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NOVEMBER 2017

**HEARTS AND MINDS:
A day to honor
water pros**

PAGE 16

**TECH TALK:
Better specs for
coatings projects**

PAGE 26

The Formula for *Excellence*

**JODY FLANNERY'S DEDICATION
TO PERFECT LAB PROCEDURE
SERVES HER COMMUNITY WELL**

PAGE 30

Jody Flannery
Laboratory Technician
Rhineland, Wis.

**SUSTAINABLE OPERATIONS:
Efficient lighting and power
management in Santa Cruz**

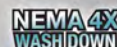
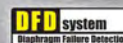
PAGE 28

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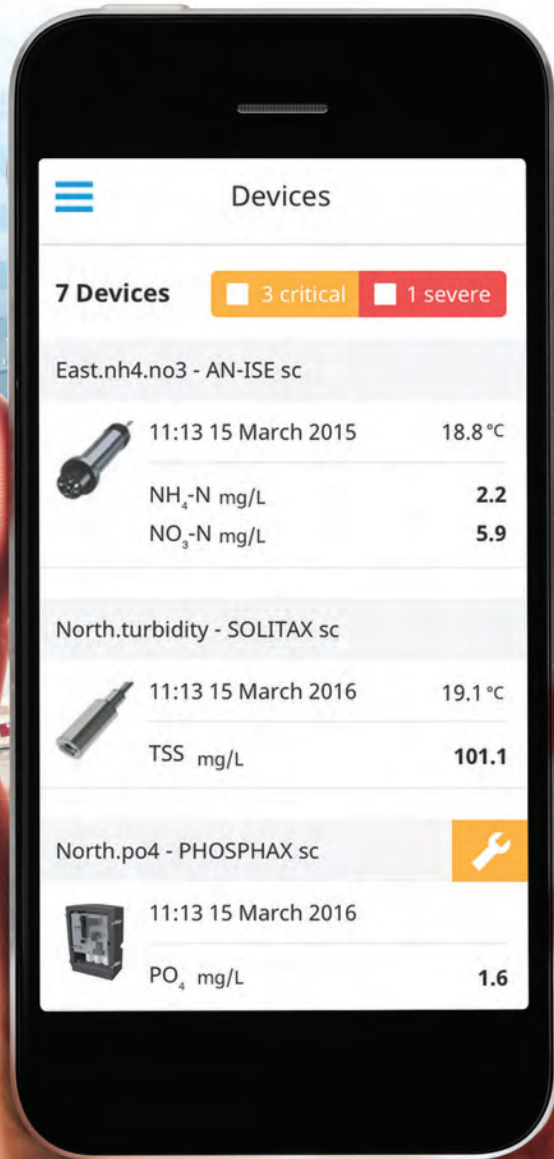
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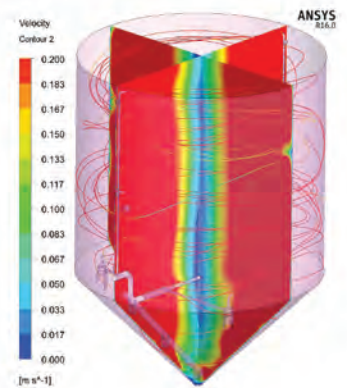
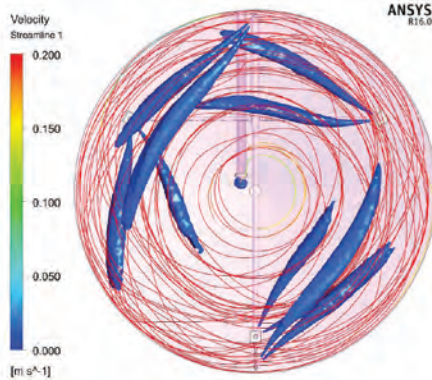
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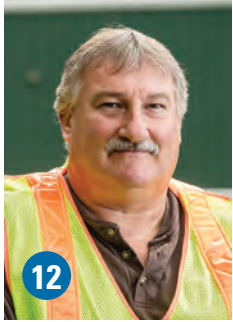


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on the cover

Jody Flannery, lab technician at the Rhinelander (Wisconsin) Wastewater Treatment Plant, has earned regulators' praise for her dedication to quality control and attention to detail. That's a big reason her plant received a 2017 Laboratory of the Year award from the state Department of Natural Resources. (Photography by Cory Dellenbach)

top performers:

WATER SYSTEM Page 20

By the Numbers

Randy Randall and his operations team rely on data to pump water efficiently and take full advantage of the local utility rate structure.

By David Steinkraus

WATER OPERATOR Page 40

Mission Critical

Earl Stewman leads a crew keeping some of Alaska's fire hydrants in working order, battling the elements to maintain public safety, and building an award-winning career.

By Jack Powell

WASTEWATER OPERATOR Page 12

One-Man Gang

Tim Mills rarely strays far from his small community's clean-water plant. Maybe that's why it runs so well and produces such high-quality effluent.

By Jim Force

WASTEWATER LABORATORY Page 30

The Formula for Excellence

Jody Flannery's dedication and insistence on perfect procedure have helped her community earn Laboratory of the Year recognition.

By Anthony Drew

LET'S BE CLEAR Page 8

Who Are These Guys (and Gals)?

If you deal with news reporters, it helps to understand their roles, their skills and limitations, and the daily demands they face on the job.

By Ted J. Rulseh, Editor

@TPOMAG.COM Page 10

Visit daily for exclusive news, features and blogs.

HEARTS AND MINDS Page 16

Overlooked No More

Virginia celebrates June 30 as Drinking Water and Wastewater Professionals Appreciation Day as declared by the state General Assembly.

By Craig Mandli

HOW WE DO IT: WASTEWATER Page 18

Productive Package

A sequencing batch reactor plant in a rural Tennessee county provides an operator-friendly process that yields quality effluent and saves energy.

By Ted J. Rulseh

TECH TALK Page 26

Building Better Bids

Specifying coatings for water facilities can be tricky. Consultation with coatings experts can lead to selection of a product that protects effectively and extends service life.

By Kevin Morris

SUSTAINABLE OPERATIONS Page 28

Dialing Down Power Bills

A California plant team achieves big energy savings with high-efficiency lighting retrofits and intelligent electric power management.

By Steve Lund

EXAM STUDY GUIDE Page 37

By Ron Trygar

PLANTSCAPES Page 38

Wild Wetlands

Ponds and man-made wetlands at an Indian River County Utilities treatment plant provide a major attraction for birders and wildlife watchers.

By Jeff Smith

IN MY WORDS Page 44

Bang for the Buck

The Dixie Drain project in Idaho is an example of innovative approaches to reducing phosphorus loadings on streams at affordable cost.

By Jim Force

TECHNOLOGY DEEP DIVE Page 46

New Life for Old Pumps

Reverse engineering of impellers and other components can be a cost-effective solution for pumps that are no longer manufactured and for which off-the-shelf parts are not available.

By Ted J. Rulseh

PRODUCT FOCUS Page 48

Treatment and Filtration

By Craig Mandli

CASE STUDIES Page 56

Treatment and Filtration

By Craig Mandli

PRODUCT NEWS Page 58

Product Spotlights:

Wastewater: Keeping the solids out

Water: Total control in tough environments

By Craig Mandli

INDUSTRY NEWS Page 61

WORTH NOTING Page 62

People/Awards; Events

coming next month: December 2017

FOCUS: Annual Plant Proficiencies Issue

- » Let's Be Clear: The importance of passion
- » Top Performers:
 - Wastewater Operator: Tony Wood, Osgood, Indiana
 - Water Plant: Hendersonville (Tennessee) Utility District Water Filtration Plant
 - Wastewater Plant: Marshall (Missouri) Southwest treatment plant
 - Wastewater Operator: Andrew Johnson, Lab Analyst, Anchorage, Alaska
- » How We Do It: Hiring interim expertise in Menlo Park, California
- » Sustainable Operations: Affordable solar in Silver City, New Mexico
- » In My Words: The power of analytics
- » PlantScapes: Reservoir mural in Decatur, Illinois
- » Hearts and Minds: Watershed education in Virginia
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let's be clear

Who Are These Guys (and Gals)?

IF YOU DEAL WITH NEWS REPORTERS, IT HELPS TO UNDERSTAND THEIR ROLES, SKILLS AND LIMITATIONS, AND THE DAILY DEMANDS THEY FACE ON THE JOB

By Ted J. Rulseh, Editor

“There’s a reporter on the phone.”
Often, a water professional’s first response to that is “Uh-oh.” That’s because water and waste-

water plants tend to work in the background until something goes wrong. But it’s also because most operators aren’t used to dealing with the media.

Whether you face the prospect of being in the news or you’re just laying the groundwork for good long-term media relations, it helps to understand who reporters are and how they do their jobs. I can address this subject with some authority because in past lives I’ve been a reporter and editor and have worked with journalists as a community relations representative. Here are a few key points to remember:

There is no such thing as “the news media.” That is to say, not all

reporters are alike and neither are the newspapers, websites, radio stations or TV channels they work for. Every one is different — they have their own backgrounds, agendas, abilities, limitations and (yes) biases.

Reporters aren’t out to get you. Well, maybe a few are. Some have visions of making a name by “nailing a bad guy,” but most are fair-minded and will do their best to cover your issue in a responsible manner, conveying your side of the story to the extent you tell it with clarity. Paranoia will not help you; it will only make the reporter think you’re hiding things. Be a little careful what you say, but start by assuming you’ll be treated fairly if you’re honest and direct.

Reporters are generalists. Exceptions to this rule are science and environmental reporters — if you’re able to deal with one of those, you’re in good hands. Otherwise, the reporter you talk to may have little or no science background and may also cover everything from the police blotter to the local garden club. You need to explain things carefully and



simply, in language both the reporter and his or her readers will understand. Avoid industry-insider terms and jargon.

