment operating decisions. Numbers replace sight, sound, smell and dosing-and-retention-time guidance handed down from old-timers. Plants and distribution and collections systems substitute calculations and facts for guesses and gut feelings.

A case in point is Louisville, Colorado, which has two water treatment plants and eight full-time operators for its population of 20,000-plus. The city, between Denver and Boulder, was founded as a coal mining town in the late 1870s. It became a bedroom suburb in the 1950s when the coal played out and the need for living space continued to grow.

Louisville's Sid Copeland Water Treatment Plant (North) can produce 8 mgd, and the Howard Berry Water Treatment Plant (South) can produce 5 mgd. Both are conventional dual-media sand filter plants using alum as the primary coagulant and chlorine dioxide as a preoxidant for manganese reduction and taste and odor control.

Both plants have undergone major construction and improvements over the last two years. Greg Venette, chief water plant operator, oversees both. "We recently completed construction of a new $3.2 million potable water pump station that had been on the books for 10 years and replaced an old pump station that had been in service since the 1970s," Venette says. The old pump station could deliver to only one of three distribution zones in the city: the high zone.

"With the new pump station, we added three pumps that can pump directly to the midzone," Venette says. "Previously, both plants would have to be operating to support all three zones, or valves in the distribution system would have to be adjusted manually every day."

BANDAGE FIXES FIXED

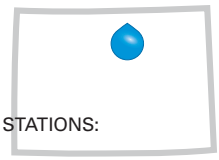
The old pump station was at about the same elevation as the storage tank it was built to pump to. It was a bad design made worse by bandage-type fixes applied over time. Operators Bob Carra, Glen Siedenburg and Herb Trickle are among those who kept things running even when times were tough.

"Lines would air-lock, and pumps would rattle. It was scary," Venette says. "And it was almost impossible to find spare parts for the pumps." The new pump station, completed in May 2018, includes modern Aurora split-case centrifugal pumps (Pentair), variable-frequency drives and monitoring equipment. "We also built in pressure relief valves that allow us to download water to different pressure zones in town and back-feed storage tanks," Venette observes.

The new system provides water to a pressure zone that never existed before. It can send water throughout the city in multiple ways and configurations. The project included replacement and upgrade of the emergency generator (Cummins Power Products) and switchgear (Eaton) and the backwash recycle system.

The project engineer, Rob Anderson with JVA engineering, also figured out how to tie waterlines into the plant cost-effectively to help "jump-start"

Louisville (Colorado) water treatment plants



TREATMENT FACILITIES:
8 mgd Sid Copeland (North Plant); 5 mgd Howard Berry (South Plant)

RAW WATER SOURCES:
El Dorado Springs; Carter Lake at Colorado-Big Thompson Project

RAW WATER STORAGE:
3 reservoirs

TREATMENT PROCESSES:
Conventional

PUMP STATIONS:
2

FINISHED WATER STORAGE:
8.5 million gallons

DISINFECTION:
North Plant, chlorine gas; South Plant, sodium hypochlorite

Jeff Owens, operator, collects a filtered water sample. Plant operators who live in the city have been enlisted as early warning taste and odor monitors.

> "We bought new lab equipment ... and implemented new testing procedures to better analyze and measure algae in our source water."
>
> **GREG VENETTE**

Operator Steven Daniels monitors the plant's variable-frequency drives (Eaton).

it under emergency conditions. The emergency interconnect, 200 feet of pipe and a couple of valves, ties the potable distribution line into the backwash influent line to let operators backwash filters using distribution system water and pressure. This provides a backup system so filters can be washed quickly and put back into service without damaging the media or potentially violating regulations.

BETTER SOURCE WATER

Data-driven decisions also helped at the Louisville Reservoir, one of three raw water reservoirs in the system. For about a decade, the reservoir had problems with algae blooms that led to taste and odor issues and widespread complaints from customers.

"It was a pretty serious issue," Venette says. "We bought new lab equipment including a Leica microscope, Vortex Mixer (Thermo Fisher Scientific), and centrifuge (Thermo Fisher Scientific) and implemented new testing procedures to better analyze and measure algae in our source water. Operator Thoa Pham became absolutely dedicated to and excels at understanding algae in the lab." She provides data that helps operators stay ahead of algae blooms.

The operators learned to identify the algae species so they could see the blooms coming. "We looked at algae data for the past 10 years," Venette says. "We found we could have higher levels of some and it wouldn't affect taste and odor, but the blue-green algae is what kills us. It causes the most issues."

Analysis showed that the blue-green algae arrived mostly through one specific supply line. Team members decided to tackle that problem in-house because of their knowledge of the system. "We began a new protocol using copper sulfate, an algaecide, to surface-treat our reservoir from a boat. And we added an in-line injection system that our operators designed and installed to treat our incoming water with copper sulfate."

HUMAN INSTRUMENTS

The staff also began using barley straw to control algae in the reservoir intake. The results were good. Venette, who holds Class A water, wastewater and industrial wastewater licenses in addition to Grade 4 collection and distribution licenses, says the use of barley straw was based on experience he had in a previous job where he used it in a wastewater lagoon to knock down ammonia and provide nitrification: "We buy it from a local farm and replace it every couple of weeks."

The Louisville water treatment plant team includes, from left, Jeff Owens, David Cole and Jocelyn Brink, operators; Greg Venette, chief water plant operator; Nick Owens and Edmond Song, water plant interns; and Steven Daniels, operator. Not pictured: Matt Formandy, Thoa Pham and Glen Sidenberg, operators; and Terrell Phillips, superintendent.

The water treatment team also added a second SolarBee solar-powered mixer (Medora Corporation - SolarBee / GridBee) to the reservoir to help control algae. They installed an automated water-quality profiler (YSI, a Xylem brand) to provide real-time data on the entire water column. The profiler takes readings at preset depths and includes a probe that measures pH, conductivity, temperature and other parameters.

But instruments can only go so far in measuring subjective qualities such as taste and odor. Venette enlisted the city's Human Resources Department to help him ask some employees who live in the city to become early-warning taste and odor monitors. They, in turn, enlisted some of their neighbors.

Now the team has both hard data and sensitive human palates supporting efforts to deliver good-tasting water. "We've gone two years without any taste and odor complaints caused by algae," Venette reports.

COLLABORATIVE UPGRADE

In improving its water treatment, Louisville recently completed its first design-build utility project using local engineering and construction firms. The project included both the North and South plants. Cory Peterson, city engineer, directed the effort, which involved replacing existing infrastructure, upgrading equipment and appearances, constructing new systems and resolving nagging issues that are part of any 30-plus-year-old plant. A small

EMBRACING CONTINUOUS IMPROVEMENT

Businesses and government units like to say they go beyond complying with environmental laws and regulations. Yet few yardsticks are available that measure what that really means.

However, Colorado has developed an environmental compliance measurement. It's a structured approach to improvement called the Environmental Leadership Program (www.colorado.gov/pacific/cdphe/environmental-leadership-program).

The ELP defines what "beyond compliance" means and provides measurable standards by which organizations that voluntarily exceed compliance with state and federal environmental regulations can operate and be recognized.

The ELP has three levels: bronze, silver and gold. It offers benefits and incentives to member organizations that exceed requirements. Greg Venette, chief water plant operator in Louisville, discovered the ELP last year while looking for recognition for his staff's efforts to excel. He signed up and got started.

The ELP sees a quest for continuous improvement as a part of an organization's new culture. Venette says that's the culture his staff members embraced when they began using data to drive decisions. In Louisville's first year as an ELP member, the team achieved the bronze level; this year they were awarded the silver.

Greg Venette, chief water plant operator

> "In two years, we went from all pen and paper for recordkeeping to fully digital: computer data entry, automated SCADA data collection and compliance reporting tools."
> **GREG VENETTE**

sampling of the capital improvement projects included cleaning up old electrical panels, replacing messy, old PLC cabinets, and remodeling valve vaults and adding lighting and ventilation.

The project involved the operations staff and was collaborative from beginning to end. "We completed over 100 individual items called out for resolution in scoping the project," Venette says. Operators helped identify problems and told the design-build team what was wrong. They put stickers on everything that needed work and kept and prioritized a list so that, as the project became better defined, they had both input and buy-in.

Some items were large and required the support and direction of Kurt Kowar, Public Works director, and approval from the Colorado Department of Public Health and Environment. One example was replacing a drain for the 600,000-gallon clearwell. It went on the design-build list, and when completed, it reduced the time to drain the tank from three to four weeks to three to four days.

ACROSS TOWN

The Howard Berry Water Treatment Plant (South), built in 1993, underwent major upgrades as well. The project replaced the filter media, underdrain nozzles and air scour system. Tube settlers were replaced with stainless steel plates; disinfection switched from chlorine gas to sodium hypochlorite using on-site MIOX generators.

The team also remodeled the HVAC system and installed drying beds for the sludge removed from the sedimentation basin. Together, these improvements made the plant more predictable and easier to keep running smoothly and consistently. "We increased filter runtimes by 12% and now use 2.5% less water for backwashes," Venette observes.

Under the guidance of Terrell Phillips, superintendent, the staff upgraded the SCADA system from two old Windows XP computers with manual disk backup (and daily prayers) to new SCADA servers, client computers, onsite automated backup, offsite backups and full redundancy for both plants.

Human-machine interfaces had to be completely overhauled to accommodate all the upgrades and changes. The city installed more than $150,000 in new instrumentation, such as turbidimeters, streaming current monitors and chlorine analyzers to replace outdated and obsolete equipment at both plants and laboratories.

"We replaced all of our diaphragm chemical feed systems with new Qdos peristaltic pumps (Watson-Marlow Fluid Technology Group) and integrated them into our SCADA system for flow control and feedback," Venette says. That change reduced system maintenance and made parts replacement much safer.

The Hach Water Information Management Solution, or WIMS, became the primary database for plant information. Operator Steven Daniels was instrumental in its implementation. "In two years, we went from all pen and paper for recordkeeping to fully digital: computer data entry, automated SCADA data collection and compliance reporting tools," Venette says.

"We are now rolling out our new asset management system, Lucity, to replace our old, manual preventive maintenance procedures with a streamlined, digital process." Operators Jeff Owens and David Cole have shepherded that project along.

CELEBRATING SUCCESS

The treatment staff celebrated the upgrades with a Water Day event they hosted for city employees and the public in 2018. It included plant tours and presentations on water use and conservation. Operators volunteered to tell visitors about the facilities. They prepared their own talking points and checked their information in the operations manuals.

The face of the entire operation has changed in a few short years, Venette says: "It took us from a conventional operation to a front-running, optimized, progressive team dedicated to sustaining health by removing water's impurities through positivity, dependability and data-driven decisions." tpo

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Raking in Savings

GREATER NEW HAVEN AUTHORITY SOLVES A SCREENING PROBLEM WITH MAINTENANCE-FREE AND RELIABLE BAR SCREENS BACKED BY QUALITY SUPPORT

By Thomas V. Sgroi and Charlie Biggs

The Greater New Haven Water Pollution Control Authority serves the Connecticut communities of New Haven, Hamden, East Haven and Woodbridge.

Focused on wastewater management, the authority oversees a system that includes 555 miles of collection pipeline, 30 pump stations and a 40 mgd (design) advanced secondary wastewater treatment plant.

The authority has always found it essential to budget responsibly and keep rates as low as possible. That includes choosing efficient equipment that requires minimal maintenance and repair. After experiencing difficulty with aging bar screens at the treatment plant and lift stations, the authority looked for replacements.

Since 2013, the authority has replaced several of the old bar screens with FlexRake screens from Duperon.

INHERITED TROUBLE

Wastewater treated by the authority at its East Shore Water Pollution Abatement Facility is discharged to Long Island Sound and must meet federal and state effluent quality standards. In the heart of the authority's territory sits Yale University.

When formed in 2005, the Greater New Haven authority took over all assets of the existing wastewater system, inheriting bar screens installed in the 1980s when the plant and lift stations were built. The screens worked but were unreliable and expensive to maintain.

They used a traditional catenary design: a series of vertical steel bars 1 to 3 inches apart with cross-secting scraper bars at 5-foot centers, driven by motor, gear reducer and sprockets. Maintenance to the components was labor intensive, according to Thomas V. Sgroi, P.E., director of engineering with Duperon.

A BETTER WAY

In line with its commitment to do everything "smarter and better," the authority looked for remedies, led by Charlie Biggs who had served as the New Haven wastewater treatment facilities' operations and engineering coordinator since 1988.

Biggs manages maintenance for all vertical assets at the plant and pump stations. He recalls his introduction to Duperon at a Connecticut wastewater trade show where the company had a mobile demonstration trailer.

"They had the same type of screen as our equipment — catenary bar screens," Biggs says. "The same concept, but different proprietary chain design and a different scraping bar. It's much, much more user friendly and a much neater installation, all-cast stainless steel, easier to repair and corrosion resistant. That's very important at a wastewater plant. Basically, the screen was simple but robust."

New FlexRake bar screens (Duperon) at the authority's Boulevard Pump Station have been effective in removing debris including leaves entering through a combined sewer.

The authority was especially interested in the design of the FlexRake bar screens, in which only the chain is below the water. Sgroi and colleagues believed that could make a real difference in uptime. They invited Duperon representatives for a visit.

"We really liked their style," Sgroi says. "Their equipment spoke for them. They weren't trying to sell their product; they really were trying to solve our problem. And the technology was different — not your typical mechanical bar screen. It's more like a link system, rigid and effective."

KEEPING RATES LOW

The authority tested the first FlexRake screen in 2013 and has since replaced old screens with seven FlexRake screens at four locations: two at the East Street Pump Station, each with 35 mgd capacity; two at the Boulevard Pump Station, also 35 mgd each; one at the Morris Cove Pump Station, 18 mgd; and two at the East Shore Main Plant, with 20 mgd average flow. The plan is to add new screens at two other locations to provide increased capacity.

Authority leaders say the new screens have produced significant savings on maintenance and repair. The old screens needed to be rebuilt every 1.5 to three years, at costs from $25,000 to $30,000 apiece. In addition, each rebuild meant downtime of up to a month to wait for specialized parts. When the screens were out of service, a high-flow event created potential for a backup.

The authority estimates it would have cost $300,000 on average to rebuild the old screens over the last four years. Chains also would have had to be replaced every two years; they would stretch so much that links had to be removed to shorten the chains so they wouldn't drag.

The cost estimate doesn't include the regular maintenance required by the operations team to keep them running. It was also labor-intensive to clean up the debris that built up over time on the screens, chains and surrounding areas. Then there was the downtime and its associated risk.

JOB WELL DONE

The first FlexRake screens have been in operation for four years. "They've been running fine, better than fine," Biggs says. "We grease them as recommended every quarter; that takes 10 to 15 minutes. We change the oil once a year, and that's about a couple hours per unit each time. The maintenance is minimal, a lot less. After four years, the chains aren't even worn. We haven't needed to replace a part in four years."

Besides saving money, the new screens are much more effective. At the Boulevard Pump Station, for example, the influent comes from a combined sewer. During a New England autumn, the stations are inundated with leaves, which would blind the old screens. Now the leaves are spread all over the room and all over the conveyer, overflowing from the dump containers because the screens do their job so well.

The new bar screens have been installed at the East Shore Water Pollution Abatement Facility as well as at pump stations in the collections system.

Sgroi, who has worked closely with the Duperon team over the past six years, observes, "They work with us, brainstorming a problem. They feel like an extension of our staff. We feel safer or more comfortable with the company that invented the technology, but more important, the customer service and willingness to listen are second to none.

"We like that they put a lot of effort into research and development, and we're now looking into some of their other equipment. The FlexRake screens have been absolutely reliable and maintenance-free, saving us tremendous time and money. We employ 60 people. If three of them aren't pulled off their work to fix problem equipment, we can have their time spent elsewhere. Having maintenance-free, reliable equipment allows us to have money for other projects."

ABOUT THE AUTHORS

Thomas V. Sgroi, P.E., (tsgroi@gnhwpca.com) is director of engineering with Duperon. Charlie Biggs (cbiggs@gnhwpca.com) is operations and engineering coordinator with the Greater New Haven Water Pollution Control Authority. tpo

industry news

OCV Control Valves implements new global strategy and restructuring

In April 2018, OCV Control Valves, a family-owned company, was acquired by and began operating under the MAT Holding Group umbrella. MAT then merged OCV Control Valves with Dorot Control Valves, resulting in the creation of OCV Fluid Solutions. This strategic plan ensures a globally stronger product line, new innovative technologies, improved engineering, customer service and technical support. In addition to continuing to offer its existing products, OCV is now responsible for the control and sale of the Dorot Fire Protection product line under OCV Fluid Solutions branding.

SNF Polydyne invests in its polyacrylamide capacity

Over the last two years, SNF Polydyne has added 75,000 metric tons per year of powder-grade polyacrylamide (or PAM) production capacity globally to match the increased demand for enhanced oil recovery applications. By the end of 2020, SNF will add 75,000 metric tons per year more. This new capacity will be spread across several regions and will provide easy access to its products. In the U.S., this year SNF will complete an additional emulsion-grade PAM expansion of 100,000 metric tons per year. The company's goal is to have a total emulsion-grade PAM production capacity in the U.S. of 1 million metric tons per year by the end of 2020.

MFG Chemical plants win safety awards

MFG Chemical received three Awards of Excellence for workplace safety at each of its three Dalton, Georgia, area plants from the Georgia Department of Labor. In order to qualify for the award, a location or facility must have achieved at least 250 workdays during the previous calendar year with no days away from work due to workplace injuries or illnesses.

Industrial Scientific welcomes new general manager

Parker Burke

Industrial Scientific announced it hired Parker Burke as senior vice president and general manager. He will be responsible for leading the company's global gas detection and iNet business. Burke most recently worked as vice president and general manager at Anderson-Negele, based in Fultonville, New York. Prior to that, he was with Gilbarco Veeder-Root, where he held leadership positions in marketing, product management and operations.