Reporters cover viewpoints, not facts. This bit of wisdom comes from risk communication consultant Peter Sandman; in my experience, it rings true. A reporter unfamiliar with your issues isn't equipped to judge that you and your experts are credible and those with contrary positions are not. Therefore, expect the reporter to give equal weight and space to someone with impressive credentials (like a scientist) and someone who has essentially none. That may not be fair, but that's the way it is.

In a two-minute TV evening news report, you can expect to be on the screen for perhaps 30 seconds or less. So you'd best distill your main point into a couple of crisp and memorable sentences.

Different media have different needs. A newspaper reporter might interview you for a long and in-depth story. A radio or TV reporter most likely will not. In a two-minute TV evening news report, you can expect to be on the screen for perhaps 30 seconds or less. So you'd best distill your main point into a couple of crisp and memorable sentences.

Reporters aren't your friends, but they can become your allies. To do their jobs, reporters need reliable news sources. If you gain credibility with local reporters — by welcoming their calls and consistently sharing useful information — they may come to trust and rely on you. Then, they'll be inclined to call you first when covering stories about the industry.

Reporters work on deadlines. Know this, and respect it. If a reporter leaves a message, call back as soon as you get it. If a reporter sends an email, reply now or — better yet — pick up the phone and call. If you wait, the deadline may pass and you'll lose the chance to share your views and information.

Reporters care about accuracy. Nothing ruins a good journalist's day like getting something wrong into print or on the air — but being human, reporters make mistakes. If you see an error in a story about your plant, you have the right to ask for a correction. Don't call and berate the person. Instead, politely explain what's wrong. You may get an immediate correction; at the least, you'll make sure the mistake isn't repeated in future stories.

Reporters are people. They have homes, friends, families, hobbies — and feelings — like anyone else. Like you, they're trying to do a job as best they can. Show that you respect them and they'll be all the more likely to respect you in return. **tpo**

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FLOODED WWTPS

Interactive Map

As those in the water/wastewater industry know all too well, it's not just homes that must be evaluated and rebuilt in the months following Hurricane Harvey's devastation. The area surrounding Houston, Texas, is also home to hundreds of public and private facilities vital to infrastructure — and many of them were underwater. Take a look at an interactive map showing the facilities affected by the storm.

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OVERHEARD ONLINE

“I’m just trying to figure out if there’s a way to get people to understand one system and take it from there.”

Water System Video Game Could Be Public Education Tool
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DESALINATION OPTIONS

Carbon Nanotubes

A team of scientists recently developed carbon nanotube pores that can separate salt from seawater. The team also found that water permeability in carbon nanotubes (CNTs) with diameters smaller than a nanometer exceeds that of wider carbon nanotubes by an order of magnitude. The nanotubes, hollow structures made of carbon atoms in a unique arrangement, are more than 50,000 times thinner than a human hair.

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HURRICANE HARVEY

Plants Devastated

It started Aug. 13 when a tropical wave off Africa's west coast combined with a low-pressure area near the Cabo Verde Islands. By the end of the month, Hurricane Harvey made landfall in southeastern Texas, creating a humanitarian and public works crisis, and eventually leaving hundreds of water and wastewater treatment plants inoperative. Houston's struggle isn't that surprising when you consider that Harvey dumped an estimated 15 trillion gallons of water on the city.

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ONE-MAN GANG

TIM MILLS RARELY STRAYS FAR FROM HIS SMALL COMMUNITY'S CLEAN-WATER PLANT. MAYBE THAT'S WHY IT RUNS SO WELL AND PRODUCES SUCH HIGH-QUALITY EFFLUENT.

STORY: **Jim Force** | PHOTOGRAPHY: **Oliver Parini**

TIM MILLS OPERATES THE TOWN OF BETHEL, VERMONT, WASTEWATER treatment plant all by himself. He's up early to be at the plant by 6 a.m. He returns each night around 7 o'clock to check on things before he heads to bed.

He takes vacations in his RV just eight miles from town so he can maintain close contact with the plant. He's been doing that since 1987, and he wouldn't have it any other way. "It's not a job, it's a lifestyle," says Mills, winner of the 2016 Operator Excellence – Wastewater award from the Green Mountain Water Environment Association. "You find out who you really are. There's nobody else here to let you down. It's just you."

KEEPING IT CLEAR

The Bethel treatment plant came online in 1987, the year the town hired Mills to operate it. The design flow is 115,000 gpd; an oxidation ditch process yields crystal-clear effluent that's discharged to Vermont's White River.

The oval-shaped ditch (75 feet long by 20 feet wide by 7 feet deep) is equipped with a fin-type rotor that aerates and mixes the contents. Two circular clarifiers follow, and the effluent is UV disinfected. BOD and TSS removal averages 98 to 99 percent.

Waste activated sludge is stored on site in an aerobic digester that's emptied twice a year. The digested material is hauled as a liquid to the Montpelier Wastewater Treatment Plant about half an hour away; it is dewatered there and sent to a landfill.

For many years, the biosolids were applied by injection on farm fields, but the sites were in an area that the state Department of Fish and Wildlife is returning to its original condition. Hauling costs are about \$25,000 a year — about 10 percent more than it cost to land-apply. "That's a bargain when



Tim Mills, Wastewater Treatment Plant chief operator, Bethel, Vermont

you consider the time saved, plus not having to deal with traffic or liability with the equipment on the road," Mills says.

FLYING SOLO

As the sole operator, Mills has had to be creative and resourceful. When the state imposed effluent nitrogen requirements a few years ago, Mills put on his thinking cap and went to work on his oxidation ditch. "By controlling the speed of the rotor, we've been able to achieve nitrification-denitrification biologically," he says. "We create an anoxic zone in the ditch."

That is accomplished by increasing the mixed liquor suspended solids level and using the inverter on the rotor to slow it down so that oxygen levels drop to as low as 0.1 mg/L through the last one-fourth of the ditch. "It gets just enough oxygen to make it around the bend" before encountering the rotor again, Mills says.

Temperature is another factor that makes it difficult to maintain the nitrification-denitrification process. "In the fall, when the wastewater temperature drops and we hit about 60 degrees F, we increase the MLSS load," Mills says. "It doesn't end up being a complete nitrification-denitrification process, but it's close enough to maintain reasonably low nitrogen levels. We run with a heavy MLSS throughout

the cold weather, and we can easily meet our limit of less than 11 pounds of nitrogen a day, even in January and February."

DIVERSE EXPERIENCE

Adjusting the rotor system is just one of many steps Mills has taken to fix things and improve operations — and that goes to his background. After high school and a brief stint in landscaping, he earned his first operator's

“I can tell how the plant is doing by the way it sounds. When I come back between 7 and 9 at night, I listen to it. It’s hard to explain. You end up being intuitive by what you hear.”

TIM MILLS

Mills came to his wastewater career with a high school diploma and a background in landscaping.





Besides the wastewater treatment plant, Mills is responsible for four pump stations and the collections system.



Mills takes pride in polished effluent that “actually glistens.”

Tim Mills, Town of Bethel, Vermont

POSITION: | **Wastewater Treatment Plant chief operator**

EXPERIENCE: | **30 years with town**

RESPONSIBILITIES: | **Daily operations including reports, lab, maintenance, repairs, process optimization; maintenance of collection system and four pump stations**

CERTIFICATION: | **Grade 3 domestic wastewater operator**

GOALS: | **Maintain quality effluent at all times**

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license while working at treatment plants in Plainfield and Randolph, Vermont. He worked up to a Grade 3 at Randolph, but moved on when he couldn't see an opportunity to become chief operator. He moved to Bethel as the head man when the town opened its new plant and has been there ever since.

“I bought a house here, raised a family and we are very happy,” he says. “If I need someone to lend a hand, I have a gentleman on the town road crew with a Grade 1 operator’s license. I can call on him to help out.”

Town Manager Keith Arlund says, “I have a great deal of confidence in Tim. He is very professional and has a high level of mechanical skills.” The skills come in handy. Mills used them recently when a small fire burned out the control panel for the UV disinfection system.

“The original equipment manufacturer had gone out of business,” he recalls. “I had lost all my controls, but I thought I could put it back together my way. I did some UV spectrum analysis with some stronger ballasts and found they produced a stronger light.” Mills installed them, added an on/off switch, and saved the town about \$100,000 with his home-built unit.

“I did one unit, then the other,” he says. “I check the lamps every morning and everybody’s up and running and happy. We have no more electronics to be fussy with.”

FUTURE CHALLENGES

As resourceful and successful as he has been, Tim Mills realizes the profession is not without challenges. “What worries me most is having something happen to the plant that I can’t control,” he says. “We did have some episodes in early 2000s when our UV unit wasn’t getting penetration. It all depends on what’s getting flushed down the collections system.”

He also shares the concerns of wastewater professionals across the land about unfunded mandates: “I worry about new regulations coming down but no funding to support them.”

BOOSTING RELIABILITY

His Yankee ingenuity also helped solve a maintenance problem with the rotor. “During winter freeze-ups, ice tended to smash the fins on the rotor,” Mills says. “The estimate was \$200 a fin, plus a \$1,200 setup fee at the factory. Twelve fins are bolted together to form one ring of fins around the rotor, which has 10 rings.

“I bought 12 strips of steel (10 inches long, a quarter-inch thick and 4 inches wide) and hired a local welder,” Mills says. “We unbolted the original fins and welded new strips in their place around the rotor barrel. We haven’t lost a tooth since.”

In another case of do-it-yourself, Mills replaced the belts on the rotor drive units with chain and sprocket mechanisms. “We were going through drive units way too frequently,” he says. “If the belts got too tight, we’d burn the bearing; too loose, and we’d burn the belt.” Now, the gear drive works fine, and the plant saves the \$1,500 it spent every eight to 12 months on new belts, bearings and oil: “We put a new chain on every 2 to 3 months at a marginal cost.”

Mills also got rid of the belts on the sludge pumps, replacing the original units with direct-drive electric motors controlled by inverters. “We used to use so much oil around the plant that I’d get an oil infection,” he jokes. “We’ve gotten rid of 90 percent of the oil, and that’s another significant saving.”

TAKING ON MORE

As if the treatment works didn’t put enough on his plate, Mills is in charge of the town’s collections system and four pump stations. He deals with the

consequences of residents' flush-it-and-forget-it syndrome. "People don't understand what not to flush," he says. He's committed to a clean system that generates no emergencies.

"We contract for a Vactor Manufacturing truck to clean out all wet wells and sags every fall, just before winter. Our system is only 30 years old, but we also clean one mainline section of the system each year. It's an ounce of prevention." The town is fortunate to be home base for Green Mountain Pipeline Services, which cleans and lines pipes all over the Northeast: "They usually return home on Thursdays and are available for jobs locally on Fridays."

The four pump stations create another set of issues. The system doesn't flow by gravity — it's 100 percent pumping. Electrical failures are the biggest problem. The two main pumping stations have 100 kW emergency diesel generators (Yankee) and so does the treatment plant.

The two main pump stations are also connected to the plant through radio communication, which alerts Mills of alarm by way of a pager. Always on the alert for improvements, Mills has changed the alarm systems in the pump stations.

"There are four floats in the wet wells of the pump stations," he says. "The floats are set from lowest to highest: pump shut-off, lead pump, alarm, and finally lag pump. That way, I get alerted if the lead pump can't keep up or is broken down and the lag pump is needed in order to keep up. That saves us a lot of trouble in the end. In my little world, that's huge."

SIGHTS AND SOUNDS

Like most solo operators, Mills has learned to look and listen to the treatment plant. "I can tell how it's doing by the way it looks — the mixed liquor color in the oxidation ditch, the amount of algae on the walls of the ditch, and the effluent," he says. "There's a difference between clear effluent and polished effluent. Polished effluent actually glistens. It sparkles when the sun shines through it. You're not going to make it any better."

That's important to Mills, who loves to fish. "I'm intrigued by the White River running past our plant," he says. "When the plant's running good, I feel that I am doing my part in maintaining the river and this job is something worth doing."

"I can tell how the plant is doing by the way it sounds. When I come back between 7 and 9 at night, I listen to it. It's hard to explain. You end up being intuitive by what you hear."

Mills finds a lot to like about working alone, even though he admits that being chief operator puts the bulls-eye on his back. "You're the guy whose name is on the final report. Your name is the one in the newspaper," he notes. "But it means everything to me, and I can't emphasize that enough. I think the world of the community I work for and live in."

The 2016 award from the Green Mountain Water Environment Association "came out of left field," Mills says. "I had no idea. An official with the Vermont Department of Environmental Conservation nominated me. The town manager called and asked what I was doing on an upcoming date and told me to make space on my calendar. Two weeks later, he told me that I would be receiving the award and we were going to attend the presentation together."

"The nominator stated during the presentation that he had learned a great deal about wastewater from his work with me over the years," says Mills.

"That was the best compliment I've ever received."

Turnover of veteran personnel in local government agencies is another issue: As they retire, they take important hands-on knowledge with them. Younger staff members coming out of school have the book learning but lack the field experience of running a treatment plant.

"Everything is not just black or white," Mills says. "There are a lot of shades of gray, and, as we all know, it really doesn't matter what the book says. Bacteria can't read." **tpo**

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EXPECT PERFORMANCE

Prince William County Service Authority employees perform valve exercising. June 30 is Drinking Water and Wastewater Professionals Appreciation Day in Virginia.



PHOTOS COURTESY OF THE PRINCE WILLIAM COUNTY SERVICE AUTHORITY

Overlooked No More

VIRGINIA CELEBRATES JUNE 30 AS DRINKING WATER AND WASTEWATER PROFESSIONALS APPRECIATION DAY AS DECLARED BY THE STATE GENERAL ASSEMBLY

By Craig Mandli

When you work in water and wastewater, no news is typically good news. If the people you serve aren't thinking about what you're doing, it means you're running a tight ship.

However, everyone appreciates a pat on the back once in a while. That's why June 30 is known as Drinking Water and Wastewater Professionals Appreciation Day in Virginia. The day celebrates the efforts of water sector professionals to protect public health and the environment.

In early 2016, the state General Assembly passed Joint House-Senate Commending Resolution HJ 88 marking the special day. State Rep. Richard Anderson sponsored the resolution. Before holding elected office, Anderson served 30 years in the U.S. Air Force and saw firsthand the effects of inaccessible drinking water and inadequate wastewater treatment.

"Day in and day out, these pros safeguard the health of our citizens and make invaluable and lasting contributions to the Prince William community, and they care for our environment in the process," Anderson says. "The General Assembly salutes the professionals who provide these invaluable services across the Commonwealth."

SALUTING WATER HEROES

The Prince William County Service Authority came up with the idea for the resolution. The authority's communications division contacted regional and state water sector organizations to gather support and worked with Anderson to compose the resolution.

"People take the water that comes from their tap for granted," says Kipp Hanley of the communications division. "Because these professionals often go unnoticed day in and day out, our organization wanted them to be recognized for the essential work they perform. We felt like it was the right thing to do."

Planning began in spring 2015. As word of the idea came out, it didn't take long for partners to join in. "We found it to be a fairly straightforward pro-



LEFT: Dean Dickey, general manager of the Prince William County Service Authority, holds Joint House-Senate Commending Resolution HJ 88, which proclaims June 30 as Drinking Water and Wastewater Professionals Appreciation Day. RIGHT: Virginia state Rep. Richard Anderson speaks at the 2016 inaugural event. Anderson was instrumental in getting the Drinking Water and Wastewater Professionals Appreciation Day resolution passed.



cess," Hanley says. "It wasn't difficult finding partners. Once we explained what we were trying to do, groups were more than happy to contribute."

MANY PLAYERS

In the end, the Service Authority was joined by several other organizations, including the Virginia Water Environment Association, the Virginia

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“We have a week dedicated to safe drinking water every May, so it’s only right to show recognition for those that make it possible.”

KIPP HANLEY

chapter of the American Water Works Association, the Metropolitan Washington Council of Governments, the Northern Virginia Regional Commission and the Virginia Rural Water Association.

“It’s an honor for our staff to work with the many talented and dedicated water professionals in Virginia and across metropolitan Washington, and we are thrilled that they’re being recognized,” says Chuck Bean, executive director of the Metropolitan Washington Council of Governments. “Our area utilities work around the clock to deliver clean drinking water and treat our wastewater. Their work is vital.”

Once the resolution was drafted, Anderson was happy to bring it to the House floor. “We have a week dedicated to safe drinking water every May, so it’s only right to show recognition for those that make it possible,” Hanley says. “State Rep. Anderson recognized that, too, and graciously agreed to be the sponsor.”

VITAL DUTIES

For background on the resolution, the partners provided their own takes on why treating water and wastewater is integral to public and environmental health and welfare. The state’s water professionals provide drinking water and wastewater services for 8.3 million residents. They clean more than 620 mgd of wastewater.

“When you look at the various water crises around the country, you realize how important it is to dedicate resources to improving infrastructure,” Hanley says. “While they are overlooked, the people behind that clean water are a major part of that infrastructure.”

Virginia celebrated its second Appreciation Day last June. The Service Authority celebrated with an ice cream social for employees and a presentation from Dean Dickey, general manager. Besides encouraging professionals and organizations to use the day as a platform to educate about water sector services, the Service Authority encourages utilities to lobby for their own state recognition.

“When we introduced this idea, partners were more than happy to jump on board,” Hanley says. “This resolution is another great way to keep the conversation going on the importance of clean water and about those who help deliver it to the public.” tpo



Jacob Oney, water reclamation operator, samples the outfall at Prince William County’s H.L. Mooney Advanced Water Reclamation Facility.



The SBR system (Parkson Corp.) includes the two concrete tanks on the left. The large metal tank (shown while under construction) includes the post-equalization basin and two digesters. The chlorine contact chamber is on the far left.

Productive Package

A SEQUENCING BATCH REACTOR PLANT IN A RURAL TENNESSEE COUNTY PROVIDES AN OPERATOR-FRIENDLY PROCESS THAT YIELDS QUALITY EFFLUENT AND SAVES ENERGY

By Ted J. Rulseh

The Moore County (Tennessee) Utility Department needed a new wastewater treatment plant. Its continuous-flow activated sludge package plant was showing its age; when it needed repairs, parts were hard to find.

In 2013, Rick Garland, utility manager, began planning a replacement. Construction started in early 2016, and a new sequencing batch reactor (SBR) plant went online on Feb. 1, 2017, with a design flow of 0.4 mgd and an average flow of 0.3 mgd.

The department chose an EcoCycle SBR from Parkson Corp. with a five-step, fill-and-draw activated sludge process. All treatment steps occur within the system's two tanks. Garland and operator Amy Smith have found the new process easy to operate, energy efficient, and effective in meeting permit requirements for BOD, TSS, and ammonia for discharge to Mulberry Creek, a tributary of the Elk River.

EFFICIENT TREATMENT

The Moore County Wastewater Treatment Plant in Lynchburg, Tennessee, serves a rural county with a population just over 6,000 but with only 311 sewer connections; most of the homes are on septic systems. "We are so spread out in a big county that we can't reach all of them," observes Garland, holder

“With the old system, ammonia would spike up and down, and we had to really stay on top of that. There were times when ammonia was as high as 5 mg/L. With the SBR system, ammonia has been under 1 mg/L all the time.”

AMY SMITH

of a Grade 3 wastewater operator license along with water distribution and backflow prevention licenses.

The flow to the treatment plant is residential; the community is home to the Jack Daniel's distillery, which has its own SBR treatment systems and would only send flow to the Moore County plant in an emergency.