Holland Pump announces new chief financial officer

Holland Pump announced the appointment of Keno Cox as its chief financial officer. Cox previously held senior finance roles at Neff Corp. He has extensive experience in strategic planning, enterprise accounting and mergers and acquisitions, and holds a Bachelor of Science in accounting from Temple University.

SEEPEX names two new managers

Bill Martiniere

SEEPEX announced the hiring of two new managers. Bill Martiniere accepted the new position of chemical market manager. In this position, he will be responsible for all chemical pump sales-related activities. Martiniere has more than 35 years of industrial experience with heavy emphasis in chemical applications along with extensive knowledge of progressive cavity pumps in chemical metering applications. And Chris Brooks was hired for the position of territory manager for the Southeast region of the U.S. He will cover Louisiana, Mississippi, Alabama, Georgia and Florida's industrial and municipal markets. Brooks was previously employed as a branch manager at a SEEPEX distributor and has an extensive knowledge of SEEPEX progressive cavity pumps. tpo

plant PROFICIENCIES

Why Peristaltic Chemical Dosing Pumps Are a Solid Choice for Treatment Applications

Specifying the proper chemical dosing pump for an application can be daunting, however, the process is simpler if you first acquire all application parameters. It's important to consider such factors as the fluid to be pumped, the output volume required, and the pressure the pump will work against in the system.

Once all parameters are taken into consideration, the task of selecting the best pump option to ensure optimal performance and dependability becomes clearer and the decision is easier to make.

PERISTALTIC DOSING

In both municipal and industrial water and wastewater treatment applications, peristaltic dosing pumps often prove to be the preferred technology.

Water treatment applications use chemicals such as sodium hypochlorite and peracetic acid, which are known to offgas and calcify. When diaphragm pumps are used in these applications, these chemicals can cause vapor locking and clogged valves. Meanwhile, peristaltic pumps are not affected by gas, air bubbles or particulates. Peristaltic technology allows the bubbles and particles to simply be moved through the system.

THE FLEX-PRO SERIES

Blue-White Industries' Flex-Pro M-2, M-3 and M-4 pumps have been solving problems and providing solutions in water and wastewater treatment applications for years. Flex-Pro peristaltic dosing pumps deliver the precision, function and dependability system designers and operators want and need. These units can handle the often aggressive and high-viscosity fluids commonly used in these applications.

Blue-White engineers designed ProSeries-M pumps to be rugged, efficient and technologically advanced while delivering precision chemical dosing and providing ease of use and service.

ProSeries-M units have two CNC-machined rollers and two alignment rollers for optimum squeeze and tube life. The single-piece, heavy-duty rotor means no flexing and increased accuracy, with no metal springs or hinges to corrode. Operators can set the pump to inject at maximum pressure in either direction — clockwise or counterclockwise.

The sturdy pump head cover is made of clear acrylic that has been annealed for added strength and chemical resistance. There are no tools required for pump-head-cover removal, allowing for quick and easy access during routine maintenance.

The electrical interface of all three ProSeries-M Flex-Pro pump models is an operator-friendly touchpad with menu-driven software. The VGA graphic, multicolor backlit LCD screen displays remote/local control status, motor speed, output rate, input signal values, service and alarm status. All electronics are easily accessible and are SCADA ready. The firmware is field upgradable.

ProSeries-M, M-2 and M-3 pumping units are equipped with Blue-White's exclusive Flex-A-Prene pump head tubes. Multi-Tube is a multichannel pump tube assembly designed by Blue-White exclusively for ProSeries-M Flex-Pro peristaltic metering pumps. Multi-Tubes are engineered for optimum performance, excellent chemical resistance and long service life.

Flex-Pro pumps also are compatible with Blue-White's all new CHEM-FEED chemical feed flowmeter, according to the manufacturer.

Finding the pump with the correct capabilities and desired features for your application will save time, money and energy. When you're speccing out your application parameters, consider a peristaltic metering pump.

Blue-White Industries, Ltd.

Blue-White Industries was founded in 1957 and is a leading manufacturer of metering pumps — diaphragm, peristaltic; flowmeters — variable-area, paddlewheel, ultrasonic; and water treatment accessories. The company has a CNC department with lathes, mills and saws; a pump department with diaphragm and peristaltic pumps, assembly and testing; and a new computer-enhanced flowmeter calibration facility. Its products serve a wide range of industries, including swimming pools and water parks, agriculture and irrigation, car washes, food processing, mining, and water treatment.

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Water Research Foundation Pilot Recovers Highest Rate of Total P

The CalPrex pilot ran as a 10 gpm system in the fall of 2018 at Nine Springs Treatment Plant, a 42 mgd facility in Madison, Wisconsin. The pilot was situated between the acidogenic and methanogenic digesters. CalPrex was fed with acid digest.

A Centrisys CS10-4 decanter centrifuge dewatered the feed to 20% solids, which were conveyed to a recombination tank. Centrate was dosed with calcium hydroxide, causing the precipitation brushite, a form of phosphorus. The brushite settled in a lamella clarifier. Clarifier overflow was recombined with the acid digest cake and discharged to the methanogenic digester. The settled brushite was dewatered and cake was dried as a high-quality fertilizer for a study funded by the U.S. Department of Agriculture.

PILOT RESULTS

CalPrex demonstrated its ability to recover high rates of total and soluble phosphorus before the digesters. Preliminary pilot performance analysis indicates a 66% solubilization rate in the fermented sludge after the phosphorus release that went to the Ostara process in Madison.

Forty-four percent of the total phosphorus was captured with an 89% soluble phosphorus reduction in the CalPrex reactor. The pilot system's clarifier effluent averaged 44 mg/L soluble phosphorus.

HOW CALPREX WORKS

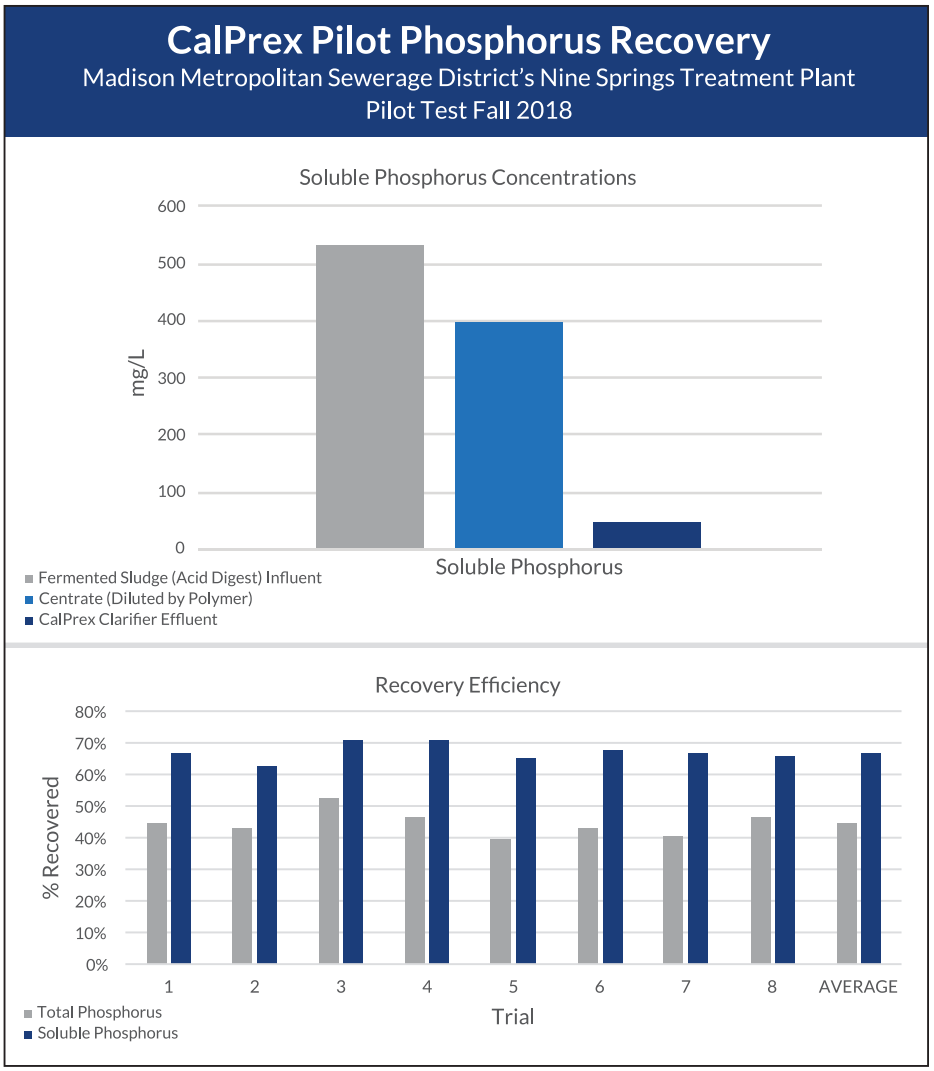
CalPrex incorporates thickened sludge from a fermentation tank or acid digester to increase the amount of soluble phosphorus which increases the phosphorus-recovery potential. CalPrex is uniquely suited for recovering a high rate of soluble phosphorus by adding calcium hydroxide without the need of ammonium.

This high-value solution is designed for facilities needing phosphorus removal and recovery prior to thermal hydrolysis; from waste activated sludge and/or primary sludge prior to anaerobic digestion; or from aerobic and post-aerobic digestion.

CalPrex is a viable solution for utilities seeking to mitigate operations and maintenance issues related to struvite scaling and poor sludge dewaterability.

The 11 organizations involved in the pilot project were the Water Research Foundation; Nine Springs Treatment Plant in Madison; Milwaukee Metropolitan Sewerage District; Metro Wastewater Reclamation District in Denver; Massachusetts Water Resources Authority in Boston; Colorado School of Mines in Golden; University of Wisconsin-Madison; Black & Veatch of Madison; Hazen and Sawyer of Virginia Beach, Virginia; Centrisys/CNP of Kenosha, Wisconsin; and Nutrient Recovery and Upcycling of Madison.

A peer-reviewed study will be published by WRF to elaborate on the CalPrex process performance, benefits, costs and larger scale impact.



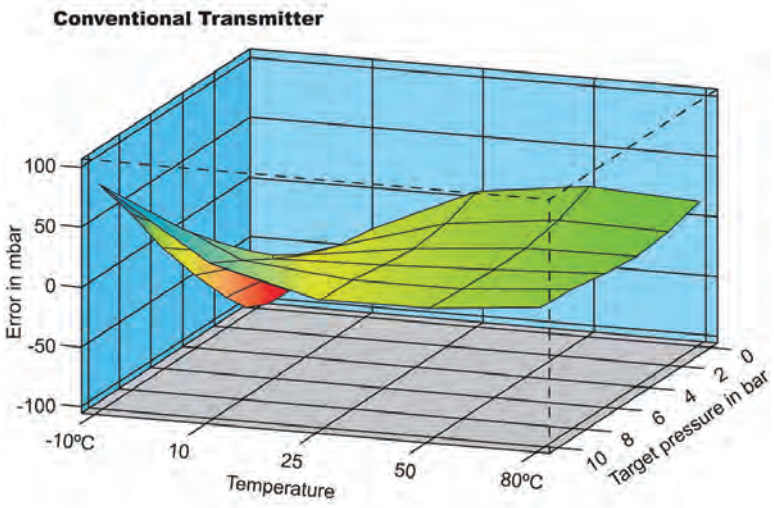


FIGURE 1

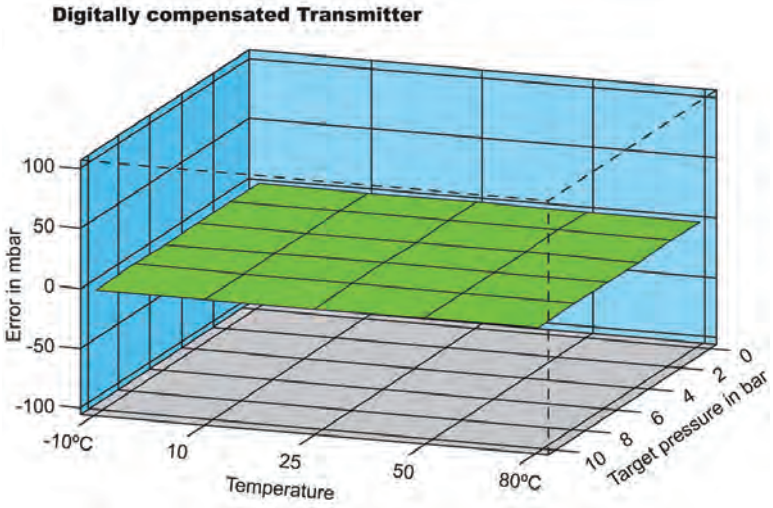


FIGURE 2

The Benefits of Total Error Band Specifications for Pressure Transmitters

In a perfect world, the output of a pressure transmitter would vary only in response to a change in pressure input. Unfortunately, the perfect pressure transmitter has yet to be invented.

All transmitters exhibit a measurable susceptibility to ambient temperature variation. This will remain true until transmitters are constructed from materials having a thermal expansion coefficient equal to zero.

It is important — sometimes more so than others — for the transmitter user to understand the effect of ambient temperature variation on the overall accuracy. Rarely does the ambient temperature remain constant over long, and even short, periods of time, so if it can affect the accuracy of a transmitter, it behooves the user to know how, and by how much.

EXPRESSING ACCURACY

The accuracy of a pressure transmitter can be expressed in many different ways. Most common is the practice of "subdividing" the sources of error into "static" and "thermal" errors. Static error — which usually includes nonlinearity, hysteresis and nonrepeatability — gets its name from the fact that it's determined at a constant temperature, usually 25 degrees C.

It's a good indicator of the ability of the device to accurately convert the (physical) pressure input into an (electrical) output signal, so long as the device is maintained at the reference temperature. The "thermal" error is provided to allow the user to predict what the total error might be at a temperature other than the reference temperature.

Typical test results obtained from a good, passively-compensated transmitter are shown in Figure 1.

ALL-INCLUSIVE ERROR SPEC

Suffice it to say, the static error alone is not a good indication of the accuracy achieved in most real-world applications. What is needed is a simple-to-understand, all-inclusive error specification like Total Error Band.

The concept of Total Error Band is not new. It's a method which combines both static and thermal error sources into one, easy-to-understand number. It is usually expressed as ±XX% of full scale, defining an error band referenced to an ideal (zero error) input/output curve. Simply stated, the transmitter output will never exceed the limits of the error band at any pressure within the rated full scale or at any temperature within the compensated temperature range.

With miniature microprocessor technology and stable sensor design, this technique can be cost-effectively integrated into individual pressure transmitters. The results are fairly spectacular, as the error band is typically narrowed by a factor of 100. Sensors are married to microprocessor circuits to form a transmitter then subjected to an extensive calibration routine including a series of complete pressure calibrations at several different temperatures which collectively define the compensated temperature range.

The result is a coherent map — or mathematical model — of the transmitter in the form of polynomial equations for calculating temperature and subsequently true pressure, using coefficients stored in the on-board EEPROM. In practice, the internal microprocessor calculates the true pressure from these equations. Typical results obtained by this technique are shown in Figure 2.

If the transmitter has an analog output, this output is updated at a preset rate, typically 400 times per second. State-of-the-art transmitters will have both analog and digital — usually bus-compatible — outputs, assuring the user of the utmost in interfacing flexibility.

Water Treatment Facilities Turn to KOHLER Generators

The KOHLER KD Series of large diesel industrial generators are connecting in targeted industries all around the world, including water treatment facilities. The KD Series generators feature powerful, technically advanced KOHLER engines and are highly customizable to match the specific needs of operators. Multiple options are available to ensure suitable performance for the most demanding applications.

Available in nodes ranging between 800 kW and 4000 kW, the KOHLER KD Series generators are backed by a comprehensive three-year warranty, a full complement of genuine KOHLER aftermarket parts, and a global service and support network. Designed to deliver extreme durability and ultimate reliability in a variety of emergency and prime applications, the KD Series is ideally suited to modern wastewater sites.

"Losing power really isn't an option for water treatment plants," says Jim Rummel, associate director for KOHLER industrial generators. "Operators today need a highly efficient solution that will deliver power whenever it's needed — a fully integrated power system designed to meet the exact requirements of their facility. The KOHLER KD Series checks all of these boxes and so much more."

A new line of generator-drive engines was developed to power the KOHLER KD Series. The compact and powerful diesel models incorporate a modular design with common components, allowing for efficient servicing, reduced spare parts inventory, and more streamlined technician training. They were designed to provide quality performance and reliability in the field.

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

The 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

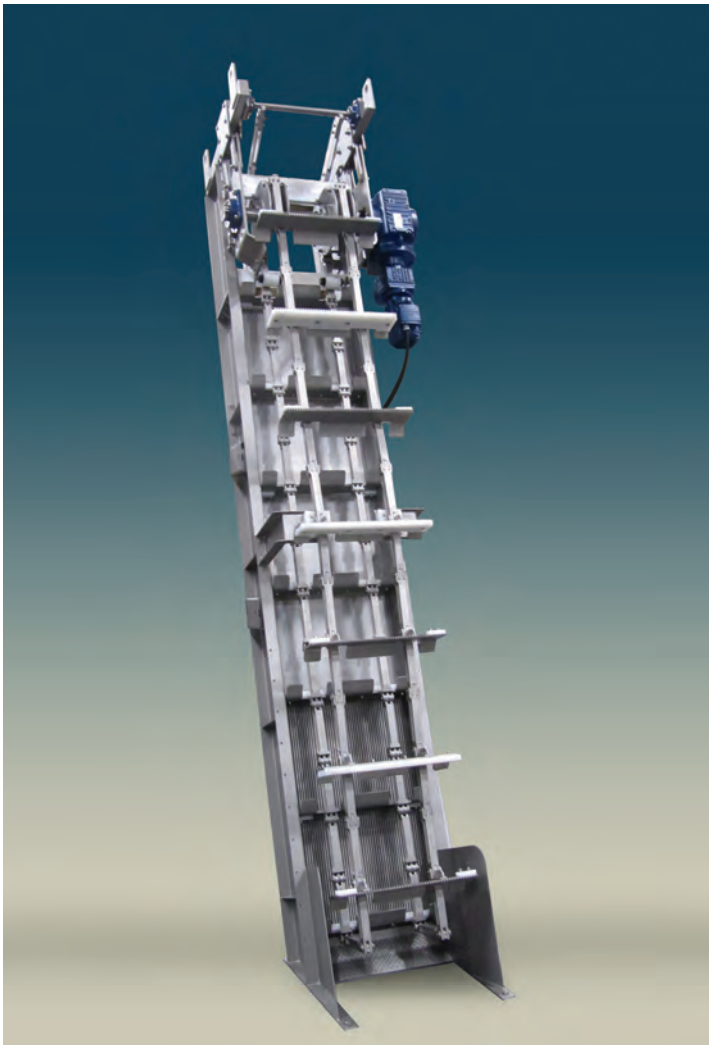
The Raptor FalconRake Bar Screen can be used in tandem with the Raptor Wash Press to wash, compact and dewater captured screenings. The screen and wash press equipment controls can be integrated into one control panel for smooth and efficient operation.