Influent to the plant passes through a bar screen (Vulcan Industries) and then enters the SBR process for a six-hour cycle. The first step is anoxic fill, during which the aeration systems are off, creating anaerobic and anoxic conditions that discourage filamentous bacteria and encourage facultative bacteria that settle efficiently. Residual nitrate is removed in this step, cre-

Moore County Wastewater Treatment Plant PERMIT AND PERFORMANCE		
	PERMIT	EFFLUENT
BOD	25 mg/L monthly average 35 mg/L weekly average 40 mg/L daily maximum	2.0 mg/L
TSS	30 mg/L monthly average 40 mg/L weekly average 45 mg/L daily maximum	1-2 mg/L
Ammonia	Summer: 5.8 mg/L weekly average Winter: 14 mg/L weekly average	< 1 mg/L

ating anaerobic conditions that promote the growth of volatile fatty acids and phosphorus-removing bacteria. Late in this stage, aeration is activated so the bacteria can begin metabolizing the organic matter they absorbed. Simultaneous nitrification and denitrification occurs in this period.

Once the SBR fill step is complete, the flow is diverted to another basin and the SBR enters the react step, where aeration and mixing occur until biodegradation of organics is complete. Aeration is provided through fine-

bubble diffusers that are mounted on retrievable grids so they can be accessed for maintenance without dewatering the tanks. Two 15 hp positive displacement blowers (Universal Blower Pac) supply the process air. Mixing is provided by floating downdraft mixers (Aerator Solutions)

in the center of each SBR. Dissolved oxygen (DO) is monitored to determine when residual DO starts to form, indicating that oxygen demand for the batch has been satisfied and treatment is complete. Luxury uptake of phosphorous occurs during this step.

In the settle step, liquid-solids separation occurs. Because no flow enters the reactor in this phase, a perfect, quiescent condition is created. Operators can adjust the settle period, which usually lasts 45 minutes. In the decant step, effluent is withdrawn from roughly the upper four feet of the 19-foot-deep, 50-foot-diameter reactor tank. The floating decanter removes effluent from below the water surface to exclude foam, scum and floatables.

Finally, in the idle step, waste activated sludge is removed to maintain the correct biomass population in the reactor. Aeration and mixing are turned off as the reactor waits for the next cycle to begin.

The SBR-treated effluent proceeds to a post-equalization tank for final aeration and then to a contact chamber for chlorination with bleach, followed by dechlorination with sodium bisulfite and discharge to the creek. Waste activated sludge is delivered to aerobic digesters; the resulting biosolids are land-applied.

CONSISTENT PROCESS

Smith observes that the SBR runs with minimal operator attention; a feedback loop based on the DO level determines when to run the aeration



The Moore County Wastewater Treatment Plant SBR aeration tank before filling (above), and in operation (below).



systems. Effluent BOD and TSS are about the same as with the old plant, but nitrogen removal improved from 30 to 50 percent up to 75 to 80 percent.

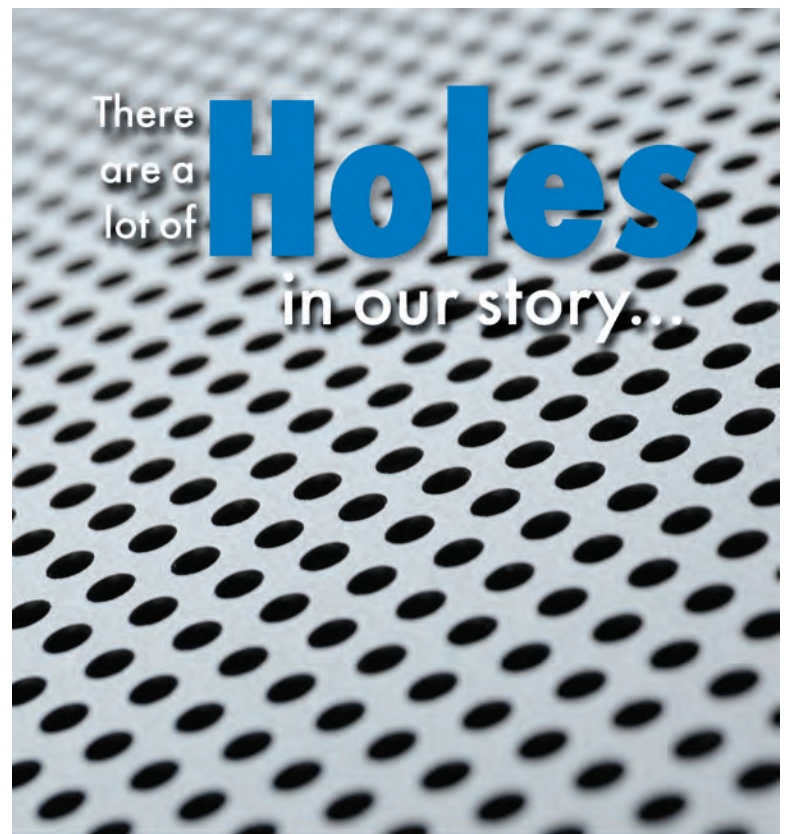
“With the old system, ammonia would spike up and down, and we had to really stay on top of that,” Smith says. “There were times when ammonia was as high as 5 mg/L. With the SBR system, ammonia has been under 1 mg/L all the time.”

As of last May, Garland reported electric bills with the SBR at \$1,300 to \$1,800 per month, versus an average of about \$2,300 per month and as high as \$2,700 per month with the old plant. (He noted at the time that the old process was still treating a portion of the wastewater as the SBR was being phased in.)

Smith expressed satisfaction with the training provided by the manufacturer. A Parkson Corp. representative was on site for two weeks for the initial filling of the system and to ensure that all was operating as designed. When the time came to begin wasting sludge, the representative talked Smith through the process over the phone. In a later phone call, he helped Smith reset the process after a two-hour power outage.

“The SBR has been really easy to learn and is a more user-friendly process,” Smith says. “Also, during rain events, we’re not here until 11 o’clock anymore trying to run the water through the system. The SBR can adjust its cycle time to the flow coming in. Right now, we’re on a six-hour cycle, but if we have an increase in flow, it shortens the cycle to four hours. That’s very nice.”

Garland concludes, “I’ve been very pleased with the project and with the assistance we received from Parkson. We couldn’t ask for a better setup.” **tpo**



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By the *Numbers*

RANDY RANDALL AND HIS OPERATIONS TEAM RELY ON DATA TO PUMP WATER EFFICIENTLY AND TAKE FULL ADVANTAGE OF THE LOCAL UTILITY RATE STRUCTURE

STORY: **David Steinkraus** | PHOTOGRAPHY: **Sallie Shatz**



The team at the Centerville City Public Works facility includes, from left, Isaac Kershner, Steve Hunt, Ron Blackman and Sam Lovato, water operators; Randy Randall, Public Works director; and Mike Carlson, water supervisor and assistant Public Works director.



The Centerville City Public Works Facility.

THE WATER DISTRIBUTION SYSTEM IN CENTERVILLE, Utah, has been recognized for its accomplishments, and it's because Randy Randall thinks about harmony.

That isn't a touchy-feely idea — it's practical, says Randall, public works director. It grows from recognizing the energy inherent in moving water and from understanding the needs of the local electric utility. Combined with Randall's enthusiasm for testing to determine what's really happening, the approach has saved hundreds of thousands of dollars in power costs.

Centerville (population 16,500) is one of a string of suburbs north of Salt Lake City at the feet of the Wasatch Mountains. Most of the available land has been developed, and the population is expected to top out at about 20,000. Future development will consist of apartment buildings and other high-density uses.

KNOWING THE SYSTEM

The water system draws from six wells that require no chlorination and from the Weber Basin reservoir that's operated by another entity (some chlorination is required because the source is surface water). "One of our geographical blessings is we're against the mountains, so we can place reservoirs there and don't have to construct tall towers," Randall says. All that water in a high place carries energy, and in Randall's view, it is better to use and manage that energy than to let it dissipate and then add energy with a pump.

"You need to know how your system operates: What are the loads? What are the demands?" Randall says. "I've been here long enough to know how much we need to pump per day, per week, and per year." A few years ago, the system used 60 hp booster pumps, but they were running for one hour a day. Randall had a different goal: using smaller pumps during off-peak hours for the utility.

"We allow our reservoirs to act as a battery," he says. "We used to refill the reservoirs completely. Because the smaller pumps don't refill completely, the reservoirs drop a little bit more every day. At the end of a week, they're typically 10 percent lower, and we refill completely over the weekend. There's no hurry to fill the reservoir. As long as we have enough storage for fire flow and daily demand, what's the rush?"



ABOVE: A Reliance Super-E Motor (Baldor Electric) operates at a lower pressure than is traditional. It pumps water in circles to keep the system pressurized, saving utility demand charges. BELOW: Ron Blackman and Steve Hunt install an insulated vent cover to conserve heat and save energy at the Church Well fill station.



Switching to smaller pumps cut the system's cost. A variety of 5 hp and 7.5 hp pumps move water into and out of the reservoirs. The larger pumps are still in place in case of need, such as to refill a reservoir that has been drained for cleaning. When the big pumps need testing, Randall doesn't start them with utility power; he hauls a portable generator to the pump house. Generators need to be exercised, and even at the city's low rates, starting a large pump incurs a \$600 demand charge.

MOVING WATER NATURALLY

The distribution system is split into five zones, and a series of electronic and hydraulic valves allow water that's flowing down from the reservoirs to move among zones by gravity. "It's really like a card game where you strategize to reduce the kilowatt hours," Randall says. "And power companies want loads spread over 24 hours. They want lower and longer loads."

Pump houses are built into hill-sides because surrounding them with earth on three sides insulates them.

The area's winds brought a new problem and a new idea. "We have strong east winds," Randall says. "My dad's gas station was blown down twice, and we've had trains blown over. During one windstorm, air blowing through the vents in pump houses froze the pipes."

In response, the Centerville team built vent covers insulated with an inch of foam. In summer, they're removed so fans can cool the pump house. For winter, they snap onto a frame. During a winter day, sunlight heats the pump house interior. At night, the temperature remains above freezing because of the insulation and heat from the pumps.