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.



LAKESIDE EQUIPMENT CORPORATION
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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.

630-837-5640 | sales@lakeside-equipment.com
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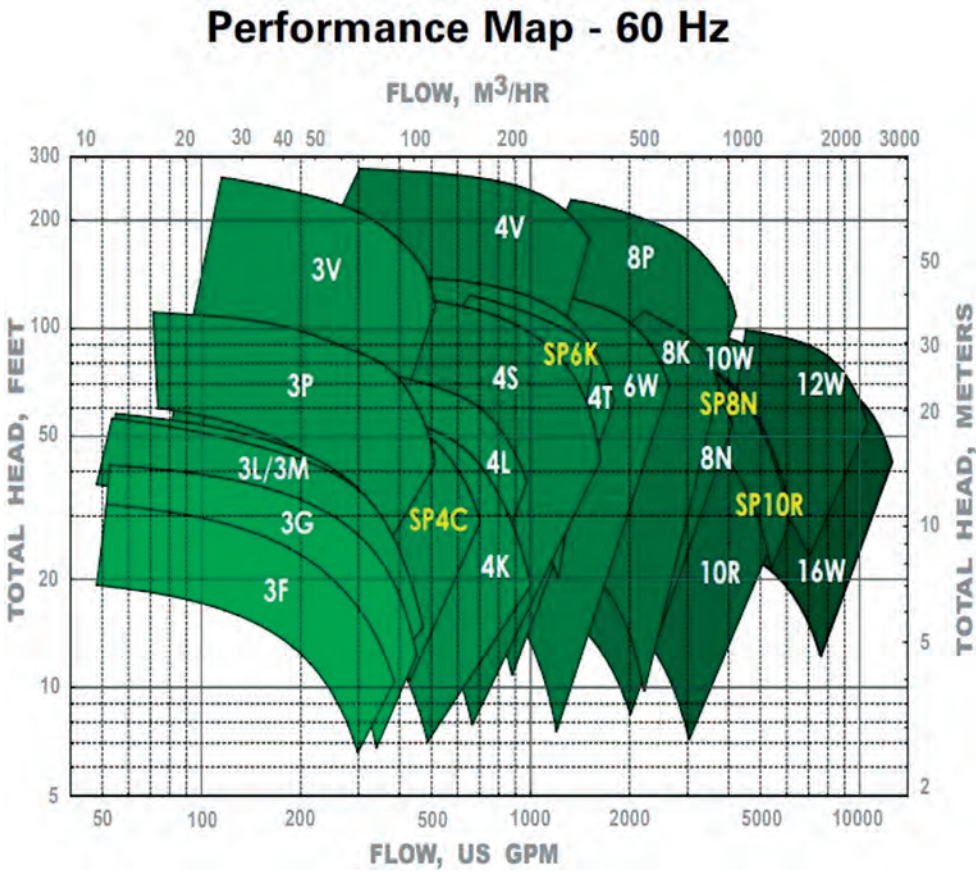
The Science of Chopper Pump Reliability

The design principles of chopper pumps have evolved over 60 years. New ideas and concepts have come to fruition from field experience in chopping and pumping an ever-widening variety of items.

As a result, chopper pumps are able to pump a large array of solids that make their way into effluent wastewater. In treatment plants, these chopper pumps have been a crucial asset for operators who rely on consistent, minimal maintenance solids-handling pumps in critical applications.



CHOPPER PUMP DEVELOPMENT

Development of the first chopper pump began in the late 1950s when Jim Vaughan recognized the need for better pumps in local dairy waste streams, according to a Vaughan Co. spokesperson.

The pumps of the time weren't able to handle the manure, twine and animal bedding that cluttered the waste streams in the dairy fields. To solve the issue, Jim Vaughan designed a chopper pump to break down solids using a multiblade rotating impeller chopping against fixed shear bars at the suction opening. While this basic design is the foundation of chopper pumps, field experience has proven that a number of additional chopping features increase the pump's ability to eliminate clogging and binding.

TREATMENT PLANT APPLICATIONS

Ongoing engineering and field testing found an effective use for these pumps in the handling of tough solids often found at modern treatment plants. Kent Keeran, recently retired chief engineer of Vaughan, explains that Vaughan chopper pumps chop materials inside the pump rather than in front of a typical nonclog impeller.

"We also employ a number of patented chopping features specifically designed to ensure that the entrance to the pump remains free of solids entering the pump, and to ensure that both the front and back of the impeller remain free of any material that could eventually cause clogging or binding between the impeller and volute," he says.

PRODUCT DESIGN

Vaughan has spent many years refining the use of computational fluid dynamics to improve the efficiency of existing pump designs and generate new pump models. Through careful validation of CFD simulations, Vaughan has been able to bypass physical performance testing of prototypes, which allows the engineering team to test hundreds of combinations of impeller blade shapes and pump casing designs to maximize chopper pump efficiency and reliability.

The key component in this process is the nearly 60 years' chopping experience that forms the basis of knowledge, which allows the Vaughan team to accurately identify what impeller blade shapes and configurations work best for a chopper pump when considering how to run the CFD simulation process.

The final verdict for a successful chopper pump design can only be obtained in actual sewage treatment plant applications. "Vaughan Co. is very proud of the fact that through commitment to rigorous design and focused attention to customer feedback, all of the Vaughan chopper pump models operate successfully around the clock in the toughest applications found in today's sewage treatment plants," says a company spokesperson.

AdEdge Offers Multiple Solutions for Arsenic Contamination

Compliance with the U.S. EPA and the World Health Organization's maximum contaminant level of 10 parts per billion for arsenic affects thousands of water systems throughout the United States and other countries.

The dangers of arsenic are masked by its colorless, odorless appearance. It is a carcinogen that occurs naturally in groundwater and is known for leading to dangerous health conditions such as cancer, neurodevelopmental disorders and heart failure.

AdEdge offers multiple water treatment solutions rated from 5 gpm to more than 12 mgd. The right option depends upon flow rates, arsenic concentration, the presence of co-contaminants, and site-specific conditions or limitations. Upon receiving a complete water quality analysis, AdEdge determines the best treatment for a plant's needs based on years of experience and an accurate, predictive model.

Options include adsorption using Bayoxide E33 granular ferric oxide media; coagulation/filtration with iron augmentation; and oxidation/filtration.

Pre-engineered AdEdge Packaged Units are the ideal solution for public water systems, schools, subdivisions and more. The company also offers a line of modular treatment systems that arrive assembled, ready for hookup. These solutions can incorporate the adsorption, oxidation/filtration and/or coagulation/filtration treatment processes with pre- and post-treatment for a complete integrated system.

ADSORPTION PROCESS

In the adsorption process, contaminants break their bond with water molecules and chemically adhere to a filter media. This is accomplished by directing water flow through pressure vessels that contain the adsorptive media at a specific rate that allows the right contact time for adsorption.

Bayoxide E33 adsorption media is the industry standard for arsenic removal. This granular ferric oxide media reduces up to 99 percent total arsenic, including arsenic (III) and arsenic (V).

OXIDATION AND FILTRATION PROCESS

Oxidation/filtration is a precipitative process that removes naturally occurring arsenic (if it coexists with high levels of iron), as well as — iron, manganese and hydrogen sulfides. The process oxidizes the insoluble forms of these contaminants into their soluble forms and then removes them via filtration.

Oxidation/filtration media has a high catalytic and oxidation capacity, superior handling properties, NSF 61-certification, does not require permanganate or coagulant addition, and has low operating and capital costs.

COAGULATION AND FILTRATION PROCESS

Coagulation/filtration introduces a coagulant, typically an iron or aluminum salt, to pretreat water contaminated with arsenic, iron, manganese and/or sulfides. The process allows for significantly higher flow rates per square foot of media, creates less backwash water than other conventional treatment approaches, and has a smaller footprint that allows for lower operating and capital costs. This process involves chemical addition and automated processes to decrease operator involvement and expense. It does not generate hazardous waste.

AdEdge water technologies

AdEdge Water Technologies specializes in the design, development, manufacturing and supply of innovative water treatment solutions that remove contaminants from process or aqueous streams. For more information, **866-823-3343 | sales@adedgetechnologies.com | www.adedgetech.com**

ARSENIC IS NOT A GAME

Ready to make the right move?

AdEdge is your one-stop resource for arsenic treatment systems for any size community. We now supply Bayoxide E33 adsorptive media and E33 media replacements for the largest and the smallest systems. As always, AdEdge offers competitive pricing, experienced engineers, and unparalleled support.

With AdEdge's arsenic treatment systems' global success history, why would you go anywhere else?

When you're ready to make the right move, call us at **866.823.3343**.

AdEdge™ water technologies

www.AdEdgetech.com

Rushville Sees Clean Effluent After AquaStorm Cloth Media Filter Installation

The City of Rushville, Indiana, had to remedy a consent order filed in 2007 for its untreated combined sewer overflow discharges that were polluting the Flatrock River in violation of the Clean Water Act. The city originally planned to install a 1 mgd stormwater storage tank, but was approached by Aqua-Aerobic representatives with a pilot test proposal using a new technology.

The pilot proposal featured the AquaStorm Cloth Media Filter utilizing 5-micron microfiber cloth media, which would be tested during five wet weather events. This study captured events from May to July 2015 and produced impressive results.

The successful pilot test prompted the city to request a design for an AquaStorm filtration system in February 2016. The request came with two stipulations — the filters were to treat both dry and wet weather conditions, and alum coagulant was to be injected upstream of the filters to meet future effluent phosphorus limits and eliminate fine CSO particles.

AQUASTORM PERFORMANCE

Start up of the two 14-disk AquaStorm filtration system began in July 2017 with a design average flow rate of 1 mgd in dry conditions and peak wet weather flow rate of 12.6 mgd.

Each cloth media disk is 6.6 feet in diameter and provides an effective filtration area of 53.8 square feet for a total filtration area of 1,506.4 square feet.

The filters were retrofitted into the plant's existing, abandoned sand media filter structures, saving the city considerable capital costs. In addition, the new filtration system cost $1 million less than the original, conventional storage tank design.

The AquaStorm cloth media filters experienced the first wet weather events shortly after start up in October and November 2017. Due to the continuous treatment capacity, no untreated overflows have occurred.

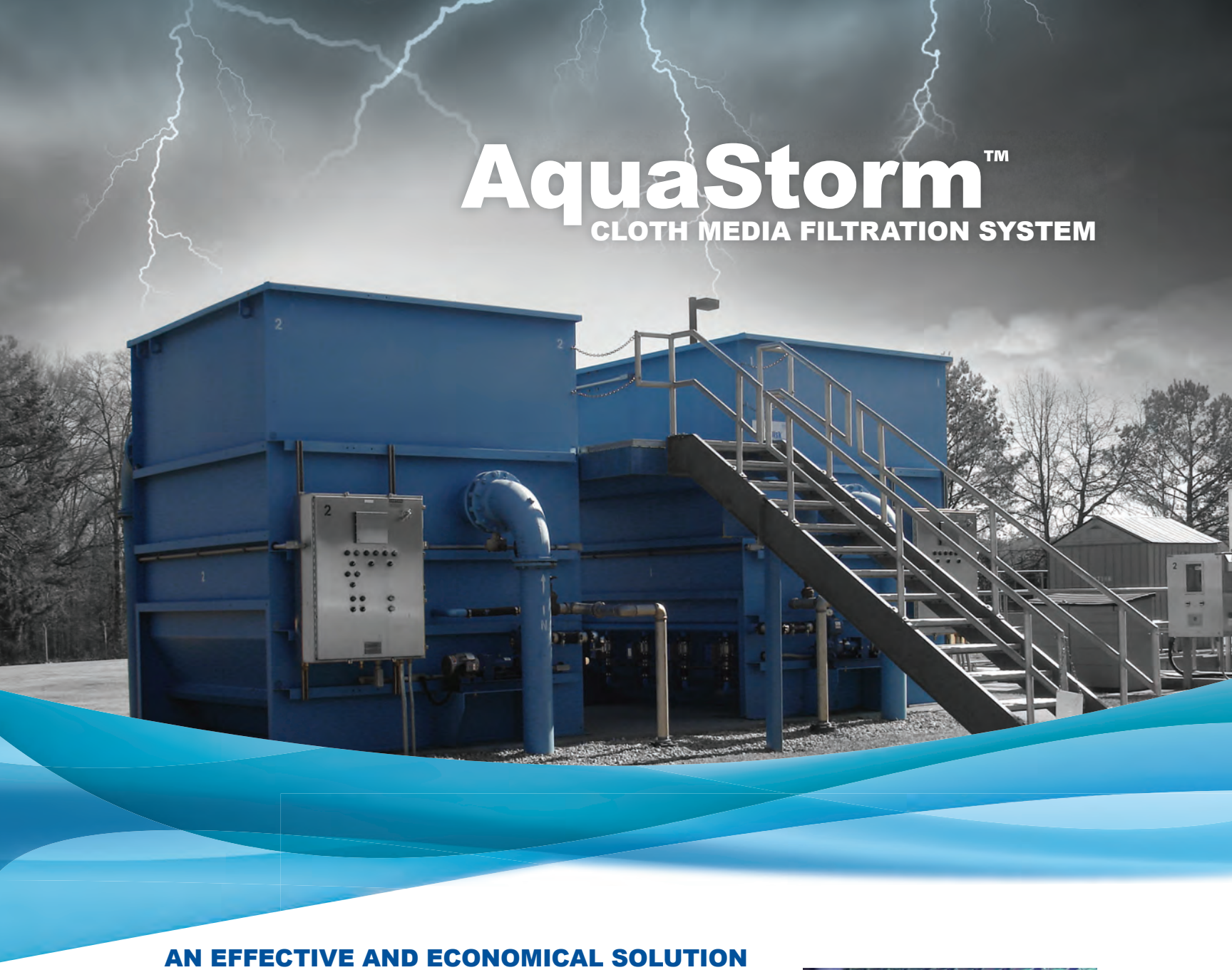
IMPROVED WATER QUALITY

Rushville's new tertiary/wet weather filtration system also included replacement of its existing gas chlorine disinfection system with a UV disinfection system. The UV system was installed in the existing tank, which also provided significant project cost savings. Completion of the filtration/disinfection phase of the city's upgrade project was achieved five years earlier than required by the state regulation agency.

This project is the first AquaStorm filter installation in the nation for dual tertiary/wet weather treatment and will keep approximately 50 million gallons of raw sewage from entering the nearby Flatrock River annually, according to Les Day, utilities director for Rushville.

"With the addition of the AquaStorm filter system and new UV disinfection system, Rushville is discharging the best quality of water to our receiving stream, Flatrock River, than in years past," he says.

AquaStorm™
CLOTH MEDIA FILTRATION SYSTEM

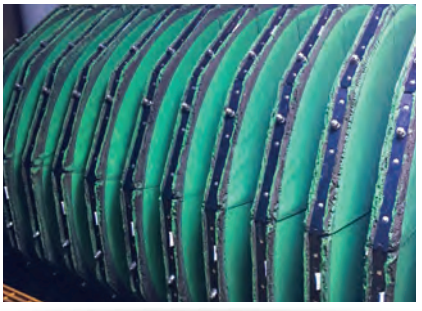


AN EFFECTIVE AND ECONOMICAL SOLUTION FOR WET WEATHER TREATMENT

The **AquaStorm™** filtration system utilizes OptiFiber PF-14® pile cloth media in a disk configuration with three zones of solids removal to effectively filter wet weather flows without the use of chemicals. The system is designed to handle a wide range of flows and influent solids conditions in a fraction of space compared to other treatment methods.

AquaStorm is ideal for CSO, SSO and stormwater applications due to its proven removal efficiencies and high quality effluent.

- Low Level TSS and BOD
- Dual use flexibility for tertiary and wet weather treatment
- Simple start-up and shut-down with unattended operation for remote locations
- Automatic procedure for cleaning and draining unit for offline storage



City of Rushville, IN

- Tertiary/CSO application
- Wet weather TSS and BOD effluent less than 10 mg/l

A "Green" Advantage Product
Lower Energy • Small Carbon Footprint

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NamWon's Turbo One Blower Saves Energy Costs

Blowers are a vital part of water treatment operations, and selecting the right one for your application is crucial. For those that require high volumes of air, the energy saved on a turbo blower can offer savings that help pay back your investment.

As an example, Nestlé's plant in Bangkok replaced a Roots-type blower with a NamWon Turbo One blower in February of 2019 and realized approximately a 45% energy and cost savings for its food waste treatment application.

With an operating pressure setting at 0.6 bar, Nestlé's previous power consumption averaged 1,600 kW per day, or 66.66 kW per hour. After running the NamWon Turbo One, the company reduced energy consumption to 950 kW per day, or 39.58 kW per hour.

SAVING ENERGY IS SAVING MONEY

Using an average of 27.08 kW per hour less, blower power consumption has decreased by more than 40% for Nestlé. That means the Bangkok plant is saving about $22,000 per year, according to a NamWon spokesperson.