POWER OF TESTING

Testing is a hallmark of the approach taken by Randall and his team, which includes Mike Carlson, water superintendent; Sam Lovato, water worker I; and Ron Backman, Steve Hunt, and Isaac Kershner, water workers III. Testing is how the team measured leakage in the system. "It took a year

Water distribution system, Centerville, Utah

BUILT: | 1838; refurbished 1982

POPULATION SERVED: | 16,500

SERVICE AREA: | 6 square miles

EMPLOYEES: | 4

FLOWS: | 2.5 mgd maximum, 1.8 mgd average

SOURCE WATER: | Six wells and Weaver Basin reservoir

SYSTEM STORAGE: | 5.5 million gallons

INFRASTRUCTURE: | 70 miles of mains

ANNUAL BUDGET: | \$2.8 million (operations)

KEY CHALLENGE: | Aging infrastructure

WEBSITE: | www.centervilleut.net/publicworks

GPS COORDINATES: | Latitude: 40°55'28.12"N; longitude: 111°53'51.25"W



“I truly love to analyze and figure out how things function and how they work. I understand a lot of the principles of nature.”

RANDY RANDALL

A LOW-TECH BACKUP

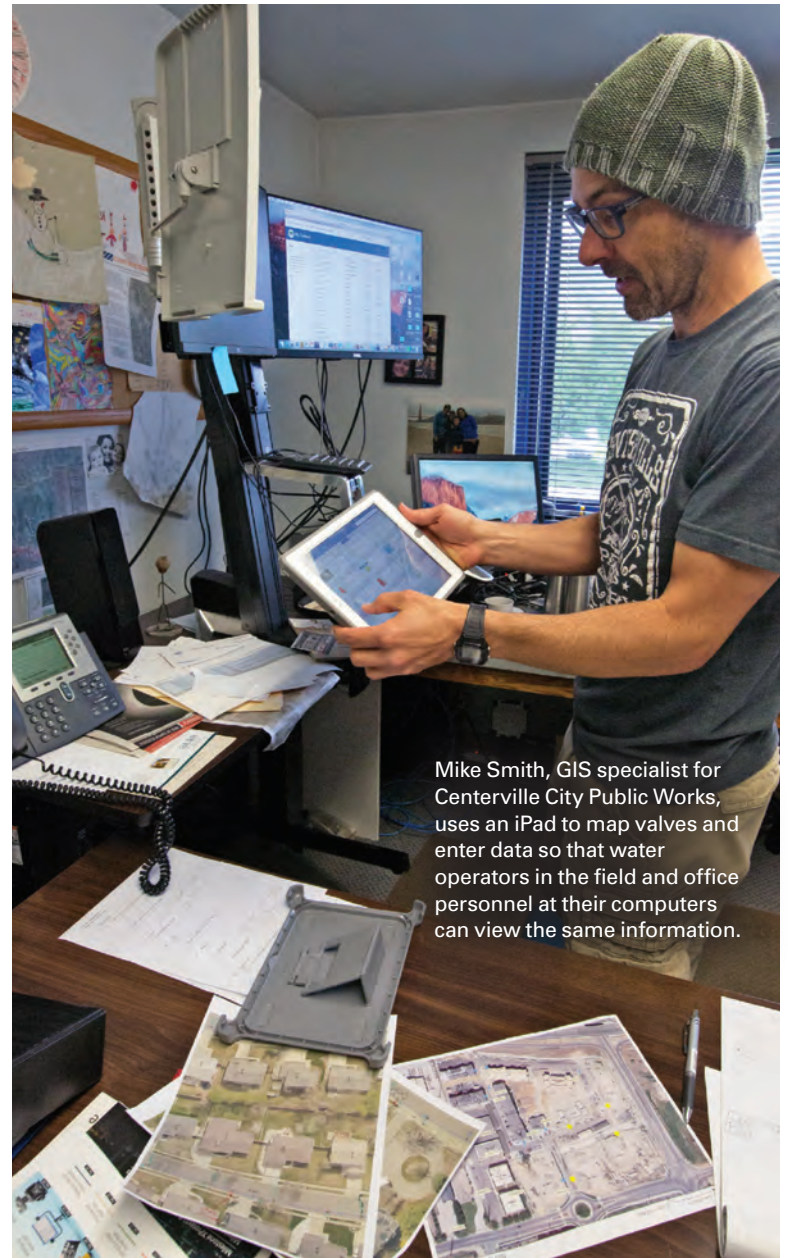
While advanced SCADA equipment is beneficial in running a water distribution system, there are risks with any computer connected to the internet. So, the Utah city of Centerville developed a communications loss plan (CLP).

It is a single-page document that shows technicians how to position valves and switches to operate the system if communications are out completely and all the computers are down, says Randy Randall, public works director. To make the plan work, the system has backups incorporating older mechanical technologies. Floats govern flows into a reservoir. Outside one reservoir is a plastic tube with a yellow ball in it to show the level of water. The other reservoirs connect to it, so one tube shows the level of all three.

"We have run our system for two to three weeks at a time using the CLP just to test it," Randall says. "It really works quite well." Under normal operations, iPad tablets tell technicians what's happening in the system and allow them to control it. If someone manages to break in and interrupts the telemetry, the system shuts off communications with the tablets and can be operated without an internet connection. This provides another option before the CLP is needed.

Randall is not worried about hackers. He has taught cybersecurity for water systems and observes that the amount of information flowing through a SCADA system makes successful attacks difficult. Centerville's system is relatively small, yet it gathers thousands of points of data, from the water depths in wells to the temperatures inside buildings.

A hacker might change a parameter or two but wouldn't understand enough to dynamically change the system, Randall says. Also, the SCADA computer issues commands over UHF radio, which is not subject to internet hacking. At the same time, people who work closely with any system know it. By observing information in the SCADA system, he says, they will know when something is abnormal.



Mike Smith, GIS specialist for Centerville City Public Works, uses an iPad to map valves and enter data so that water operators in the field and office personnel at their computers can view the same information.

to do all that, and one question I asked myself was how much water was leaking through people's homes every day?" Randall says.

The team collected data on baseline water usage, doing the testing at night when usage is minimal. They measured the flow in each zone by routing water around the pressure-reducing valve and through a small meter that's sensitive enough to detect a change of only 1 gpm. Using bypass pressure-reducing valves, recording flowmeters, and recording pressure gauges, Randall found the baseline: a 13 percent discrepancy between water produced and water sold.

"Our conclusion was that on average about 0.02 gallons per minute is lost in each building's water system through leaks," Randall says. "They can't make a meter for those low flows. It's just cost prohibitive, so you're accepting some loss in the system." The team tested all five zones in the system and found another twist: Areas with multiple rental dwellings lost about 0.07 gpm on average. They concluded that leaky faucets and fixtures in those homes were not being repaired. Overall, the city was losing an estimated 112 gpm at its 5,500 connections. Randall verified that by checking wastewater flows.

“I had to talk to an incredible number of people to understand what's really going on and how the power company operates. One of the most important things I learned was how to read a power meter.”

RANDY RANDALL

Randall is using this information as a baseline so he can spot problems in the future. There is the possibility of launching a program to encourage people to fix leaky fixtures — or even to provide money for them to do so — but the electricity cost to produce the lost water is only \$5,000 to \$6,000 a year, and any leak-fixing grant program would exceed that cost.

POWER ECONOMICS

A good deal of what Randall has accomplished was possible because he took time to understand the power utility. "I had to talk to an incredible number of people to understand what's really going on and how the power company operates," he says. "One of the most important things I learned was how to read a power meter."

One dial registers demand, and another records the date and time; that is important to on- and off-peak billing. Randall knows what day of the month the utility reads the meters; he also knows that it happens between 7 a.m.



Randy Randall, with a water system model showing how to use gravity or existing pressure to push water through the distribution system without using energy.

and 3:30 p.m. He and his team plan the use of pumps around that day and time. For example, if they want to switch from using Well 1 to Well 2, they do it on the day when the meter is read and after 3:30 p.m., which is during off-peak hours. As a result, there is only one demand

charge for each month: one charge for the Well 1 pump on the day before the meter is read, and one charge for the Well 2 pump on the day the meter is read.

By managing when pumps come online, the team eliminates an extra demand charge. One day when Randall was out of the office, a pump went down, and the technicians could not get it back online. The power meter was scheduled for reading a few days later, so they opened a valve and bought water from the city's outside supplier. That saved about \$1,000 for a demand charge. Savings from such decisions add up.

Centerville pumps 99 percent of its water using off-peak power. About five years ago, Randall calculated that careful management had saved the city about \$266,000 in annual power charges. Since then, the system's energy bill has continued to drop by about \$10,000 per year. Randall's analysis shows that energy charges account for about 38 percent of each power bill and

demand charges account for about 25 percent. "It takes a lot of time to figure out what the power company really wants you to do, but if you do that, you can save a lot of money by working within their parameters," he says.

APPLYING TECHNOLOGY

Advanced SCADA equipment enables the team to keep the system running at peak performance. They also use the system to isolate leaks: It's a side benefit of running pumps at night to take advantage of off-peak power costs. That means the entire day is a continuous leak test.

"I looked at the SCADA system for one zone, and I said, 'That has changed,'" Randall says. "I'm talking about the slope of the graph on the screen that shows the demand on a reservoir. It was more than usual, and that means there's a leak. And all of this comes back to the principles of observation and understanding what the observation means. I looked at the previous week's graph, and I noticed the change."

Over 18 months, the SCADA system revealed three leaks that didn't break through on the surface. Using the valves installed for cross-connecting supply zones, the team fed one section of a suspected zone from one reservoir and another section from another zone. They progressively isolated smaller and smaller areas, and by watching the pitch of the graphs on the SCADA system, they could see which section had the leak.

The Centerville system has won efficiency awards from the Rural Water Association of Utah and the National Rural Water Association. One event that started the utility on that road was fire protection: A test found that some areas of the city with larger structures needed higher flows to the hydrants than existed. Randall obtained money for one check valve and two pressure-reducing valves to interconnect distribution zones and increase flows for emergency demands. Then, he considered how more valves could cross-connect zones so water could move under its own energy.



Fluoridation injection pumps (LMI Pumps) at the Church Well fill station.

“You need to know how your system operates: What are the loads? What are the demands? I've been here long enough to know how much we need to pump per day, per week, and per year.”

RANDY RANDALL

"One thing built on another, and here we are," Randall says. "I truly love to analyze and figure out how things function and how they work. I understand a lot of the principles of nature. From youth I've been interested in those concepts." Although he is the public works director responsible for streets and other services, his passion is water. With a lot of thinking and some creativity, he makes the water flow affordably, and citizens can thank him each time they open a bill. **tpo**

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Building Better Bids

SPECIFYING COATINGS FOR WATER FACILITIES CAN BE TRICKY. CONSULTATION WITH COATINGS EXPERTS CAN LEAD TO SELECTION OF A PRODUCT THAT PROTECTS EFFECTIVELY AND EXTENDS SERVICE LIFE.

By Kevin Morris

Whether restoring existing assets or building new ones, municipalities need to make reasonable economic decisions about how to best update their wastewater infrastructure. Many could benefit from more knowledge when specifying protective coatings and lining materials and from writing better bid specs.

One issue is that municipalities usually don't have experts on staff qualified to develop complete and accurate coatings project specifications. As a result, specifiers simply choose solutions that worked in the past and use those specifications, no matter how old. They may also approve change requests from bidders without knowing the implications of swapping out technologies. In addition, they can be prone to accepting low bids from contractors with suspect qualifications because the specifications don't accurately define the project parameters.

All this means many municipalities inadvertently limit competition from qualified bidders and restrict their ability to take advantage of newer technologies. The key to better infrastructure outcomes is to consult with experts, improve the specifications, select the most appropriate products, and ensure that qualified contractors are part of the bidding process.

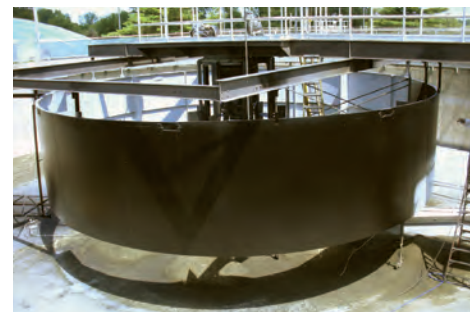
RELYING ON EXPERTS

To develop accurate project specifications, it's critical to know which coatings and linings are the most suitable to address specific situations. However, neither small nor large municipalities typically employ coatings experts.

At best, they may have staff engineers with broad knowledge about wastewater infrastructure and the materials used to control corrosion and facilitate repairs. However, without help from a qualified coatings expert, these engineers are likely to make specification mistakes, from not considering newer technologies to improperly defining service environments and specifying inappropriate products. Getting help from a local engineering firm may lead to the same missteps if that firm also lacks a coatings expert.

The remedy for these concerns is to work directly with representatives from third-party coatings suppliers during specification writing. This ensures that all parties have the most accurate information to complete the specification. For repair projects, the process should involve a site visit so that the coatings representative can inspect the service environment and note any specific challenges.

For example, consider a headworks repair specification that calls for products rated for immersion service. If the repair is also within a highly corrosive vapor zone and that detail is left out of the spec, the products offered in the bids likely won't adequately address the more severe environment. A



A proper coatings specification for this clarifier with severe corrosion (upper left) would specify surface preparation with a flake-filled epoxy intermediate coat including stripe coats on weld seams for added protection (below), and a flake-filled epoxy topcoat (above right) to mitigate the effects of corrosion on the restored surfaces.



coating supplier's involvement can ensure that the specification properly defines the site conditions.

UPDATING OLD SPECS

When building new facilities or expanding existing ones, municipalities often revert to the original materials and construction specifications used for older assets. Unfortunately, this may exclude new and better products introduced since those specs were developed. Copying older specs may also limit competition: Some bidders may not respond because they no longer use the products specified.

It's best to make sure everyone involved in the process considers all potential solutions — old and new — to produce the best specification. This starts with recognizing and questioning older specification language.

Especially problematic are specified technologies that don't meet current life cycle expectations, such as a commodity-based aliphatic urethane coating specified for a water tank exterior. Such products may deliver only a three- to five-year lifespan, whereas a fluoropolymer coating could extend the service life to upwards of 25 years with significantly better UV stability and color and gloss retention. Reliance on the original specification would mean much shorter maintenance cycles and higher total cost of ownership.

Another risk for older repair specifications is that the service environment may have changed. For example, a specification for a 25-year-old wastewater treatment plant may stipulate the use of coal tar epoxies. However, the plant today likely has more corrosive operating environments that would rapidly deteriorate such material. Therefore, the specification should be updated to include newer, more suitable technologies, such as a polyurethane elastomer or a glass flake-filled, amine-cured epoxy.

HANDLING CHANGE REQUESTS

After projects are put out to bid, contractors sometimes request to use different materials than those specified. However, the municipal staff members usually aren't qualified to know whether a substitute coating or lining is acceptable. In these cases, it is advisable to reconnect with a coatings supplier expert who can verify whether the alternative will deliver the intended results.

Failure to verify a change request can mean exposure to greater risk. For example, on one real-world project bid, the municipal engineer issued a specification for a robust zinc, urethane, fluoropolymer topcoat system. Instead, a contractor requested to use an epoxy system with a polyurethane topcoat.

The contractor claimed this recommendation was equal to the specified system, but in fact, it was not even comparable. The proposed substitution cost less than one-third of the specified solution, but it did not meet the requirements for service life and aesthetics. If the municipality had not asked a coatings expert for advice, it may have accepted the lowball bid and faced the reality of short-term performance and higher life cycle costs.

It's best to make sure everyone involved in the process considers all potential solutions — old and new — to produce the best specification. This starts with recognizing and questioning older specification language.

THE RIGHT HELP

Another pitfall is failure to understand who is qualified to do the work. Many municipalities simply select the lowest bidder, not questioning whether the contractor is qualified to do the job correctly or will use the specified materials.

The solution to this problem is to separate specialty coating applications from regular painting, explicitly stating the project parameters and required qualifications from bidders. It is then necessary to look beyond a contractor's ability to brush, roll, or spray coatings and to require references, documentation of quality-control processes, copies of safety programs, and more as part of the bid submittal.

Contractors with extensive quality, safety, and other programs may not offer the lowest prices. Therefore, evaluators should look not just for the lowest bidder, but also for the lowest *responsible* bidder, based on the submitted information. An alternative is to ask a coatings supplier for a list of qualified applicators before issuing a bid. This should ensure a greater number of accurate bids.

IMPROVING OUTCOMES

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coating and lining project specifications by working with coatings experts to define project operating environments and conditions and the expectations for service life and aesthetics. Often, this exercise reveals oversights in older specifications that can be updated to reflect modern technologies.

A coatings expert can also help qualify bidders and review proposed change requests to ensure that competent contractors use appropriate products. Following these steps will help officials develop better specs that can lead to improved project outcomes.

ABOUT THE AUTHOR

Kevin Morris is market segment director for water and wastewater with Sherwin-Williams Protective and Marine Coatings. He can be reached at kevin.l.morris@sherwin.com. tpo

Dialing Down Power Bills

A CALIFORNIA PLANT TEAM ACHIEVES BIG ENERGY SAVINGS WITH HIGH-EFFICIENCY LIGHTING RETROFITS AND INTELLIGENT ELECTRIC POWER MANAGEMENT

By Steve Lund

Workers at the Santa Cruz (California) Wastewater Treatment Plant haven't just seen the light, they've measured what it costs to operate. After energy-efficient lighting was installed outdoors, Mike Sanders was confident the plant could cut electricity costs some more with a similar conversion indoors. It worked. The new lighting systems have produced measurable savings, inside and out.

The outdoor lighting project, which converted 82 high-pressure sodium and mercury vapor lights to DuroSite LED fixtures (Dialight), gave better light and saved nearly \$17,000 the first year. It also reduced maintenance costs significantly.

The next budget year, Dialight replaced 120 high-pressure sodium indoor lights with more efficient fixtures — LEDs and T5HO fluorescents. The new system uses only 12 percent as much electricity as the old, saving nearly \$12,000 per year. The 10-year operation and replacement costs are about 17 percent of the old system.

"It's been working out pretty nicely so far," says Sanders, operations manager at the 17 mgd (design) facility. "We've had a few bulbs go out, but Dialight replaces them right away because we have a 10-year warranty." The plant's security video is better, too. "We don't have super-expensive video equipment, but there's better clarity and brightness in the images."

“We were looking at energy from a 30,000-foot viewpoint, not at the equipment component level. Now, we're going to be able to tell how much power we're consuming at the process layer.”

MIKE SANDERS

"Operators would make their rounds, and it would take maybe 10 minutes if everything's good," Sanders says. "Then, as they were leaving the basement area where all the equipment is, some people were turning lights off and some were leaving them on." The team considered but rejected putting motion sensors on the lights; managers were concerned that the lights could go off too early and possibly leave an operator in the dark.

CULTURAL CHANGE

The new lights are technologically more efficient, but the Santa Cruz plant also made changes in procedures that helped reduce energy consumption. One of the most important was making sure that lights get turned off when they aren't needed. More than half of the high-pressure sodium lights indoors were routinely operated 18 hours a day, and some 24 hours. With the new lighting system, the "on" time for many of those lights is two hours.

"Operators would make their



ABOVE: A part of the Santa Cruz plant property when lit with old high-pressure sodium and mercury vapor lamps. BELOW: The same area now lit by highly efficient LEDs (Dialight).



Instead, the team focused simply on efficient practices. The new rule is to make sure lights are turned off when leaving an area. "Early on when we were just developing our energy profile, people were not really thinking about that impact," Sanders says. "It was just a lack of institutional knowledge. Now, it's just second nature. Energy management at any kind of facility involves employee buy-in, and it's a cultural change, for sure. These guys have done a great job as we continually evolve our energy management."