EASY MAINTENANCE

While turbo blowers have a relatively higher price point than Roots-type blowers, there are some maintenance benefits for choosing a turbo. NamWon's Turbo One offers simple maintenance. Since it uses air bearings that use air instead of lubrication oil, the blower can be used semipermanently without failure simply by changing the filter.

Blowers using oil as lubricant can incur additional costs because operators must buy oil and they typically use more electricity to run.

"In terms of environmentally friendly aspects, it is also effective to use a turbo blower," says a NamWon spokesperson.

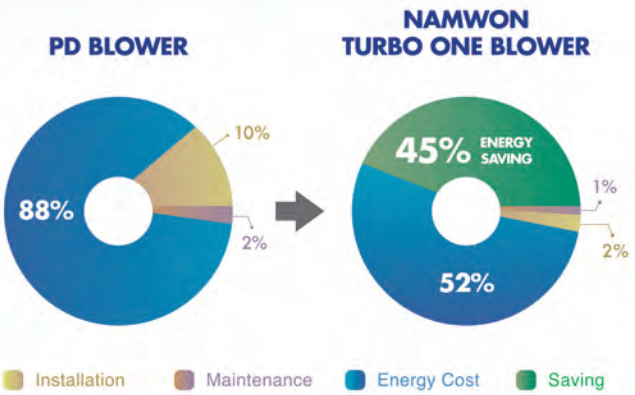
The Turbo One turns room-temperature air into high-temperature pressure and supplies it to the production facility. It's a low-noise, low-vibration product that transforms inverter frequency for capacity modulation to save additional electricity costs.

NAMWON TURBOONE

NamWon is a specialized manufacturer of turbo blowers. The company researches, develops, produces and sells high-quality performance products by using modern air bearings; precision machined impellers; high-speed, high-efficiency permanent magnet motors; high-speed control inverters; and automatic control.

821-544-2280 | nwturboone@daum.net | www.nwturbo.com

DISCOVERING NEW FRONTIERS WITH TURBO BLOWER INNOVATIONS



Saving energy is all about making deliberate choices:
it's time to choose Namwon Turboone's full- fledged blower.
Equipped with unmatched speed & high efficiency PMSM and VFD, our blower will surely reduce your operating costs.

Compared to a standard PD blower, our unique equipment is the eco-friendly, cost-saving alternative that uses 45% less energy, has a 100% oil-free air foil bearing, and a precisely-manufactured impeller that cannot be replicated.

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NAMWON TURBOONE

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Turn Data Into Decisions With Claros, the Water Intelligence System From Hach

Changing regulations, unpredictable influent levels, unplanned instrument downtime, irregular samples and incorrect data logging are all problems plant operators face. Without a clear picture of their water or data, operators face uncertainty about efficiency and compliance. With 17 percent of the nation's wastewater treatment plants receiving penalties for compliance issues, there's a clear need for a solution.

Imagine the time savings, cost reductions, and peace of mind that a complete water intelligence system could provide. Channeling 80 years' instrument expertise and 25 years' software development in wastewater treatment, the Claros Water Intelligence System from Hach addresses three critical areas: instrument management, data management and process management, harnessing information to deliver guided insights for optimized plant operations.

IS YOUR INSTRUMENT DUE FOR MAINTENANCE?

Sludge. Scaling. Toilet paper. Probes at wastewater plants have a dirty job, and need proper maintenance and calibration. Even process equipment needs attention. Keeping instruments well-maintained means operators can trust measurement data.

Prognosys predictive diagnostics helps plant operators stay in front of instrument maintenance and calibration, reducing unplanned downtime and errant measurements. Mobile Sensor Management provides status alerts for all connected instruments within a single view, allowing operators to see their system's complete performance. Better instrument management helps reduce unplanned downtime, and lets operators know if changes to measurement data are due to an instrument or the water.

DO YOU HAVE THE DATA YOU NEED, WHEN YOU NEED IT?

Data on its own doesn't ensure compliance or reduce costs. Claros provides the insights into the data that can make the difference between optimization and compliance woes. Data traceability helps pinpoint where a data error may have occurred, while quick data compiling available in a central location provides accurate views of critical parameters.

Water Information Management Solution (WIMS) software combines water system data sources in a central, secure database, providing the tools needed for electronic and paper reporting, analysis and monitoring. When investigating data, the filters, drill-downs and custom forms help operators find insights hidden in raw data.

ARE YOU WASTING MONEY ON OVERTREATMENT?

There is a certain rhythm to wastewater influent, but there's no way to predict an unexpected peak load, so process management is crucial to ensuring cost-effective plant operation leading to compliance. Claros Real-Time Control Solutions (RTC) measures water continuously, providing major cost-savings opportunities such as reducing chemical dosing and basin-blower run-time, helping operators stay in compliance while using the least amount of chemicals and energy.

ARE YOU READY TO SIGN THAT REPORT?

With a complete picture of a plant's instrument, data, and process information, users will gain the insights needed for optimization. Proactive maintenance means less unplanned instrument downtime. Crucial operations can be automated around the clock. Data compiled from multiple sources provides actionable insights, so operators can run their plant efficiently and sign the report with confidence.

HACH®

Hach has provided innovations to support its customers for more than 70 years. Hach gives customers confidence in their water analysis by delivering expert answers, outstanding support and reliable, easy-to-use solutions. Hach analytical instruments, services, software, and reagents are used to ensure the quality of water in a variety of industries in more than 100 countries globally.
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+ 135,000,000 Tests Conducted Annually by You

+ 2,304,000 Claros™ Measurements Taken by You Per Day

At Hach, our focus is you. Your process. Your permits. Your challenges. No matter how many patents, projects, or installations we earn, your success is the true measure of our success. **It all adds up to you.**

See the Power of Hach.

Learn more at hach.com/wastewater

HACH®

Be Right™

Duperon Bar Screens Solve 'Grit in the Pit' Issue at North Carolina WWTP

The Water and Sewer Authority of Cabarrus County (WSACC) serves selected water and sewer needs for five jurisdictions in south-central North Carolina. One of WSACC's primary facilities is the Rocky River Regional Wastewater Treatment Plant in Concord. This two-stage 26.5 mgd biological wastewater treatment facility processes domestic and industrial wastewater.

In early 2016, maintenance staff determined that the four existing 1970s-era bar screens at Rocky River's main pump station needed to be replaced to address serious operational challenges — safety, cost and time — that WSACC had been dealing with for years.

THE PROBLEM

The bar screens were deep — about 40 feet from the deck level to the bottom and about 55 feet total — making them difficult to access at the bottom of the 4-foot-wide channel. The coarse screens are used to remove debris from wastewater prior to entering the dry pit submersible influent pumps that convey the water to WSACC's headworks facility. The main problem at WSACC was profound grit buildup at the screen. Grit is not an unusual issue with aging U.S. infrastructure, but it can, and did, wreak havoc at WSACC.

During a rain event, when water flow picked up, grit would inundate the old screens and jam the sprockets at the bottom of the system. To get the screen moving again, a maintenance crew of six or more would need to access a dark, 4-by-8-foot pit to shovel the grit out of the pit and into buckets to be hauled back up to the deck. After unburying the screens, the crew would replace any broken components. This would happen three to four times each month, according to WSACC officials.

"The old screens constantly broke," says maintenance manager Chris Carpenter. "Access was so hard, and it was a tremendous amount of staff time — and permits for confined space entry — to deal with the grit backup."

Engineering firm Black & Veatch worked with WSACC staff to select the best option to replace their problematic equipment. The new screens needed to be unfailingly reliable during weather events and keep their maintenance crew out of the channel.

THE SOLUTION

The team agreed that the technology that would fully address their concerns was the FlexRake FP-M 1-inch full-penetration coarse screens from Duperon Corp. The stainless steel, link-driven mechanical bar screens are front-clean, front-return, mechanically cleaned screens with no lower sprockets, bearings or tracks that can jam below the deck. The FlexRake FP-M is suitable for vertical and near-vertical applications, such as the one at Rocky River, because the Flexor technology allows the screen to be vertical without adding submerged maintenance components into the channel.

COST SAVINGS

Time and employee safety aren't the only benefits WSACC is experiencing with their new equipment. The cost of maintaining the old equipment was significant, including $100,000 to rebuild each screen every five or six years. Carpenter estimates that 10% of the WSACC maintenance budget was spent on the previous bar screens.

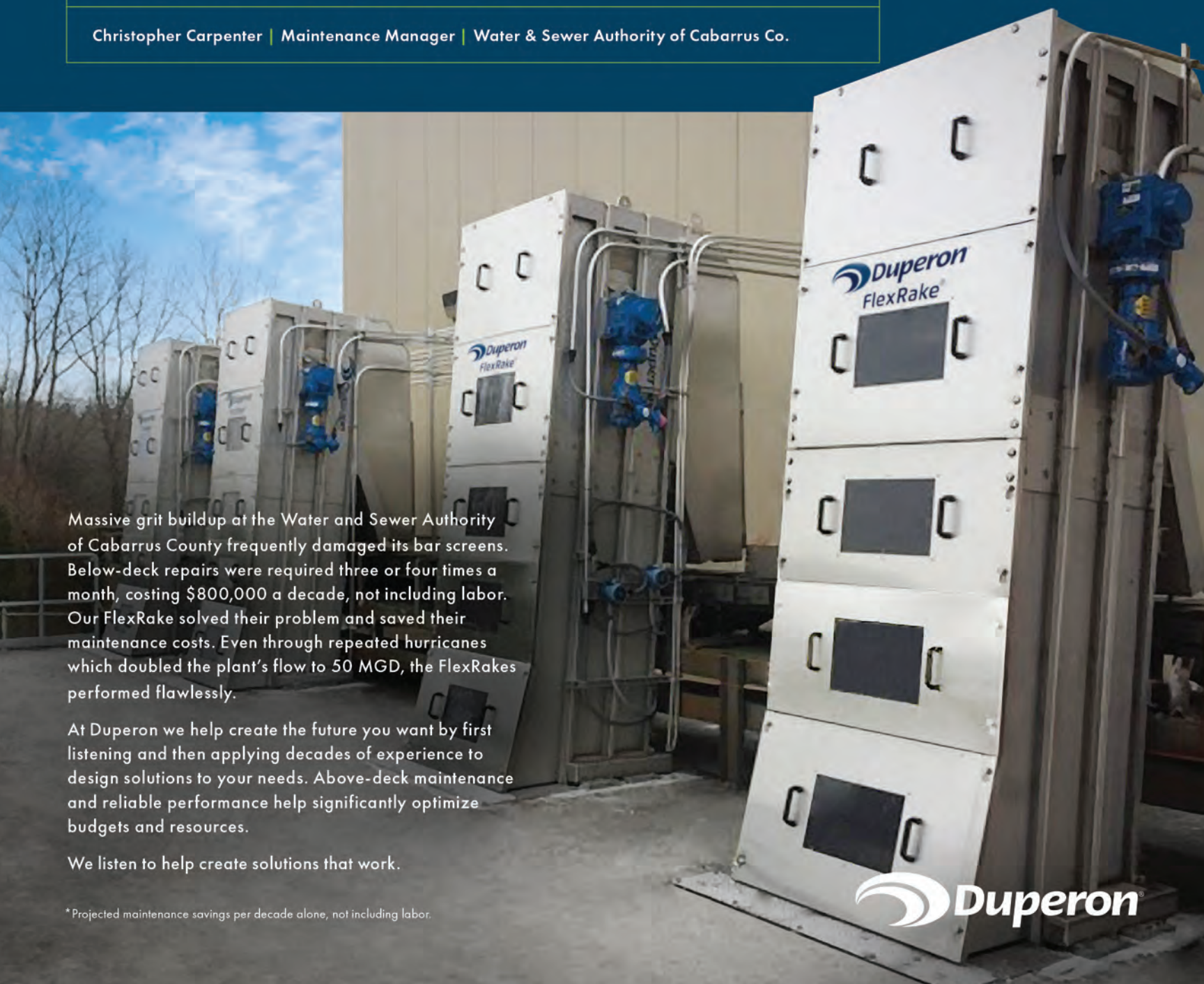
The Duperon FlexRake®

THINKING AHEAD

CREATING $800,000* SAVINGS, DESPITE REPEATED HURRICANES

"We have had zero maintenance other than preventative greasing and inspecting. We don't need to babysit it and there have been no problems at all."

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



Massive grit buildup at the Water and Sewer Authority of Cabarrus County frequently damaged its bar screens. Below-deck repairs were required three or four times a month, costing $800,000 a decade, not including labor. Our FlexRake solved their problem and saved their maintenance costs. Even through repeated hurricanes which doubled the plant's flow to 50 MGD, the FlexRakes performed flawlessly.

At Duperon we help create the future you want by first listening and then applying decades of experience to design solutions to your needs. Above-deck maintenance and reliable performance help significantly optimize budgets and resources.

We listen to help create solutions that work.

*Projected maintenance savings per decade alone, not including labor.

Duperon®

Penn Valley's Double Disc Pumps solve problems at Illinois plant

Moline, Illinois, is located on the Mississippi River in northwestern Illinois. The city of 44,000, which is one of the Quad Cities, has two wastewater treatment facilities — the North Slope and South Slope plants.

In April 2010, plant staff needed to replace a piston (plunger) pump at the North Slope facility. The pump, which fed a unique blend of wastewater and lime blowdown sludge at up to 8 to 10 percent solids to the belt filter press, needed to pull a small suction lift, and it needed to operate against a discharge pressure between 10 and 20 psig because the belt filter press was across the plant.

The city of Moline turned to Penn Valley for answers. A 6-inch Penn Valley Double Disc Pump Model 6DDSX76 was installed on a trial basis in May 2010. The trial pump performed well, and the plant purchased it in August 2010. In May 2011, Moline purchased a second Penn Valley pump to replace another piston pump for belt filter press feed.

In the next three years, the city chose Penn Valley pumps for other replacements at the South Slope plant, including a 4-inch pump for waste activated sludge transfer, a 6-inch pump for primary sludge transfer, and a 4-inch pump for WAS transfer. In 2014, the city took bids for a $40-million plant upgrade at the North Slope facility. Because of success with the city's five existing Penn Valley pumps, plant staff urged the consulting engineer to use Penn Valley in the new plant design, which resulted in the purchase of seven additional Penn Valley 6-inch pumps.

Delta Hybrid Compressor Prioritizes Efficiency, Reliability

Aerzen'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.

Bright Technologies' Dewatering Equipment Helps Overcome Disposal Problem

Officials 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.

800-253-0532 | www.sebrightproducts.com

Kationic Technology and Wastewater Treatment

Kationx introduced natural kationic technology to the wastewater industry with its KCD-X six-in-one lift station treatment and SETTApHY nontoxic flocculant. Kationic technology uses unique blends of positively charged natural materials which interact with negatively charged contaminants to deliver enhanced performance for conditioning and treating wastewater.

HYDROGEN SULFIDE AND ODOR REDUCTION

Hydrogen sulfide, volatile organic compounds and other toxins released as a byproduct of wastewater treatment pose a threat to workers and the public. Kationic technology safely entraps these, reducing risk at the plant and downstream.

REDUCE AND CONTROL CORROSION

Many of the corrosive compounds in wastewater are damaging to pipes, valves, sensors and floats. Kationic technology buffers these compounds' corrosive potential, extending the life span of plant equipment.

Additionally, the mineral base of these products acts as a micropolishing compound, removing existing corrosion and maintaining equipment in a clean state.

EMULSIFY AND MOBILIZE FOG

Floating mats of fats, oil and grease can bottleneck lift stations and treatment plants. Kationic technology quickly emulsifies FOG via adsorption and lubricates floating plastics and rags, preventing them from adhering to the inner pipe walls, improving flow and reducing the need for vac truck servicing.

Kationic technology also induces the spontaneous formation of large, dense flocs that separate from the water phase to improve effluent quality and lengthen the life span of downstream filters and grinders. The fast sludge settling during liquid-solids disengagement quickens processing times.

By removing nitrogen and phosphorus-rich materials, kationic technology also helps reduce the potential for algal bloom formation in runoff areas. Kationx's products are pH neutral, inert and will not induce any unwanted chemical reactions.

Kationx utilizes innovative chemistry to offer exceptional solutions improving water quality by displacing traditional toxic ingredients with effective nontoxic alternatives.
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Watson-Marlow Offers Advanced Bredel Hose Technology

Bredel hose pumps reliably handle harsh materials, including abrasive sewage and slurry, making them ideal for feeding primary or thickened sludge to digesters or filter presses.

Advanced hose technology enables Bredel pumps to handle viscous, grit-filled sludge dependably for extended periods. Peristaltic hose pumps are virtually maintenance-free, with no seals to replace, no check valves to clog, and no rotors and stators to wear.

The highly abrasive nature of sludge does not affect pump life. Hose replacement is quick and easy, minimizing downtime. Only one spare part — the hose — needs to be inventoried. These features makes Bredel hose pumps ideal for tough environmental applications.

Bredel hose pumps also eliminate many pieces of ancillary equipment such as run-dry protection, seal-water flushing systems and in-line check valves. They are backed by a two-year warranty.

Watson-Marlow Fluid Technology Group is a world leader in niche peristaltic pumps and associated fluid path technologies. Founded on nearly 60 years of supplying engineering and process expertise and with over 1 million pumps installed worldwide, Watson-Marlow's pumps are tried, tested and proven to deliver.

WATSON MARLOW
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Watson-Marlow Fluid Technology Group comprises 10 established brands, offering an unrivaled breadth of solutions for pumping applications.
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Reliability, Ease of Operation, Define Komline-Sanderson's Product Line

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.

Komline-Sanderson

Since its incorporation in 1946, **Komline-Sanderson Engineering Corporation** has provided quality equipment for process/production filtration, drying, wastewater treatment, sludge processing and pollution control.
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Wastewater Treatment and Sludge Management Solutions from Komline-Sanderson

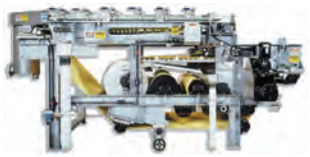
Pump. Thicken. Dewater. Dry.

Paddle Dryer

- indirectly heated
- produce Class A product
- high efficiency

Belt Filter Press

- sludge dewatering
- high cake solids
- low polymer cost



Gravity Belt Thickener

- sludge thickening
- high rates
- low polymer cost

Dissolved Air Flotation

- sludge thickening
- wastewater clarification
- high float solids

Rotary Vacuum Filter

- sludge dewatering
- wastewater clarification
- continuous operation

Plunger Pump

- sludge transfer
- positive displacement
- high suction lift

Komline-Sanderson

AWWA's New Standard: Progressive Cavity Chemical Metering Pumps

The American Water Works Association (AWWA) has released the first edition of the ANSI/AWWA E200-18 standard for progressive cavity (PC) chemical metering pumps. This standard demonstrates the quality and reliability of PC pumps for chemical metering applications.

All AWWA standards are developed in a rigorous, defined manner with due process to interested parties and stakeholders to ensure all views and objections are considered. The result is a true industry consensus that can be trusted and widely accepted.

COMPLETE PROCESS CONTROL

SEEPEX BRAVO Chemical Metering Systems are equipped with NSF/ANSI 61-certified SEEPEX PC chemical metering pumps. PC pumps are self-priming and dose accurately with low-shear, laminar flow and no vapor lock. Pulsation dampeners can be eliminated due to minimal pulsation. Chemical consumption is reduced, and slip is minimized even if fluid temperature, viscosity or discharge pressure fluctuates. PC pumps also wear predictably without risk of catastrophic failure.

BRAVO is used in a variety of industries for disinfection, pH control, flocculation, corrosion inhibitors, oxygen scavengers and containment elimination. The plug-and-play packaged skids minimize time and cost associated with engineering, procuring, assembling and installing flow control systems.

BRAVO is fully integrated, modular and scalable. Systems can be adapted to any layout and are available in simplex, duplex or triplex pump configurations for floor or wall mounting. BRAVO incorporates user-customized, color-display touch-screen controls. Systems handle pressure ratings up to 175 psi with flow rates from 0.1 gph up to 250 gph.

SEEPEX.

ALL THINGS FLOW

SEEPEX Inc. is an ISO 9001-2015 certified manufacturer and a leading international supplier of PC pumps, systems, accessories and services. SEEPEX takes a consultative approach to offering innovative products and customized solutions for fluids handling and processing applications in nearly every industry.
937-864-7150 | sales.us@seepex.com | www.seepex.com

SEEPEX.
ALL THINGS FLOW

MAXIMUM RELIABILITY AND SUPERIOR PROCESS CONTROL

BRAVO

CHEMICAL METERING SYSTEMS

SEEPEX's BRAVO Chemical Metering Systems provide maximum reliability and whole process control. These modular and scalable systems incorporate progressive cavity Intelligent Metering Pumps (IMP) and are the most flexible solution for disinfection, pH control and flocculation in your industry.

BENEFITS

- Simplified design reduces installation and operating costs
- Less chemical use due to minimal pulsation
- NSF/ANSI 61 certified progressive cavity pumps
- Single source for pumps and controls

SEEPEX Inc.
sales.us@seepex.com
T +1 937 864-7150
www.seepex.com

For more information visit:
www.seepexsales.com/go/bravo

Processing Debris-Laden Septage Is a Job for the BEAST

The small Pennsylvania community of Ralpho Township sits in the middle of septic-tank country, and there's a need for its wastewater plant to process as much local septage as possible.

While the Ralpho plant has the treatment capacity, its vintage septage screen didn't. The screen was constantly out of service for repairs, forcing haulers to bypass Ralpho and drive farther to discharge loads. Even when the screen was running, it did a poor job of capturing debris. There had to be a better solution.

DESIGNED FOR DEBRIS

In May of 2018, a Ralpho engineer heard a presentation on the BEAST at a regional association meeting and requested more information. He learned that the BEAST was specifically designed to screen septage with large amounts of debris. Each design feature from the tank configuration to the dual-drive operation of the screen basket and extraction screw promotes fast truck unloading and high debris capture.

The engineer determined that a BEAST 800 had the correct capacity and would provide higher capture with its perforated plate screen. In March 2019, a BEAST 800 was installed and put into operation.

The first load screened was a 3,000-gallon tanker with septage from a local nursing home. The BEAST processed the entire load in under 15 minutes, averaging over 500 gpm without pressurizing.

The plant operator is enthusiastic about the BEAST, and says he anticipates a reduction in maintenance along with an increase in downstream process efficiency. He also anticipates an increase in the number of septage haulers coming to the Ralpho plant.

Enviro-Care A WAMGROUP® Company

Enviro-Care Co., a member of the WAMGROUP, supplies screening and solids/grit management equipment to the North American water and wastewater markets and is represented by Envirep in east-central Pennsylvania.
ecsales@enviro-care.com | www.enviro-care.com

How Do You Protect Your Lone Workers?

Many know the definition of a lone worker is one who performs activities in isolation from others, with after-hours operations being most common. But how do you identify and protect your lone workers? Do you have a written policy identifying job positions classified as lone workers? Do you have workers with known medical conditions or other special risk conditions?

An effective lone worker device is a worn personal safety monitor designed to sense a lack of motion and also provide the worker with a means to manually initiate a panic alarm when able to call for help.

METHODS FOR SAFETY MONITORING

Manual check-in systems make it the responsibility of the worker to check in with someone, or for someone to check in with the worker. This method is risky because a lot can happen during the time between an expected check-in, creating the risk of someone mentally checking out when no one is expecting a check-in. It's a dangerous practice, according to a Grace Industries spokesperson.

Meanwhile, immediate notification monitoring systems have the ability to notify, identify and locate a worker in distress. If you want to pay a monthly fee, there are monthly fee/subscription cellular-based systems. But a system that relies on cellular service or cellphone apps should be vetted carefully to ensure that reliable cellular coverage is always available. After all, any system is only as strong as its weakest link.

Grace Industries' lone worker system doesn't rely on cellular connections or require subscriptions or monthly fees and is designed specifically for your facility. It's connected to a voice telephone dialer or SCADA system to provide immediate emergency notification of a worker in distress.

GRACE INDUSTRIES, INC.

Grace Industries is a manufacturer of life safety innovations for a number of industries. The company's products are made in the U.S. and have helped protect lone workers, firefighters, miners, military personnel, industrial workers, chemical workers and more for over 40 years.

724-962-9231 | www.graceloneworker.com

Water Treatment Facility Reduces Dewatering Costs With 3DP Belt Press

An 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 | www.bdpindustries.com

Advanced Aeration Technologies Provide Energy and Maintenance Savings

The Town of Monroeville, Alabama, faced aeration and mixing issues, sludge buildup in one of its wastewater lagoons, and power bills of $12,500 per month after a major employer relocated its garment manufacturing facility.

The company had generated about 90% of the wastewater entering the lagoon, and its fees covered 90% of the operation and maintenance cost, which included $1,500 per month for aerator maintenance. The lagoon was 80% full of biosolids, and the estimated cost to dredge was over $1.6 million. The lagoon had to remain operational and the town needed to reduce costs.

THE SOLUTION

DO2E installed two 5 hp high-volume floating aerators and two 3 hp floating mixers.

In four years of operation, the equipment saved the town over $513,000 in energy cost and $72,000 in maintenance, while reducing biosolids buildup by 90%.

Staying in Control With REXA Actuators

REXA actuators offer reliable control of any valve or gate service. Its electraulic technology operates like an electric actuator that employs a hydraulic transmission without the use of an actively pressurized reservoir system.

The technology eliminates maintenance burdens, liability concerns and high costs of ownership. The result is a hydraulically driven actuator designed to modulate accurately and reliably over long periods without attention.

SUPERIOR CONTROL

REXA can turn any valve or gate into an accurate flow control device. Specifically, REXA can modulate a butterfly valve close to the seat, dramatically improving the efficiency of processes such as aeration or filtration. The company can also modulate gates in collections and UV systems.

RELIABLE OPERATION

REXA is designed to reliably operate in demanding applications and during worst-case scenarios, easing worries about collections system gates moving during wet-weather events. The technology can offer operators peace of mind, assuring them that critical valves and gates will operate when called upon.

DRAMATIC COST REDUCTION

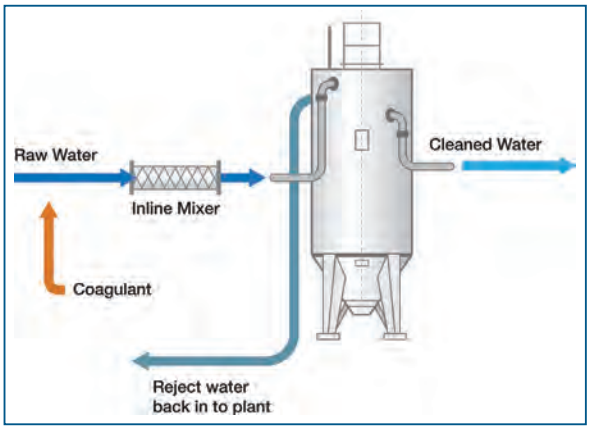
Products that operate reliably over long periods eliminate unnecessary costs. REXA can eliminate unexpected failures on demanding valve or gate services, helping users' bottom line.

REXA is a custom-designed, American-made product designed to solve problems through retrofits of existing infrastructure or in new construction. **508-584-1199 | sales@rexa.com | www.rexa.com**

DynaSand's Continuous Contact Filtration Achieves Ultralow Phosphorus Removal

For over 40 years, the Parkson DynaSand filter has been successful at continuously filtering liquid suspensions while cleaning the filter media.

Chemical coagulants such as metal salts are injected into a static mixer in the piping prior to the filters. The effluent wastewater is then introduced to the bottom of the sand bed where flocculation takes place. This process is known as "continuous contact filtration."



SPACE SAVINGS

The DynaSand filter makes it possible to carry out coagulation, flocculation and separation directly in the filter bed. This eliminates flocculation, settling and backwash water tanks, and reduces equipment volume by as much as 85% when compared to conventional chemical treatment.

CHEMICAL SAVINGS

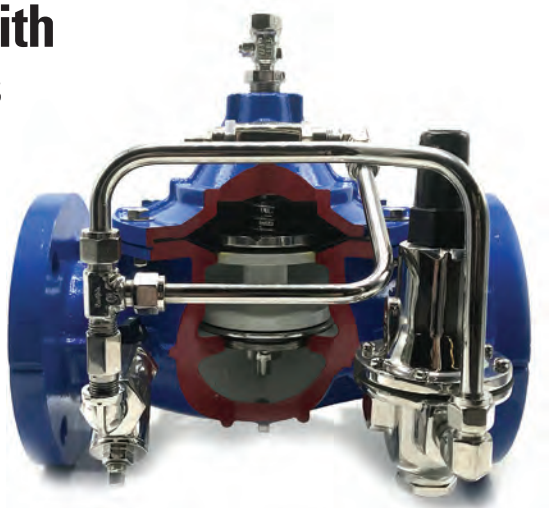
Coagulation and flocculation in a granular bed is an effective process, according to the manufacturer. The water to be treated will be exposed to frequent contacts with already separated flocs in the sand bed, creating many collision possibilities.

Effective separation in a sand filter can be achieved at a smaller floc size. The amount of chemical addition required is proportional to the feed flow and reduces the chemical dosage required, in some cases up to 30%, according to a Parkson spokesperson.

Meanwhile, suspended solids content can be reduced by up to 97%-98%. Excellent results are also obtained in phosphorus reduction, as several plants have achieved effluent total phosphorus concentrations of 0.02 ppm, according to the manufacturer.

Parkson 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.
1-888-PARKSON | technology@parkson.com | www.parkson.com

Take Control of Complex Applications With AIS-Compliant Automatic Control Valves



Valve products that are compliant with the American Iron and Steel (AIS) Act are now being adopted and demanded in many water and wastewater treatment plants across the U.S.

The AIS provision requires Clean Water State Revolving Fund and Drinking Water State Revolving Fund assistance recipients to use iron and steel products that are 100% produced in the U.S. These requirements apply to projects for the construction, alteration, and maintenance or repair of a public water system or treatment works.

Flomatic, founded in the U.S. in 1933, offers a full AIS-compliant automatic control valve selection to meet your needs. As a manufacturer under a certified ISO 9001-2015 and ISO 14001-2015 quality and environmental systems, the company exclusively works with U.S. foundries that can meet its standards and can 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 Automatic Control Valves are self contained, hydraulically operated and single-diaphragm actuated. Designed in compliance with AWWA C530 standards in addition to being NSF/ANSI 61 approved, Flomatic offers a wide range of options and series for every application.

FLOMATIC® VALVES

Flomatic Valves is a leading manufacturer of valve products with over 85 years in the business. The company is dedicated to manufacturing high-quality valves that are built to last.

800-833-2040 | www.flomatic.com

How Portable Flow Instruments Can Benefit Your Plant

Accurate 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.

Landia AeriGator Chops Through Waste Buildup at Texas Lift Stations

Even with just 480 residential connections at one of Lake Lyndon B. Johnson's most coveted neighborhoods in Texas, Llano County Municipal Utility District No. 1 was becoming weighed down with ongoing lift station maintenance issues and increasing odor concerns — until the introduction of a Landia AeriGator.

This chopper pump (with external chopping system and venturi nozzle), injects air into sewage lift stations to eliminate scum buildup. The combination of chopping and air injection successfully chews up rags and breaks down the mass of solids that triggers unwelcome labor hours in lift stations.

A WELCOME SOLUTION

The scum buildup in Llano County reached the point where workers had to spray under the pumps as they were lowered, tilting them to release air, according to operations manager Tim Webb.

"This was a challenge we could have done without," he says. "Despite our constant efforts, we were fighting a losing battle, ultimately resulting in not being able to get to the pumps through such a thick blanket of scum. The whole thing was an unpleasant, tricky job having to reach out and inevitably get covered in sludge."

The waste buildup hasn't been a problem since they introduced the Landia AeriGator. "The waste buildup is no longer sitting in the lift stations, so we have a much fresher product with greatly reduced odors."

Following the success of the 6.5 hp Landia AeriGator at the main lift station, the district introduced a 6.5 hp Landia EradiGator chopper pump to service the nearby Sandy Harbor lift station.

Proco Products Committed to Expansion Joint Design and Supply

Operators 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 PROCO PRODUCTS, INC.

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 | sales@procoproducts.com | www.procoproducts.com

Inovair Delivers Documented Energy Savings Up to 40%

Inovair geared centrifugal blowers produce documented energy savings as high as 40% compared to multistage and positive displacement blowers, according to the manufacturer. This energy savings is delivered with high reliability and low ownership cost.

Additionally, Inovair's advanced integrated control system has the ability to improve process control, resulting in further energy savings.

PRODUCT RELIABILITY

With over 20 years' experience in the aircraft ground support market, 10 years' operation in continuous duty applications, and six years' use in the wastewater market, the Inovair product family has proven to be reliable in the harshest of environments, according to a company spokesperson.

Inovair's robust gearbox design and the use of noncontact oil film bearings allows installation in the toughest wastewater applications. The company's blowers are reliable even in frequent start/stop applications, such as sequencing batch reactors.

LOW OWNERSHIP COST

Significant reduction in power consumption, low annual maintenance requirements and ease of installation are all reasons why Inovair remains a leader in low ownership cost. The use of industry standard components like variable frequency drives and motors also keeps maintenance and replacement costs low.

The Inovair simple design approach takes into account both operations and maintenance wants and needs, providing a highly efficient, reliable and simple-to-maintain blower.

Inovair products are designed, machined and assembled in the U.S. for more than 25 years. The company is a manufacturer of modern high-efficiency compact, geared centrifugal blowers and blower packages engineered for wastewater, pneumatic conveying, aircraft ground support equipment and other industrial applications. Inovair performs all of its engineering, manufacturing, assembly and service activities in the U.S. at a 50,000-square-foot campus in the metro area of Kansas City, Missouri.

1-855-INOVAIR | inovair.com

Eurus Blowers Provide Significant Pneumatic Conveying Features

Eurus MB series bilobe and ZG series trilobe blowers are rated up to 15-inch Hg vacuum (15 psig) and flows up to 5,000 cfm. Designed for the rugged and varying demands of wastewater treatment plants, the blowers feature an integral ductile iron shaft and impellers, oversized bearings, piston ring air seals and Viton oil seals for low blower vibration and noise.

RELIABLE OPERATION

Critical components, including the motor, are selected site-specific, and users can expect dependable operation whether it's used as a system component or as part of the Eurus package. This means the complete blower skid package need not be sent to a repair facility in the event one item fails or needs rework. Critical components may be quickly replaced, substituted or repaired.

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 | info@eurusblower.com | www.eurusblower.com

World Chemical USA Offers Magnetic-Drive Submersible Pumps for Chemical Sump

Corrosive chemicals and high temperatures are commonplace in the water, steel, industrial, chemical and pharmaceutical industries, which is why World Chemical USA designed its YD-GWN series of chemical sump pumps to withstand challenging applications.

The YD-GWN series is constructed of carbon fiber polypropylene, and features a nonmetallic magnetic drive pump with built-in thermal protector.

It's capable of handling high temperatures and corrosive chemicals, including hydrofluoric acid, sodium hypochlorite, and sulfuric acid and nitric acid depending on the concentration.

PRODUCT USES

Applications include mixing for metal finishing, emergency pumping and drainage for chemical plants and water departments, pickling for the steel industry, and endless industrial applications, according to a company spokesperson.

The YD-GWN is lightweight at 50 pounds and includes a 16-foot chemical resistance cable code.

World Chemical USA, Inc.

World Chemical USA Inc. is a manufacturer of chemical pumps and oil skimmer systems. The company is one of the group of World Chemical Co. Ltd.
888-860-3365 | www.worldchemicalusa.com

Nozzle mix system increases efficiency with dual-zone mixing

The JDV Nozzle Mix System is a patented dual-zone mixing technology that provides uniform mixing patterns to produce even distribution and a stable environment.