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Members of the operations, electrical, and maintenance staffs continually generate new ideas for energy efficiency, so the sustainability goals and strategies are constantly being renewed. “What this means is the facility staff backs the efforts of sustainability and also comes up with ideas for areas to work on within the process,” Sanders says. “This type of full interaction really helps the execution. Not every facility thinks this way.”

GREEN POWER

The lighting conversion is just one example of the plant team’s dedication to sustainability.

A biogas-fueled cogeneration system with Waukesha engines (GE Power) produces nearly 70 percent of the plant’s power needs.

The staff pays close attention to electricity prices at different times of day. Power is cheapest between 9:30 p.m. and 8:30 a.m., and it’s most expensive from noon to 6 p.m. on weekdays; an intermediate rate runs from 8:30 a.m. to noon and 6 p.m. to 9:30 p.m. on weekdays.

Team members try to run the biosolids dewatering centrifuges at off-peak times only. Power management software (Ion Enterprises) helps manage the load, enabling Sanders to look at the electric bill at any given moment. It warns operators when a demand threshold is being approached so that pumps and other equipment can be turned off or turned down if possible. That helps limit demand charges.

As an example, in the first 15 days of May, the plant purchased 1,171 kWh at the peak rate, 2,136 kWh at the intermediate rate, and 87,954 kWh at the cheapest rate.

MORE TOOLS, MORE CONTROL

That kind of power management takes the right tools and experience. The facility has invested significantly in variable-frequency drives with programmable logic controllers. “If you attach the PLC to a VFD and marry those things together, you can really do a lot to control costs,” Sanders says.

The plant is also investing in submeters at motor control centers that will generate even more data about power usage and may enable more control.

“That’s what I’m getting very excited about. We were looking at energy from a 30,000-foot viewpoint, not at the equipment component level. Now, we’re going to be able to tell how much power we’re consuming at the process layer. We can monitor what’s normal, and if we make any changes, we’ll be able to quantify the energy savings if there are any.”

Sanders has become a big fan of energy audits; San Francisco State University did one a few years ago. One suggestion from the audit was to put VFDs on the four fans in the odor-reduction tower; that led to significant savings. First, the old booster fans were removed. They weren’t operating or using electricity, but they were restricting airflow in the ducts, making the operating fans less efficient.

Then, when variable speed drives and energy-efficient motors were installed, operators found they could produce the optimum airflow by operating all four fans at lower speeds rather than two or three at full speed. Energy savings hit 40 percent; with that and with an energy efficiency rebate from Pacific Gas & Electric, the equipment paid for itself in about 10 months.

“The audit really opened our eyes,” Sanders says. “If you can’t meter closely how much energy you’re using, you are really driving blind. Part of an energy plan should involve an audit.” **tpo**

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THE FORMULA FOR EXCELLENCE

JODY FLANNERY'S DEDICATION AND INSISTENCE ON PERFECT PROCEDURE HAVE HELPED HER COMMUNITY EARN LABORATORY OF THE YEAR RECOGNITION

STORY: **Anthony Drew** | PHOTOGRAPHY: **Cory Dellenbach**

WHEN AUDITOR BRANDY BAKER-MUNICH OF THE WISCONSIN Department of Natural Resources (DNR) first saw the difficulties the city of Eagle River had with its wastewater treatment laboratory, she wasn't sure how to help the technicians overcome their hurdles.

Then it occurred to her: she knew someone who could. She turned to Jody Flannery, laboratory technician for the nearby Northwoods city of Rhinelander. She advised Eagle River on ways to get its recurring BOD exceedances under control.

Today, the DNR is using standard operating procedures (SOPs) and a quality control (QC) manual written by Flannery as examples of best practices in water and wastewater laboratories across the state. Flannery began writing the SOPs and QC manual when she was hired by Rhinelander, where she has worked for the past 11 years analyzing samples for the city's 7 mgd (peak capacity) wastewater treatment facility as well as the water treatment plant.

Over the years, the DNR has noted Flannery's dedication to quality control and attention to detail. That's a big reason the department presented its 2017 Laboratory of the Year award to Rhinelander, a city of 7,500 people.



Jody Flannery with the plaque for the Wisconsin Registered Laboratory of the Year award.

Baker-Munich nominated the lab after discovering zero deficiencies, rare quality-control exceedances, and outstanding commitment to producing high-quality data. "For me, this award is a testament to the quality of the resources that the people of Rhinelander have invested in, including the construction of this advanced wastewater treatment facility, upgrades to the water distribution system and an excellent staff," says Flannery.

Flannery was doing exemplary work before the new plant was built in 2011. Before she became lab manager, Rhinelander had persistent issues with excessive or insufficient dissolved oxygen depletion in BOD blanks and recurring glucose-glutamic acid (GGA) exceedances. The GGA tests are recorded weekly as part of the BOD standards, and there is an acceptance criteria of 167.5 to 228.5 mg/L. The test is set up with seeded samples, which can be purchased in capsules through suppliers.

Upon starting the job, Flannery went to work documenting, problem-solving and rectifying the issues at the lab. As part of that process, she created the meticulous recordkeeping and quality assurance standards that earned the city its Laboratory of the Year recognition.

RELIABLE PROCEDURES

Working with Tim Kingman, Public Works director, Flannery wrote SOPs and a QC manual that have been lauded by DNR auditors. They use specific step-by-step instructions, and some requirements are repeated to make things easier on technicians, who don't need to flip back and forth between sections for reference.

LAB TURNAROUND

This marks the third time the lab has been nominated for the award, and Flannery appreciates the recognition. "While I strive for excellence at each angle from within the lab, I was pretty excited to hear we would be receiving this special award," she says.

Flannery prepares samples for BOD analysis using a YSI 5100 DO meter and YSI 5010 BOD probe (both from YSI, a Xylem brand).



“ We have a responsibility to the people we serve to provide them with the very best resources and services within our limited power. To do so, we have to share our knowledge and expertise with other municipalities.”

JODY FLANNERY



Jody Flannery, City of Rhinelander (Wisconsin) Water and Wastewater Treatment Plants



POSITION: | **Laboratory Technician**

EXPERIENCE: | **25 years**

CERTIFICATIONS: | **Wastewater Operator with Advanced Laboratory Certification**

GOALS: | **Help protect water quality for community residents of northern Wisconsin**

GPS COORDINATES: | **Latitude: 45°39'12.30"N;
Longitude: 89°22'56.52"W**

The staff at the Rhinelander Wastewater Treatment Plant includes, from left, Jim Gossage, Joel Halminiak and Brad Vick, operators; Jody Flannery, lab technician; Josh Paetow, operator; and Tim Kingman, Public Works director.

Such organizational skills and attention to detail are vital to producing high-quality lab data, according to Flannery. She created SOPs with detailed instructions for each test. “I also created a traceability logbook for each standard and reagent purchased, which includes the lot number, date of receipt, date it was opened, expiration date and discard date,” she says. “For each instrument and piece of support equipment used for lab analysis, I thoroughly document any maintenance or cleaning done.”

For years, the DNR has used Flannery’s SOPs and QC manual as an example for other laboratories. “The lab data produced is accurate, and additional work is done to prevent issues from occurring,” Baker-Munich wrote in her award nomination. “Jody’s organizational, management and laboratory skills are a great example for others.”

Flannery’s quality assurance program wasn’t developed to simply meet minimum requirements. “This laboratory has the support and professional knowledge to strive to do so much better,” writes Baker-Munich. “If a requirement is mandated only once or quarterly, the laboratory will complete them monthly or even daily as a preventive measure. This includes TSS redry tests, bottle cleaning confirmation and barometric pressure verification, among others.”

HELPING HANDS

Meanwhile, Flannery has helped neighboring laboratories in more direct ways. For example, the lead laboratory analyst from the Eagle River Wastewater Treatment Plant retired, leaving behind very few details for other lab analysts to follow. During an audit at Eagle River, Baker-Munich recommended the lab staff call Flannery for help.

In short order, an Eagle River analyst toured the Rhinelander facility to see how its lab operates, taking note of the traceability resources it had available and learning from its procedures for nutrient and seed preparation for BODs. “It was much more valuable than trying to explain it during the audit,” writes Baker-Munich. “She had great tools in place and could help them.”

Eagle River was still using 50-capsule bottles of BOD seed, and since only one seed is used per weekly test, Flannery saw there was a high likelihood the seed was deteriorating. She recommended they purchase 10-capsule bottles to combat that issue. As part of the test, the capsule is added to dilution water and rehydrated for an hour with continuous aeration. While some labs perform aeration on a stir plate, Flannery demonstrated to Eagle River that she preferred the use of a fish aerator.

(continued)

Besides taking care of her own lab, Jody Flannery has shared her expertise with neighboring communities, helping them resolve problems.



ROAD TO RECOGNITION

Jody Flannery’s path as a lab technician started 25 years ago. She had just graduated from high school and landed a job in the small Wisconsin community of Crandon, working for the Northern Lake Service environmental and analytical laboratory. There, she received training for inorganic and organic analyses, chlorophyll testing and beach testing for fecal coliform, and groundwater and well sample collection.

Northern Lake Service helped nurture Flannery’s interest in lab work, and she stayed there for 14 years before moving on to work for the city of Rhinelander. Today, she has a DNR general wastewater operator license with Advanced Laboratory Certification. She has attended Hach training for wastewater analysis for disinfection and nutrients, has taken wastewater microbiology classes from North Central Laboratories, and regularly attends training seminars to maintain her continuing education credits for certification.

Her job at Rhinelander is unique in that she analyzes both water and wastewater samples. The wastewater tests include BOD₅, TSS,

ammonia, phosphorus and pH. “I also do solids drying and settling testing for plant process control,” says Flannery. She tests drinking water for pH, fluoride, chlorine and orthophosphate.