The JDV Nozzle Mix System optimizes solids suspension and contact, which increases efficiency in a wide range of applications. The system is designed for easy maintenance, with pumps installed outside the tanks. The pumps are typically chopper pumps, or pumps with inline grinders, which prevent fibrous materials from accumulating and causing plugging problems. Various pumps can be used, depending on application. The high-velocity nozzles are mounted inside the tank and are positioned to discharge in a flow pattern that completely 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 secondary treatment and biosolids holding ponds.

JDV Equipment Corporation is a leading manufacturer and provider of safe, environmentally friendly processing equipment and services for water treatment, wastewater treatment, industrial and agricultural applications. The company has more than 50 years of experience and has completed more than 10,000 equipment installations.

973-366-6556 | sales@jdvequipment.com | www.jdvequipment.com

KUHN Knight SLC 100 Series Spreaders Provide Fast, Efficient Spreading

The KUHN Knight SLC 100 Series ProTwin Slinger commercial manure spreaders set the standard for fast, efficient spreading. They provide a suitable combination of efficiency, versatility and rugged durability to maximize value.

SLINGER DESIGN

The unique twin-auger design and heavy-duty body construction allow the Slinger to handle a wide variety of wet and dry materials. A fully adjustable discharge allows faster unloading and improved material breakup for more consistent, accurate spreading.

An aggressive hammer design provides more wear surface on the bottom edge to extend hammer life. The heavy-duty drive requires minimal maintenance and provides years of reliable service.

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.

Kuhn North America is a leading innovator in the field of agricultural and industrial equipment, specializing in spreaders, mixers, hay and tillage tools. KUHN products are sold through farm equipment dealers throughout the U.S., Canada and many other countries.

608-897-2131 | www.kuhn.com

New iFIX 6.1 HMI/SCADA Improves Operator Efficiency

Are you overwhelmed with alarms? The new iFIX 6.1 HMI/SCADA software from GE Digital delivers high-performance HMI and alarm management capabilities to help operators have the right information at the right time — with just a glance.

The iFIX 6.1 increases equipment uptime and quality by supporting operators and speeding reaction time. With iFIX, operators can identify problems quickly, minimize mistakes and leverage intelligent warnings.

WIDELY USED SYSTEM

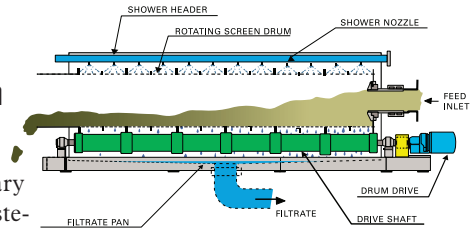
The iFIX is used by thousands of water and wastewater facilities around the world. iFIX users include Metropolitan Sewer District of Greater Cincinnati; City of San Luis Obispo, California; Charter Township of Waterford, Michigan; and City of Haverhill (Massachusetts) Water and Wastewater Division.

Many municipalities are updating to high-performance HMI screens to reduce errors and speed new operator training. Improvements include situational dashboards as well as simplified navigation, shapes and colors. With high-performance HMI, critical information is readily visible for faster operator response.

GE Digital **GE Digital** connects streams of machine data to powerful analytics and people, providing industrial companies with valuable insights to manage assets and operations more efficiently.

gedigital@ge.com | www.ge.com/digital/applications/hmi-scada/ifix

FKC Rotary Screen Thickeners Provide Reliable Predigestion Thickening



A common use for FKC rotary screen thickeners at wastewater treatment plants is for thickening sludge prior to digestion. Biological, primary or a blended sludge can be thickened efficiently, reducing the volume of sludge fed into a digester.

Outlet consistencies for biological sludge are typically 5%-7%, primary at 7%-10%, with blends at 6%-8%.

FKC UNIT FEATURES

FKC produces single- and double-drum units with flow capabilities from a few gallons per minute to more than 600 gpm. Units are made of stainless steel wetted parts with stainless steel screens.

A unique feature of the FKC design is the drum drive and support system. The drums are supported and driven by full-length, poly-coated shafts with all bearings located outside the covers.

Drums are kept clean by a shower header with a brush-cleaning capability that allows use of effluent for the showers.

FKC **FKC Co. Ltd.** custom designs and manufactures thickening and dewatering equipment used in a wide variety of industries, including wastewater treatment.

360-452-9472 | www.fkcscrewpress.com

Monitoring Polymer Accurately With the Tote Bin Scale

The Tote Bin Scale from Force Flow allows plant operators to accurately monitor the amount of polymer fed from IBC-type totes for dewatering. Operators simply place the tote on the platform and monitoring begins. There is nothing to install inside the tote.

Monitoring systems prevent costly over-feed conditions and also enable documentation of the actual amount fed, keeping operators in compliance with federal and state reporting requirements.

The Tote Bin Scale can be remotely monitored via SCADA or PLC and is available with the SOLO G2 digital display or the advanced Wizard 4000 chemical inventory monitoring system.

FORCE FLOW

CHECK. CONTROL. COMPLY.

Force Flow continues to take the lead as an innovator in chemical monitoring with products like the Wizard 4000 and Chlor-Scale 150 for cylinders. The company also offers a five-year warranty and performance guarantee. For more information about the Tote Bin Scale:

800-893-6723 | info@forceflow.com | www.forceflowscales.com

Reliability Is Paramount for VF-100 Volumetric Feeder

As 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

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.

800-780-8636 | www.eaglemicrosystems.com

The otter mural on the Sides Road water tank brings attention to the locality's water resources and their importance.

Calendar Worthy

AN AWARD-WINNING MURAL SHOWING A RIVER OTTER DECORATES A LARGE WATER TANK AND MAKES A STRONG IMPRESSION ON THE COMMUNITY

By Jeff Smith

Community outreach and education take many forms at Winston-Salem/Forsyth County (North Carolina) Utilities. Most prominent is a 50-foot-tall, 290-foot-wide mural of a North American river otter on the side of a ground-level water tank overlooking a heavily traveled parkway through town.

Named "A Morning on the Yadkin River," the mural shows an otter set in a wilderness river scene with waterfalls spilling in the background. Otters are native to the Yadkin River, the main drinking water source for the utility.

Painted in 2018 by a Florida-based artist known as Daas, the mural earned a spot in the Top 12 of Tnemec annual competition and appears as the April photo in the company's 2019 calendar. Funding was through a $38,000 grant from the Public Art Commission.

MUSEUM INSPIRATION

Daas was chosen from nearly 50 respondents to a call-for-artists sponsored by the county art commission. A committee of representatives from the city, the art commission and the community at large narrowed the proposals down to five finalists.

"We chose Daas because we liked his style and we liked his subject of the otter," says Bill Brewer, water treatment superintendent. "It brings attention to our water resources and what they mean to our city." Brewer was the utility's representative on the selection committee.

Daas got his inspiration to include the otter in the water theme after visiting the local children's museum and observing the excitement given to its live-otter exhibit. After power-washing the 10 million-gallon concrete tank, Daas and an assistant spent nearly three weeks creating the mural. Using a power lift to reach the tank's 70-foot height, they rolled on the same type of Tnemec paint used two years before in rehabilitating the tank.

CELEBRATING WATER

"We had just painted the tank a couple of years ago, so it was a good time for a project like that," Brewer says. "It didn't take too much prep work before the artist could begin." Using painter's tape and expanding from a small sketch, Daas used the tape as a guide and reference marks for the spatial relationships of his geometric creation.

"It was one of the wildest things I've ever seen," Brewer says. "It looked like a whole bunch of hieroglyphics all over the tank. The mural on the Sides Road water tank is seen by thousands of people every day. It really makes a big impact on the community."

Another big impact is in the form of activities hosted by the utility to celebrate the annual American Water Works Association Drinking Water Week event. This year's theme was "Protect the Source," and it included a children's art contest and a tour of the 25 mgd P. W. Swann Water Treatment Plant.

Tour attendees learned about water plant operations and had a chance to win tickets to a concert by country music star Lee Greenwood and his band or kayak rentals on Salem Lake, the utility's other water source.

SPECIAL OBSERVANCE

The art contest for children ages 6-8 and 9-12 focused on local water sources and the benefits of tap water. Prizes included free passes to the children's museum and the city swimming pools.

Brewer says Drinking Water Week was special this year because it was headed by the department's new communication team, Gale Ketteler and Kira Boyd. "This was the first year we were involved, and the contest was my colleague Kira's initiative," says Ketteler, public information officer.

Even though the mural didn't win first place in the Tnemec contest, utility leaders were glad to have earned a spot in the calendar. Ketteler says, "It's one more way for us to promote the value of our services for the public." tpo

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1. The CalPrex process installed at the Nine Springs Wastewater Treatment Plant in Madison, Wisconsin, where a full-scale pilot project was conducted.
2. The CalPrex process includes a reactor vessel where calcium hydroxide is added to enable precipitation of calcium phosphate mineral (brushite).
3. Jars illustrate the steps in the CalPrex process.

Toward More Phosphorus Capture

CALPREX PROCESS TAKES A DIFFERENT APPROACH TO NUTRIENT RECOVERY, YIELDING MARKETABLE FERTILIZER IN THE FORM OF BRUSHITE PELLETS

By Ted J. Rulseh

Nutrient recovery is a growing component of clean-water plant operations. Most often the target is phosphorus.

The various motivations to isolate phosphorus include combating struvite accumulation in piping and process equipment, meeting stringent effluent phosphorus permit limits, generating revenue from sale of a marketable fertilizer and simply making operations more sustainable.

CalPrex technology, which Centrisys/CNP has licensed from Nutrient Recovery & Upcycling (or NRU), is the newest arrival among phosphorus recovery processes. The technology captures phosphorus in the form of brushite (dicalcium phosphate dehydrate), which is then dried and pelletized.

The company says the process can recover 45% or more of the total phosphorus from sludge going to the digesters. It removes soluble phosphorus by adding calcium hydroxide to centrate from waste activated and primary sludges in a special reactor before anaerobic digestion. Menachem Tabanpour, vice president of business development, talked about the process in an interview with *Treatment Plant Operator.*

tpo: What is the history of this technology's development?

Tabanpour: I started working on a struvite project in 2002 as a high school student during a summer internship at the University of Wisconsin-Madison in Professor Phillip Barak's lab. The project evolved and I continued while pursuing my undergraduate degree. We began working with the Nine Springs Wastewater Treatment Plant in Madison and sampled different locations in the process to identify the most feasible place to remove phosphorus. We found that in an acid digester tank, basically a 1.5-day solids retention time digester where the pH goes down, the phosphorus becomes very soluble and extractable. So we abandoned the struvite research and launched in a new direction with brushite recovery in 2007.

> "Capturing soluble phosphorus is the easy part. The problem is how much of the total phosphorus in the sludge can get into soluble form."
> **MENACHEM TABANPOUR**

tpo: How did you move this idea toward a commercially viable technology?

Tabanpour: We launched NRU in 2011 with the aim to commercialize a calcium phosphate predigester phosphorus recovery process. We built and ran our first pilot in 2014-15 in Woodridge, Illinois. We later licensed the technology to CNP exclusively, and they picked up the development work. A second pilot was conducted in Woodridge in 2017. In 2018, we worked with the Water Research Foundation to demonstrate CalPrex as a fully scalable technology. That successful project was conducted at Nine Springs with support from the Milwaukee Metropolitan Sewerage District, Metro Wastewater Reclamation District (Denver) and Massachusetts Water Resources Authority.

> "After centrifuge dewatering, you have a centrate that has high-soluble phosphorus, on the order of 500 parts per million, and low TSS. That's the perfect solution for doing the reaction."
> **MENACHEM TABANPOUR**

tpo: Fundamentally, how does CalPrex differ from other phosphorus-recovery processes?

Tabanpour: One key difference is that instead of producing struvite, we produce brushite, a calcium phosphate mineral versus a magnesium-ammonia phosphate mineral. Also, our technology can typically recover two to three times as much phosphorus as other technologies that have been commercialized. Usually the pinch point in phosphorus-removal efficiency is how much phosphorus you can make soluble. Capturing soluble phosphorus is the easy part. The problem is how much of the total phosphorus in the sludge can get into soluble form.

tpo: How does the process maximize the amount of soluble phosphorus?

Tabanpour: Typically phosphorus that comes in wastewater gets sequestered in the sludge. About 10% to 20% ends up in the primary solids, and most of the balance is in the waste activated sludge. Maybe 10% gets sent out in the effluent. The sludge, once thickened, is basically a phosphorus sink: It contains mainly cellular or particulate-bound phosphorus. To do recovery, you need that phosphorus to become soluble. That's where a fermentation tank comes in. In that tank at lower pH, more phosphorus gets released and stays in a soluble form.

After centrifuge dewatering, you have a centrate that has high-soluble phosphorus, on the order of 500 parts per million, and low TSS. That's the perfect solution for doing the reaction.

tpo: What happens in the CalPrex reactor vessel?

Tabanpour: We add calcium hydroxide (hydrated lime), which raises the pH typically from 5.5 to 6.5. That creates conditions where the calcium phosphate mineral forms. We settle it out in a lamella clarifier and then dewater it with a centrifuge and dry it into fertilizer. The centrate, which now has low phosphorus, is sent back into the treatment facility.

tpo: Are there any ancillary benefits to the process?

Tabanpour: It helps prevent struvite buildup in plant piping and digesters. In addition, the centrate from the fermentation tank has around 5,000 ppm volatile fatty acids. That could serve as a carbon source for facilities that are carbon-limited and are buying methanol or sugar to keep their biological process functioning.

tpo: How would you quantify the phosphorus removal from the process?

Tabanpour: We typically have 65% to 75% phosphorus release from fermentation. We divert 80% toward the centrate, react 90% of that and settle 95% of the brushite mineral particulate. Then we capture 95% of the particulate in dewatering.

tpo: What is the basic nature of the brushite mineral?

Tabanpour: It is similar to struvite in that it is a very good slow-release fertilizer. In its pure form it's 18% phosphorus by weight versus 12.6% for struvite, so it's a higher-analysis mineral that is a good replacement for other phosphorus fertilizers on the market. While struvite forms crystals that grow on themselves and can create large crystals, or pearls, brushite does not. It forms 150- to 300-micron particles. When we dewater, it makes a paste that looks like thick concrete. When dry, it is an off-white or gray powder, from which we make pellets.

tpo: What kinds of treatment plants would be the best served by this process?

Tabanpour: There are four major types. For a facility using some type of predigestion hydrolysis process, it couples really well. Another category includes facilities that need most of the phosphorus removed before the digester, either because they have a really bad struvite problem or because they are regulated for phosphorus in their biosolids. Another category is facilities with post-aerobic digesters, because the PAD destroys alkalinity and drives down the pH, making the phosphorus soluble and available to recover. Another category includes plants that want to make more fertilizer product.

tpo: Once the brushite material is produced, how is it taken to market?

Tabanpour: NRU will handle that. We launched a fertilizer brand called Steady State in fall 2019. The fertilizer being marketed will be struvite from our AirPrex installations and brushite from CalPrex installations, as well as various blends of nitrogen, phosphorus and potassium, according to customer needs. **tpo**

The biosolids drying beds at the Nampa Wastewater Treatment Plant.

Change on the Fly

AN IDAHO TEAM COMPLETES A MAJOR UPGRADE FOR PHOSPHORUS REMOVAL AND A PLAN FOR WATER REUSE WHILE KEEPING THE EXISTING PLANT IN PERMIT COMPLIANCE

STORY: **Steve Frank** | PHOTOGRAPHY: **Darren Russinger**

It's been said that making major upgrades to an in-service clean-water plant without incurring violations is a like changing a tire on a car going 60 miles an hour without having a wreck.

Yet that's just what the staff of the Nampa Wastewater Treatment Plant is doing.

Located 20 miles west of Boise, Nampa is the third-largest city in Idaho. It also runs the state's oldest and third-largest wastewater treatment plant. The facility (18 mgd design, 11 mgd average) serves about 102,000 people and a population equivalent of 250,000 when industrial and commercial facility flows are included.

Throughout an area called Treasure Valley, state Department of Environmental Quality and U.S. EPA regulators in the early 2000s began requiring cities to upgrade their wastewater systems. In 2009, Nampa began negotiating its future permit limits. In 2010, the city developed a facilities plan and began a phased program of plant improvements to meet new DEQ/EPA phosphorus limits of 0.5 mg/L by 2020 and 0.1 mg/L by 2026.

CONTROLLING TEMPERATURE

During negotiations with the DEQ, it became clear that a total maximum daily limit study would be required. The city's permit would have to meet receiving stream temperature limits of 66.2 degrees F in July and August and 67.5 degrees F in September. The instantaneous maximum would be 73 degrees F. The deadline to meet those limits is 2031. These temperature limits are based on Idaho water-quality standards for cold-water fish that live in the receiving stream, according to Andy Zimmerman, Wastewater Division superintendent.

Rather than just install effluent chillers, the city sought input from citizens, industrial users and others. The comments pointed the way to an alternative: discharging to irrigation canals and to local industries instead of to the receiving water, Indian Creek, during summer when effluent temperature is high.

The city has applied to the DEQ for a Class A recycled water effluent reuse permit. Zimmerman says the permitting process has been going smoothly. The Class A recycled water program has multiple benefits. In warmer months, industries could use Class A water for process and wash water. Commercial entities and farmers could also use it, and residents could water their lawns and gardens with it. Meanwhile, the city preserves its valuable aquifer source for drinking water.

Zimmerman says a key to success will be to provide recycled water when users need it and allow the community to extend the benefits of its water resources. "Our irrigation season here is approx-

Joe Tague, wastewater operations supervisor, measures a sludge blanket using an electronic measurement tool.

> “We did a lot of timed outages, bypasses and similar things to get the system to run. And we never violated our permit.”
> **ANDY ZIMMERMAN**

Nampa (Idaho) Wastewater Treatment Plant

www.cityofnampa.us

POPULATION SERVED:
102,000

FLOWS:
18 mgd design, 11 mgd average

RECEIVING WATER:
Indian Creek

TREATMENT LEVEL:
Secondary

TREATMENT PROCESS:
Upgrading from trickling filters to activated sludge with enhanced phosphorus removal

BIOSOLIDS:
Dewatered and landfilled

The Nampa treatment plant puts out the welcome mat for visitors.

The rotary drum thickeners in the solids handling building (FKC).

Discharge from the wastewater treatment plant flows down the outfall into Indian Creek.

imately between April and October," he says. "That makes a good fit for the reuse water. In the colder months, the effluent still would go to Indian Creek."

TACKLING PHOSPHORUS

Meanwhile, the plant team is gearing up to meet the new phosphorus limits, which Zimmerman believes are workable based on experience running their plant during the upgrade transition.

"In May 2019, we removed the trickling filters from our system as other upgrade equipment came online," he says. "That allowed us to operate in full phosphorus-removal mode. During most of the summer, we've biologically met our 2020 permit limit of 0.5 mg/L."

There have been some hardships along the way. Phasing equipment installation because of funding limitations caused the greatest difficulties. "Ideally, we would have worked in parallel on both the liquid and the solids side so they would get completed simultaneously and we could switch to the phosphorus-removal process instantaneously," Zimmerman says.

But limited funds meant that wasn't possible. "Our biggest hardship was to have one process ready to go but be waiting on other processes," Zimmerman says. Nampa operators were heavily involved in the phasing, getting the processes to work when needed and keeping the plant out of trouble.

PROCESS TUNING

"The trickling filter system had three sets of clarifiers: primary, secondary and final," Zimmerman says. "For the upgrade, we also built a new pumping station. We got away from the tricking filters because of the carbon load they 'steal' from phosphorus removal. We did a lot of timed outages, bypasses and similar things to get the system to run. And we never violated our permit."

While experimenting with phosphorus removal, team members realized that the volume of solids produced might cause a permit violation, so they backed off. Zimmerman explains, "In our aeration basins, we have a flexible aeration zone so we can run it with or without air, depending on whether we're focusing on phosphorus and ammonia or primarily on ammonia. We can turn that on or off as needed based on the permit limits.

> "It's hard to find certified operators."
> **ANDY ZIMMERMAN**

"The tricking filters were phased out because they removed too much of the BOD/COD carbon source that's required for phosphorus removal. We don't run the tricking filters at all now." In the old system, flow went from preliminary treatment to the primary clarifier and then to the tricking filters to reduce BOD/COD loading.

There was a need to deal with sloughings from the tricking filter, which were removed in the secondary clarifier. The secondary effluent, with its lower BOD/COD load, went to a nitrification basin for ammonia removal.

REVAMPED PROCESS

In the upgrade, the trickling filters are still in place and connected via piping to the system. "If something happened, we could go back to them, but that would throw us out of our permit limits because it would use too much of the carbon source."

Joe Tague, left, wastewater operations supervisor, and Andy Zimmerman, Wastewater Division superintendent.

The treatment process now has raw sewage flowing into the headworks and grit removal and then to the primary clarifiers. Scum and primary solids are removed, and the primary effluent flows to the aeration basins by way of a new pump station. The secondary effluent pump station in the old system was removed to make room for another aeration basin.

A return activated sludge/waste activated sludge pump sends RAS back to the aeration basin and WAS to the anaerobic digesters, while the final clarifier effluent goes to the chlorine station, the chlorine contact basin, sodium hypochlorite for chlorine neutralization and a post-aeration basin before discharge to the creek or the reuse system (when approved).

The upgraded plant has three anaerobic digesters, and a fourth will be added. The sludge holding tanks and loading dock from the old system have been removed, and the belt presses are being converted to two centrifuges (GEA Group). A dissolved air flotation system has been replaced by rotary drum thickeners. Nampa team members truck the biosolids 35 miles to a landfill where it is mixed with solid waste.

For all these efforts and results, the American Public Works Association Rocky Mountain Chapter selected the Nampa plant as Project of the Year in the category for project values $3 million and up. In addition, the American Council of Engineering Cos. Idaho Chapter named it the 2019 Best Water/Stormwater Project and hailed it the best-in-class solution for meeting nutrient removal and water-quality requirements.

It's a nice achievement for a team forced to complete a major plant upgrade on the fly. tpo

UP THE LICENSE LADDER

Utility managers have been saying the same thing nearly forever: "It's hard to find certified operators."

The wastewater utility in Nampa, Idaho, which also manages the city's 390-mile collections system, has 20 employees, including an operations supervisor, two lead operators and six operators. The staff operates 20 hours a day in two shifts from 7 a.m. to 2:30 a.m.

To fill the need for certified operators, Andy Zimmerman, superintendent of the Wastewater Division, has built an informal apprenticeship program. The three operations and maintenance flex team members work as trainees for positions that require a state license. Three mechanics and a maintenance supervisor keep the plant running.

"We have an incentive program that provides extra pay for a higher license," Zimmerman says. "The utility financially helps employees get licensed." All operators must have at least a Class 1 (lowest) license; lead operators and the operations supervisor need a Class 3 license.

Joe Tague, operations supervisor, holds a Class 4 (highest) license, which the city prefers.

Nampa's mechanical (maintenance) supervisor must hold at least a Class 2 license.

The incentive program has enticed the other mechanics to earning at least a Class 1 license. Most hires for operators and mechanics are internal hires, and the O&M flex positions are usually filled from outside.

One of three solids contact units at the new water plant in Ames. The plant received its LEED certification in March 2019.

Upping the Ante

PURSUIT OF LEED CERTIFICATION ENHANCES SUSTAINABILITY IN A NEW IOWA WATER PLANT AND PAVES THE WAY FOR A $6.5 MILLION GRANT TOWARD CONSTRUCTION

By Steve Lund

When the City of Ames (Iowa) and its engineering partner were designing a new lime softening water plant, there was no doubt it would be a major step-up in sustainability.

The old plant, operating since 1924, had been expanded many times to increase its capacity from 2 to 12 mgd. The new plant would have 15 mgd capacity and would include more efficient lighting and indoor temperature controls, better water efficiency, better training facilities, better on-site stormwater management and more.

Just before the start of design in 2012, the Iowa Department of Natural Resources made grant money available if the plant could qualify for Leadership in Energy and Environmental Design certification from the U.S. Green Building Council.

At the time, there were no LEED-certified water plants in Iowa; the grant could be worth $6.5 million, nearly 10% of the $70 million project. Ames officials and consultants at FOX Engineering decided to apply for the grant, raising the bar for sustainability improvements.

"A lot of the elements of LEED certification were the sorts of design criteria we normally would have incorporated in managing stormwater and things like that," says John Dunn, director of Ames Water & Pollution Control. "But there were some credits we went after that did require us to make some design changes."

The administrative offices at the new Ames water plant feature bright white concrete with a high Solar Reflectance Index to help reduce the heat-island effect. Native grasses and wildflowers make the landscape water efficient.

The plant opened in 2017; and in March of 2019, the city learned it had been LEED-certified, achieving 43 points — three more than the minimum. It received the grant in the form of forgiveness against a loan from the state revolving loan fund.

KEEPING IT COOL

Among changes in the plans prompted by LEED were a white membrane for the roof instead of a black rubber membrane, and an additive to make the concrete parking lot a brighter white instead of gray. Both changes help reduce the heat-island effect, the warming of urban areas compared to the surrounding areas. The U.S. EPA says heat islands can increase peak energy demand in summer and raise air conditioning costs.

The planners also looked at using source water for heating and cooling. "We've got 55-degree-F water coming through the plant every hour of every day," Dunn says. "As part of our HVAC system, we installed essentially a geothermal well heat exchanger, so we could get some free heating and cooling from the groundwater we were paying to pump into the facility."

The LEED application also affected stormwater management, according to Lance Aldrich, a FOX engineer and project manager for the plant design. Some retaining ponds required by the city code were redesigned to be rapid-infiltration ponds.

"That is a unique thing we normally wouldn't do," Aldrich says. "The water is held with the idea that you percolate it down, so it doesn't run off. You dig a little deeper and replace that soil with a sand and soil mix, and you have plantings in it. It lets the water percolate in a lot faster."

UNDER THE RIVER

The new plant is almost next to the old one, but it is on the other side of the Skunk River. That created an engineering challenge because waterlines had to go under the river so that the wells drawing water from underground could still be used. The storage infrastructure, high-service pumping and water mains were near the old plant, so the finished water also had to be delivered back across the river to take advantage of the existing facilities.

Because the city had experienced a broken waterline during a flood in 2010, Ames officials were worried about burying the waterlines under the river. "That was a big concern," Aldrich says. "They wanted to make sure that what we did would be good for a long time, so we went deep. We went way underneath the river using directional drilling."

Four waterlines were bored under the river: a raw waterline and a finished waterline at the north end of the property and a raw waterline and a finished waterline at the south end.

"The city wanted to separate them by quite a distance, in case something unexpected would happen with the river," Aldrich says.

MOVING LIME SLUDGE

The new plant, like the old one, uses lime in the softening process. The ponds for storing lime sludge are next to the old plant, so the sludge has to be pumped back across the river. That presented another problem. "The sludge doesn't act like water," Aldrich says. "It can get thick. It can be like toothpaste. We spent a lot of time researching the best way to do that."

The sludge-moving system was designed to maximize flexibility for the staff. "We put in two pipes under the river, all the way from the plant to the lime ponds," Aldrich says. "They were set up so they could pump down one of the lines or the other or both at the same time. The pumps have very big

The main pipe gallery. The facility earned LEED points for using low-emitting paints, coatings, adhesives and sealants.

motors with variable-speed drives. They can pump at different flow rates by varying the speed of the pumps and whether they use one or both lines."

Another issue presented by moving the sludge a long distance is that lime tends to deposit on the sides of the pipe. To counteract that, the system is designed to allow flushing of the pipes with water.

BETTER WORK ENVIRONMENT

The new plant, on the site of a former U.S. Department of Agriculture property where hogs were raised for research, is a big improvement in terms of working environment, Dunn says. Six people on the Water & Pollution Control administration staff work in the building along with 13 who work in the treatment plant.

"We have a pretty sophisticated lighting control system," Dunn says. "It's motion activated. The HVAC system has a sophisticated control scheme. In the old plant, a lot of people used to have space heaters. We don't have to deal with that anymore. We've got good comfort levels."

The new plant is also more efficient, although it takes more energy to run than the old one because it is bigger. "We're able to run a much larger facility without having to increase staffing levels," Dunn says. "That's because of the automation built into the plant."

The new plant is designed to be expandable from 15 to 20 mgd and again to 25 mgd, all within the initial footprint. "This was built with the expectation that it would have a 100-year life," Dunn says. "It will serve four to five generations of Ames residents."

The Ames plant is not the only LEED-certified water plant in Iowa. There now are smaller LEED-certified plants in Humboldt and Shenandoah, also designed by FOX. **tpo**

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product spotlight
wastewater

Pumps at the heart of smart dewatering

By Ted J. Rulseh

As smart technology continues to be implemented into the wastewater treatment stream, **Godwin Pumps, a Xylem brand,** had introduced the **NC100S** and **CD100S dewatering pumps.** Equipped with interchangeable, application-specific impellers and a new generation of cloud-based Field Smart Technology, these 4-inch, surface-mounted centrifugal pumps deliver enhanced control and flexibility for dewatering applications.

"The Godwin NC100S and CD100S Dri-Prime pumps are designed to be versatile, multipurpose dewatering pumps, for use in the industry's most challenging construction, municipal, industrial and emergency response applications," says Hunter Powell, Americas Godwin product manager with Xylem. "Due to these pumps' unique design and interchangeable impellers, the customer can now select a single versatile pump that can handle complex solids — from 1 7/8-inch solids to modern stringy waste — across a variety of applications."

While each is ideal for a specific application, the pumps enable operators to switch from a NC100S to a CD100S, and vice versa, due to the interchangeable impellers. This provides a two-in-one solution for each pump to increase the application range and remove the need to invest in multiple fleet models. The CD100S pump is designed for utility and construction applications and emergency response dewatering. The impeller can be exchanged with a Flygt N-Technology self-cleaning, nonclog impeller to deliver sustained hydraulic efficiency.

NC100S and CD100S dewatering pumps from Godwin Pumps, a Xylem brand

"Digital technology is creating bold new possibilities to address the challenges of water affordability, scarcity and resilience," Powell says. "Field Smart Technology allows customers to monitor and control the pump remotely, at any time and from anywhere in the world. The customer knows the exact location, status and condition of the pump, enabling proactive maintenance for increased uptime and reduced service time and mitigating costly pump failures. Remote monitoring and control also supports more effective deployment of labor, as it removes the need for on-site pump watch."

In addition, the NC100S and CD100S models have a redesigned pump-end, yielding 20% greater pump uptime and 40% reduced service time. Both models also come equipped with a Final Tier 4 engine, cutting diesel particulate emissions by 90%.

Field Smart Technology comes as standard on all NC100S and CD100S pumps in North America. There is also an improved graphical user interface, providing greater choice in remote monitoring and control. **800-247-8674; www.xylem.com**

Flygt - a Xylem Brand - 4230 adaptive compact mixer

The 4230 adaptive compact mixer from Flygt - a Xylem Brand - is a larger, geared mixer. It utilizes the Flygt Dirigo technology platform of integrated power electronics, a high-efficiency IE4 equivalent motor, optimized hydraulics and a built-in monitoring system with alarms and overload protection. The mixer can either be fully automated or easily controlled on a tank-side operator panel or from a control room as part of the plant's SCADA system.
914-323-5700; www.xylem.com

Bionetix International BCP50 municipal activated sludge

BCP50 from Bionetix International contains strains of bacteria to

product spotlight
water

Model 80MDW-VFD
from Flomatic Valves

Check valve enables high performance, low friction loss

By Craig Mandli

Check valves are an important component of every submersible pump water system. Why are they important? First, they allow your water system to maintain pressure when the pump shuts off. They also prevent backflow and upthrust and help minimize water hammer. **Flomatic Valves** has released the **Model 80MDW-VFD Heavy Duty Deep Well Check Valve** for use specifically with variable-frequency drive-controlled submersible pumps or other conventional pumps.

This deep well check valve is designed for well water use to support the weight of up to 3,300 feet of pipe and the well pump, making it suitable for industrial and municipal wells. "It offers high performance with low friction loss," says Daniel Hidalgo, marketing manager for Flomatic Valves. "Constructed from very strong carbon steel, similar in strength to API J55 tubing, this unique valve is the perfect choice for deep-set pump applications and heavy hanging loads."

The valve features a male inlet and female outlet body with eight round external-upset tubing threads 2 3/8 through 4 1/2 inches, or eight round male short casing threads and female long casing threads 4 1/2 through 9 5/8 inches. In addition, a corrosion-resistant, stainless steel spring and stem, combined with fusion-bonded epoxy coating inside and out allow for a longer service life. It comes standard with a 3/4-inch break-off plug for easy servicing.

The check valve features Flomatic's signature spring-loaded metal-to-metal valve seat, which is designed to provide low friction loss, prevent backflow, and minimize hydraulic shocks in the system, providing years of trouble-free operation without maintenance when installed correctly. It is available in 12 different sizes, some of which are also available in an all 316 stainless steel assembly. It can operate at a maximum temperature of 200 degrees F and a maximum pressure of 4,400 psi. All valves are certified NSF/ANSI 372 and manufactured in a facility certified with an ISO 9001 and 14001 quality management system. In addition, each valve is hydro-tested to ensure a drip-tight seal at 4,500 psi.

"It is ideal for water well systems where a pump has to be set deep and space is of primary concern," Hidalgo says. "It is a flow efficient check valve designed for deep well submersible pump applications."
800-833-2040; www.flomatic.com

perform under both aerobic and anaerobic conditions. It produces efficient degradation of odorous compounds including ammonia. And starting a new wastewater operation requires seeding it with a healthy microbial population that can handle a heavy influx of contaminants. A shock dose of microorganisms and nutrients in BCP50 gives an important boost to the system so it can handle the first sudden influx of waste.
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tpo

SCADA and Controls: They Don't Last Forever

MAINTENANCE AND LIFE-CYCLE PLANNING FOR THESE MISSION-CRITICAL SYSTEMS SHOULD BE A ROUTINE PART OF WATER AND WASTEWATER TREATMENT PLANT OPERATIONS

By Charles Fiero

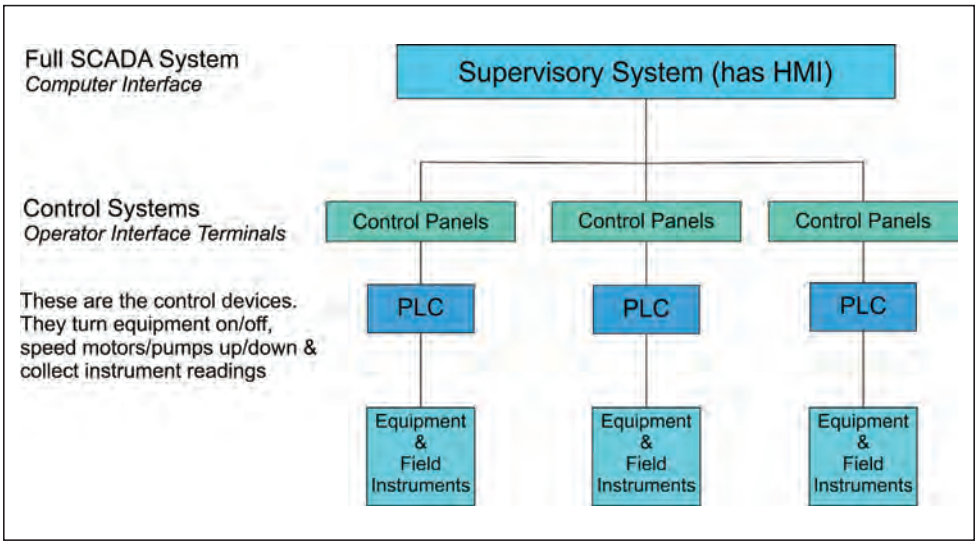
Supervisory control and data acquisition (or SCADA) systems and connected instruments are vital to many water and wastewater treatment facilities.

They perform control functions much faster and respond much quicker than humans. They alert operators to upcoming issues or events that have already happened. They can archive historical data for reports and trending to better gauge what needs to be done in the future.

Plant operations rely upon these systems; failures can cause noncompliance, waste costly chemicals and electricity, and cause bypasses and other operational upsets.

Unfortunately, most SCADA systems are installed and then forgotten until there is a problem. When problems arise, they are addressed on a "get it up and running now" basis. Maintenance is usually limited to calibrating the instrumentation, and often the system itself is not part of any capital or life-cycle programs.

SCADA and control systems are mission critical; it is prudent to keep them in a high state of reliability. Close adherence to basic maintenance practices can ensure these systems function as designed and help keep plants running smoothly and in compliance.



The basic components of a SCADA system.

THE BASIC ELEMENTS

Most SCADA and control systems consist of programmable logic controllers (or PLCs) that are connected to the field devices, such as motors, pumps, variable-frequency drives (or VFDs) and other equipment, and to online instruments and analyzers.

The PLCs are the brains of the system and perform the control work, turning equipment on and off, speeding things up or down, monitoring conditions and collecting data. PLCs are manufactured by a variety of companies including Allen-Bradley (Rockwell Automation), Siemens and Schneider Electric. They have input/output racks or modules that allow connection to the field devices, which have ports used for communication to operator input devices.

PLCs are programmed using manufacturer-supplied proprietary software that produces the control program, which is then downloaded into the PLC. This is what does the control work. Operator interface terminals (or OITs) are also programmed using the manufacturer's software, which produces the screens needed to access what the PLCs are doing. For a simple control system, there will be PLC programming software, the PLC programs, OIT programming software and the OIT programs.

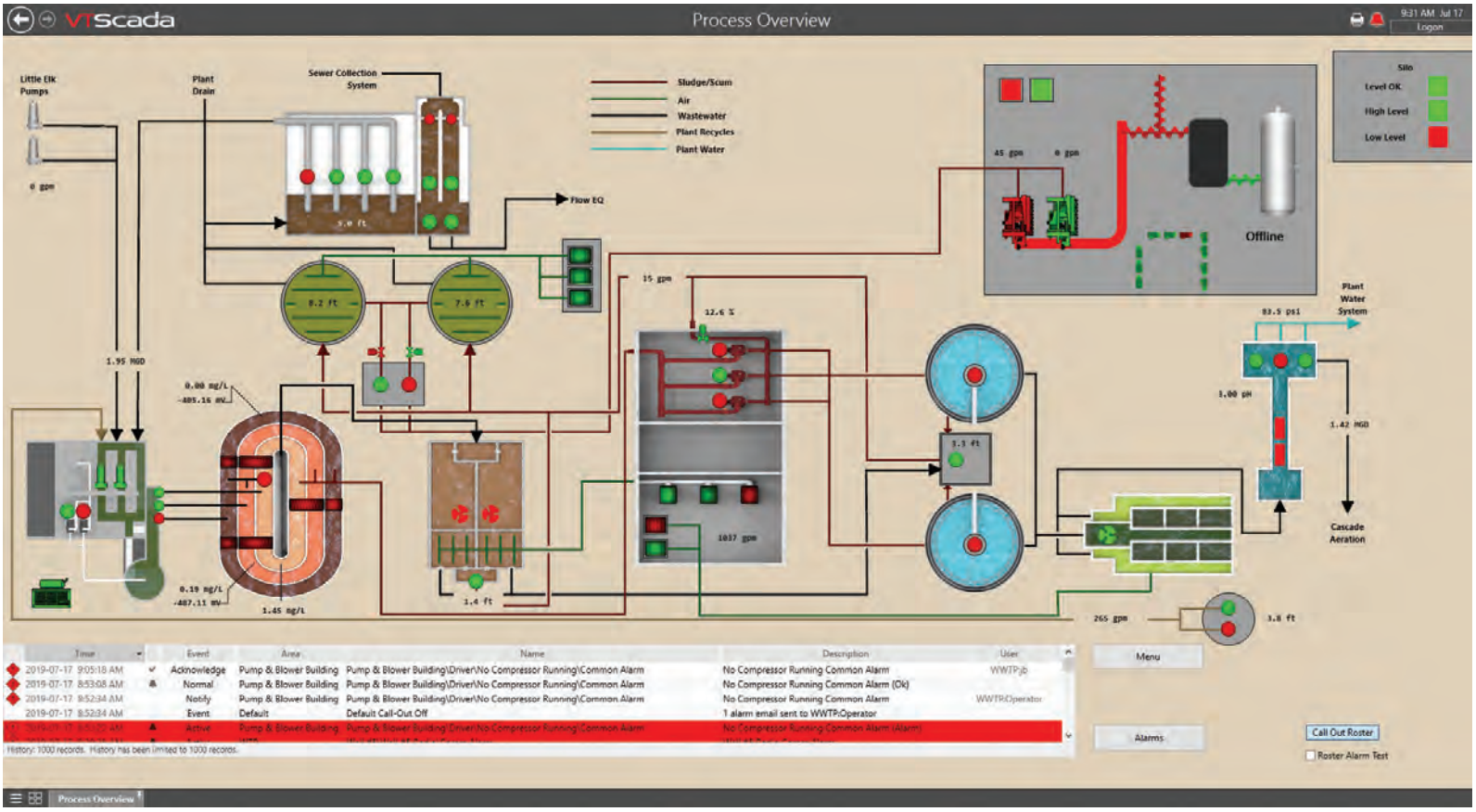
Control systems may have touch-screen panels (and keyboards), referred to as OITs. A SCADA system has a human machine interface (HMI), which is a software program running on a computer connected to the PLCs. Some commonly used HMIs are VTScada (Trihedral Engineering), Wonderware (AVEVA), RSView (Rockwell Automation), FactoryTalk (Rockwell Automation), iFIX (GE Digital) and Ignition (Inductive Automation).

A SCADA system communicates to one or more control systems or field devices and exchanges operating parameters, setpoints, real-time data and alarms with control systems, PLCs and field devices.

LIFE-CYCLE PHASES

There are four phases to the life cycle of a PLC: development, active sales, after-sale support and obsolescence. Here is a look at each phase.

Development. Here the manufacturer is designing a new product, which may or may not be backward-compatible with existing products. The new product usually



A typical screen view of a SCADA system process overview.

includes updates to hardware, communication protocols and security enhancements; it may even require new programming software.

Active sales. In this phase, there are new units on the market. Often, development on the product continues through this phase. The new product is used in new installations and in upgrades and replacements of existing control/SCADA systems.

After-sale support. This phase begins when the manufacturer has discontinued product development. The product may still get critical firmware updates addressing security and operational issues. However, availability of spare parts (such as PLCs and input/output modules) will become tighter as the manufacturer winds down and ceases production.

Obsolescence. This occurs when the manufacturer no longer supports the hardware and no longer has new parts. At that point, the only sources for parts are through secondary market sources including some vendors and online outlets such as eBay. Items purchased through the secondary market do not have manufacturer warranties and support.

A typical life cycle for a PLC is 10 to 15 years. However, if a new SCADA or control system was installed five years ago, that doesn't mean there are 10 years left in the PLC life cycle. For example, if the system was installed with PLCs that had been on the market for eight years, there may be only four to seven years left in the PLCs' service life.

Many operators have been around computers for 20 years or more; many remember the systems that came out in the late 1980s and early '90s and the many changes made since then. In the '90s, for example, there were operating systems that were disk operating system (or DOS) based, which changed into Windows 3.1 and Windows XP, NT, 7 and 10.

Unfortunately, PLCs often lagged these operating system changes. It is not uncommon for PLCs manufactured in 2000-10 to only have serial or proprietary connections for downloading the control programs. Ethernet ports did not become a common practice on PLCs until later. The older PLCs often required programming software that only runs on Windows XP or requires a laptop with a serial port — and those are no longer being produced.

The HMI and the computers they run on must also be looked at. If the operating system is Windows XP, that is a red flag from a security and product update standpoint. The HMI software needs regular updating as well, especially for security patches.

SYSTEM MAINTENANCE

Water and wastewater treatment operators need to maintain these systems. That maintenance consists of at least these items:

- A complete inventory of the critical system parts. This includes the manufacturer and model of each PLC and each type of input/output module, communication equipment (radios, adapters, network switches) and OIT panels.
- Copies of the latest versions of the PLC and OIT programs and, preferably, copies of the PLC/OIT programming software, as well as a copy of the HMI programs. These must be dated and assigned version numbers.
- Wiring diagrams for all control panels: a complete set in the office and a set in each control panel enclosure. If the drawings are not available electronically, they should be scanned.
- A list of all of the control loops describing their functionality.
- A list of all instrumentation with the scaling used in the programming.
- A list of all the analog outputs and their scaling.
- A map of the network system.
- A copy of all work done on the system by in-house staff or contractors. This information should be in the computerized maintenance management system (or CMMS) as work orders.
- Instrument calibration and cleaning schedules (also available in the CMMS).
- Periodic inspection of the control panels; a function check of the uninterruptible power supply, heaters, lights and other devices in the panel; and good general housekeeping (such as dust and cobweb removal).
- A log of any errors produced by the system and the corrective actions taken.
- Documentation and addressing of nuisance alarms.

(continued)

LIFE-CYCLE PLANNING

Besides these maintenance items, operators need to provide a list of items that need repair or replacement, now and in the near future. Historically, this activity has been limited to major equipment and processes, but it must be applied to SCADA and control systems as well. Communication of needs for repair, replacement and upgrade should be part of the asset management plan or capital plan.

For PLCs that are at or near obsolescence, a proactive approach to upgrade or replacement is highly recommended. A facility without backups of the latest programs in these units is just one lightning strike or power surge away from being down and out with no easy fix to get back up and running. If an HMI is running on Windows XP or has not been updated in more than two years, attention to that is past due as well.

Operators unsure of what type of system, PLCs and HMIs are in place should have a discussion with in-house instrumentation and control personnel, the maintenance staff, or the system integrator. Most important, proactive planning for repair or replacement of SCADA and control systems is critical to keeping a facility operating efficiently and in compliance.

The maintenance and life-cycle planning described here also applies to the control system embedded with process equipment and process operations. Control systems supplied as part of a UV system, sequencing batch reactors, oxidation ditches, dewatering equipment and pumping system need to be an integral part of this planning.

ABOUT THE AUTHOR

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worth noting

people/awards

Cary Naas was hired as superintendent of the Eureka (Illinois) Wastewater Treatment Plant. He replaces Doug Eastman, who retired after 27 years.

Jeff Arthur was hired as director of Public Works for Lafayette, Colorado. He replaces Doug Short, who retired after 20 years.

Mark Brown was hired as utility director for Union, South Carolina. He replaces Joe Nichols, who was named city administrator.

Dustin Martin was hired as superintendent of the Department of Public Works in Saranac Lake, New York.

The Water Environment Federation presented 2019 awards for published papers. Recipients include:

- Eddy Wastewater Principles/Processes Medal: "Acute Impact of Chlortetracycline on Nitrifying and Denitrifying Processes," **Rama Pulicharla, Mehdi Zolfaghari, Satinder Kaur Brar, Patrick Drogui, Serge Auger, Mausam Verma** and **Rao Y. Surampalli.**
- Gascoigne Wastewater Treatment Plant Operational Improvement Medal: "Doubling Down on Disinfection," **Michael J. Watts, Walter Collins, Aaron Stallmann** and **J. Paul Strickland.**
- McKee Groundwater Protection, Restoration or Sustainable Use Award: "Sustainability Assessment for Indirect Potable Reuse: A Case Study from Reno, Nevada," **Laura Haak, Vijay Sundaram** and **Krishna Pagilla.**
- Rudolfs Industrial Waste Management Medal: "Evaluation of Kinetic and Stoichiometric Parameters for Denitrification of a Petroleum Refinery Wastewater," **Dan Carey,** Ph.D., **David Marrs,** P.E., and **Everett Gill.**

The National Association of Clean Water Agencies presented its Peak Performance Awards. Award winners include:

- **Fort Collins (Colorado) Utilities Wastewater Department:** Drake and Mulberry water reclamation facilities, Platinum awards.
- **Upper Trinity Regional Water District** (Texas): Lakeview, Peninsula and Riverbend regional water reclamation plants, Platinum awards; and Doe Branch Regional Water Reclamation Plant, Gold award.
- **North Shore (Illinois) Water Reclamation District:** Waukegan Water Reclamation Facility, Gold Award; and Clavey Road and Gurnee water reclamation facilities, Silver Awards.
- **Pine Bluff (Arkansas) Wastewater Utility:** Boyd Point Treatment Facility, Platinum Award.

events

Dec. 2-6
National Green Infrastructure Certification Program, Georgia Association of Water Professionals, Marietta, Georgia. Visit www.wef.org.

Dec. 3-5
AWWA North American Water Loss Conference & Exposition, Renaissance Nashville Hotel, Nashville, Tennessee. Visit www.awwa.org.

Dec. 8-12
Florida Section AWWA Fall Conference: Building a Resilient Utility, Omni Orlando Resort at ChampionsGate. Visit www.fsawwa.org.

The **Snoqualmie Wastewater Treatment Plant, Chambers Creek Regional Wastewater Treatment Plant** in Pierce County and **Birch Bay Water and Sewer District** wastewater treatment plant received Outstanding Performance awards from the Washington State Department of Ecology.

The New England Water Environment Association presented the **York (Maine) Sewer District** with the 2019 Wastewater Utility Award.

The **City of Stockbridge** received the Wastewater Facility Gold Award from the Georgia Association of Water Professionals.

The Cooperstown (New York) Board of Water and Sewer Commissioners recognized longtime chairman **Ted Peters** at a groundbreaking on the village's $9.1 million project to repair and upgrade the water treatment plant.

The **Gainesville Water Treatment Plant** received a Texas Optimization Program Recognition Award from the Texas Commission on Environmental Quality.

The **Murray (Kentucky) Water Treatment Plant** received the 2019 Water Treatment Plant of Excellence award among medium-sized facilities from the Kentucky/Tennessee Section American Water Works Association.

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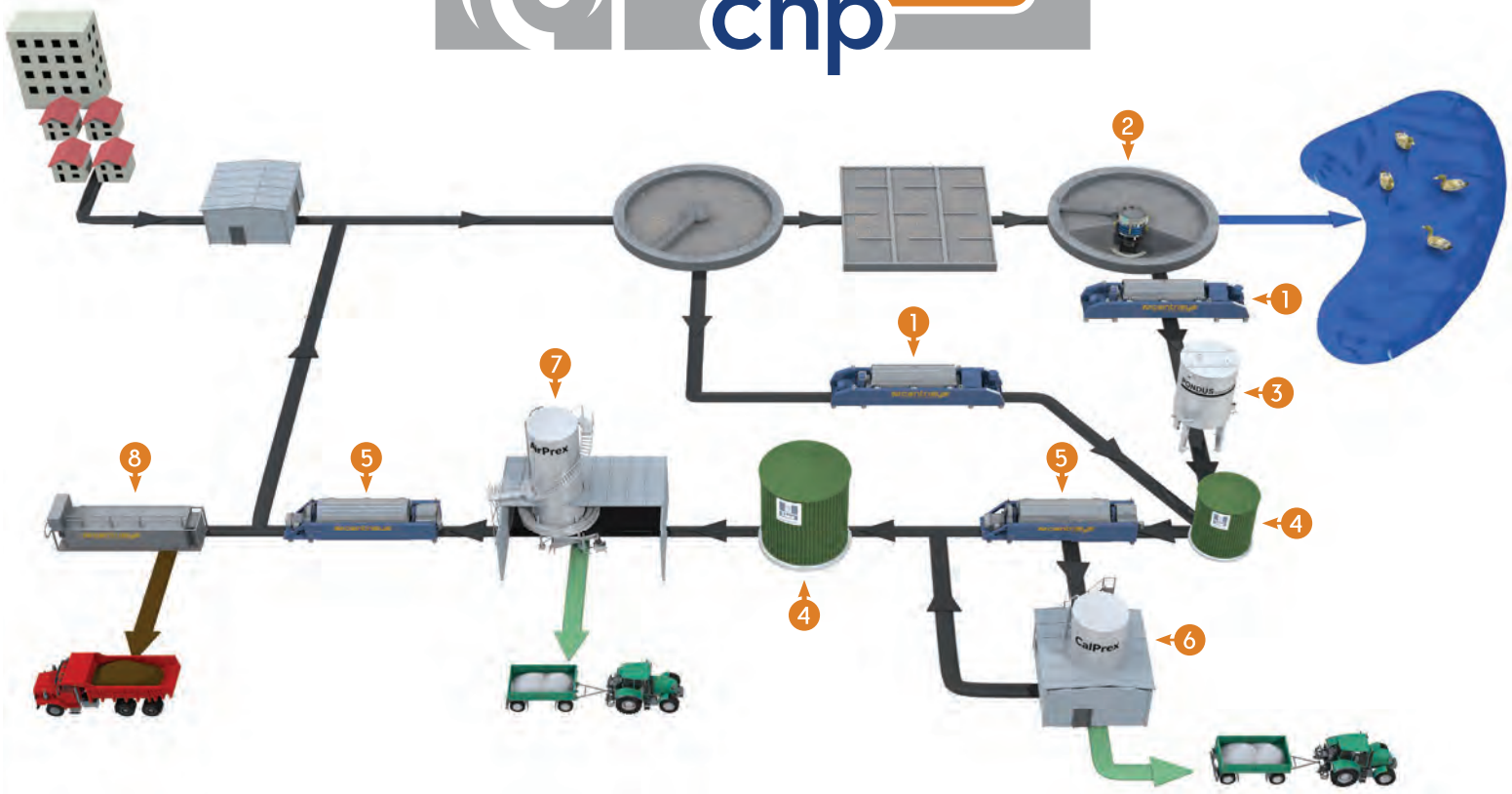

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4. **LIPP America Tank Systems** | digester + storage tanks
5. **CS Series** | dewatering centrifuge
   The most efficient pre- and post-digestion dewatering centrifuge
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