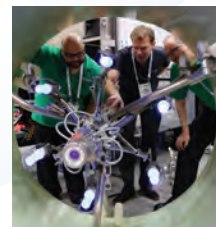
In addition, Flannery analyzes mandatory and voluntary reference samples required for lab registration; orders all the sample bottles and schedules sampling for compliance testing; monitors lab instruments and water bath, refrigerator and oven temperatures; and performs all data entry for her tests and quality control. “I also perform routine and preventive maintenance for our laboratory equipment and notify the supervisor and staff of findings for any changes needed for plant process control.”

Flannery enjoys nearly everything about her job. “I have great co-workers who are supportive and will fill my lab vacancy when needed. You spend a large part of your life at work. Therefore, I like to think that if you’re doing something you enjoy, it will be reflected in the work you do.”



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BOD samples are set up with dilution water, and the nutrients potassium, phosphate, magnesium sulfate, calcium chloride and ferric chloride are added to that. Those nutrients can be added individually, but there are also premade nutrient buffer pillows available. “Eagle River was adding the four different buffers individually, which potentially could cause a contamination problem or lead to setup error,” says Flannery. “I mentioned to them the pillows I use — where it’s all combined — and how they’re probably more cost-effective with less chance for error.”

Flannery says that kind of cooperation between neighboring municipalities is vital to the health, safety and happiness of her community: “We have a responsibility to the people we serve to provide them with the very best resources and services within our limited power. To do so, we have to share our knowledge and expertise with other municipalities. We do that with the mutual understanding that one day we may need to call on them for help here in Rhinelander.”

Baker-Munich isn’t the only one who has referred Flannery. Steve Ohm, DNR wastewater engineer, has called on her as a resource in the past. She has also helped the city of Tomah and other communities deal with laboratory issues, according to Kingman.

STRUCTURED FOR SUCCESS

With Flannery’s effort and Rhinelander’s commitment to quality infrastructure, it’s not surprising that Baker-Munich found zero lab deficiencies. In fact, quality system failures in the lab are extremely rare. The lab’s only blemish in the three years before the audit was a single GGA test failure, and that anomaly was investigated and resolved immediately. “Traceability is the best I have encountered over the past four years of auditing wastewater treatment plant laboratories,” writes Baker-Munich.

The GGA failure took place in September 2015. Using her quality assurance system, Flannery ruled out her laboratory control samples as the problem and began to assess seed source and preparation as culprits. At first, she ruled out the seed source since the laboratory control samples before and after the sample in question had passed. But after reviewing the seed preparation steps taken by another analyst at the facility, she found that the seed aeration and settling time hadn’t been performed exactly in line with her SOPs.

After talking to the analyst about the importance of following procedure, Flannery documented her corrective actions, qualifying her data to ensure that the information remains useful in the future.

Closely following protocol and adhering to requirements doesn’t put Flannery’s thinking in a box. If a one-size-fits-all approach isn’t appropriate, she’s quick to come up with novel methods. For instance, she has seen more accurate recoveries for BOD and GGA samples by ordering the smaller 10-capsule batches of seed.

Flannery also autoclaves and sterilizes BOD bottles after cleaning them with soap and water. This likely contributes to Rhinelander’s absence of BOD blank exceedances. Her use of timers during BOD analysis when she’s warming samples and stabilizing probes allows for fewer variables.

TEAM EFFORT

When the Rhinelander plant came online, the new lab space and updated equipment made life easier for the analysts, but that’s not the reason for their success, according to Flannery. The true foundation for the plant’s excellent reputation is found in high standards across the board. “Looking ahead and planning for the future, the elements necessary for permit compliance lie in an orderly and diligent approach by our staff for process monitoring and preventive maintenance,” she says.

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Flannery believes that the foundation for excellent permit compliance lies in high standards across the board and an orderly and diligent approach by the staff in process monitoring and preventive maintenance.

“The lab data produced is accurate, and additional work is done to prevent issues from occurring. Jody’s organizational, management and laboratory skills are a great example for others.”

BRANDY BAKER-MUNICH

Part of that future could include the pursuit of a certification process that would turn Rhinelander’s registered laboratory into a certified laboratory. “While we don’t plan on making that jump anytime soon, we always keep that idea as an option,” says Flannery.

Although that would enable the lab to perform tests for other entities, additional fees and regulations so far have prevented Rhinelander from making the leap. For now, it’s a goal to keep in mind as Flannery continues a tradition of excellence she helped instill. **tpo**



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Kevin Cini
An Original Environmentalist
CHIEF PLANT OPERATOR
City of Groton (Conn.)
Wastewater Treatment Facility

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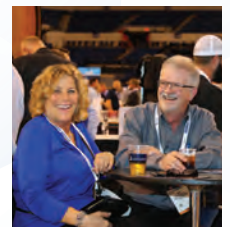
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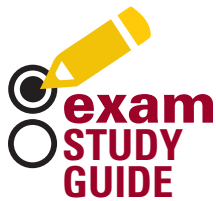
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By Ron Trygar

WASTEWATER

A rotating biological contactor (RBC) wastewater treatment plant experiences a utility power failure and standby power is unavailable. Local emergency management officials determine the power will be restored in 36 to 48 hours. What should the operator do to protect the growth on the media and the RBC units themselves?

- A. Immediately wash the attached growth off the RBC discs with a power washer.
- B. Manually rotate the RBC drum a quarter-turn every four hours to prevent the slime growth from only growing on the bottom portions.
- C. Manually rotate the RBC drum completely until power is restored to maintain permit compliance.
- D. Drain the RBC tanks and flush with fresh water.

ANSWER: B. If the power will not be restored before four hours, the RBC shaft should be rotated manually to ensure even slime growth on the discs. Rotating the drum a quarter-turn every four hours is recommended to even the pattern of the attached growth. This should be done in the safest manner possible. If the RBC drum is not rotated and the slime growth has only continued to grow on the portion that remains submerged, the weight and balance of the drum will be very uneven.

If the weight of the growth is not heavy enough to prevent the rotation completely, the unit will struggle to reach the apex point of the rotation and then move very quickly toward the bottom, causing excessive strain and wear on motors and gearboxes (if applicable) and on the RBC drum shafts and bearing mounts. Keep the biomass wet by hosing the slime growth occasionally, but do not wash off or pressure wash the media. You'll need the active biomass to treat all the wastewater that will come rushing in once power is restored. One other note: Ensure that standby generators at the treatment plant are working in good order and capable of keeping critical unit processes functioning.

WATER

In the lime softening process, when calcium hydroxide is added to water to be softened and the pH is increasing, which chemical reaction occurs?

- A. Alkalinity converts from the bicarbonate form to the carbonate form, and then calcium can be precipitated as calcium carbonate.
- B. Hardness is converted to alkalinity, becoming permanent hardness.
- C. Hardness converts to bicarbonate hardness, and noncarbonate hardness precipitates.
- D. Alkalinity converts from the bicarbonate form to carbon dioxide, and magnesium precipitates as magnesium carbonate.

ANSWER: A. As the pH of the raw water increases with the addition of lime (calcium hydroxide), the alkalinity begins to convert from the bicarbonate to the carbonate form. At around pH 10.2, the calcium in the raw water that caused the initial hardness bonds with the excess carbonate to become a calcium carbonate precipitate (CaCO_3). The heavier-than-water precipitate settles to the bottom of the lime softening unit for removal by sludge scrapers or other removal mechanisms.

Alkalinity and hardness are two distinctly different parameters and

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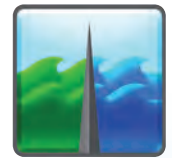
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tests, but they have some things in common. Calcium and magnesium, which make up hardness, also contribute to elevated alkalinity in the water. Alkalinity is sometimes described as the ability of water to resist a change in pH, or as a buffer against acids that cause a decrease in pH. Calcium and magnesium, found in the Earth's crust as calcium carbonate and magnesium bicarbonate, readily dissolve in water, giving groundwater natural alkalinity and hardness.

ABOUT THE AUTHOR

Ron Trygar, a certified environmental trainer, is the senior training specialist for water and wastewater programs at the University of Florida's TREEO Center. He has worked in the wastewater industry for more than 30 years in a variety of locations and positions. He holds a Florida Class A wastewater treatment operator license and a Florida Class B drinking water operator license. **tpo**

Wild Wetlands

PONDS AND MAN-MADE WETLANDS AT AN INDIAN RIVER COUNTY UTILITIES TREATMENT PLANT PROVIDE A MAJOR ATTRACTION FOR BIRDERS AND WILDLIFE WATCHERS

By Jeff Smith

Of four wastewater treatment facilities operated by Indian River County Utilities, the 6 mgd (design) West Regional Wastewater Facility is the most popular with the public. Its 14 shallow- and deep-water ponds and 180 acres of man-made wetlands attract all kinds of wild creatures.

“People from all over come to the plant to watch the birds and enjoy the wildlife,” says Terry Southard, operations manager for all water and wastewater treatment facilities owned by the utility, based in Vero Beach, Florida. “The local Audubon Society members are particularly involved.”

EASY ACCESS

Migratory birds frequent the property, as do numerous Florida shore and coastal birds. Those include roseate spoonbills, whistling ducks, sandhill cranes, snowy egrets, cormorants, blue herons, snail kites, bitterns and grebes, which nest on or inhabit the site seasonally. Bald eagles and osprey can often be spotted. More than 170 species have been identified by eBird (www.eBird.org), an interactive online checklist program developed by the Cornell University Lab of Ornithology and the National Audubon Society.

Alligators are not uncommon at the site, especially during the nesting season of February through April. “One of our operators saw a nine-footer while mowing the grass along the side of the berm,” says Rich Meckes, superintendent of the wastewater facilities. Bobcats, feral hogs, raccoons, rabbits, and other mammals also call the wetlands home.

From a parking area inside the front gate where a kiosk provides information about the plant and wetlands, visitors can walk or bicycle on a gravel-topped, 8-foot-wide berm that defines the ponds. A 4-foot-wide wooden boardwalk with handrails provides access to parts of the marsh. A covered pavilion at the midpoint of the half-mile boardwalk overlooks the

greater wetlands. An observation deck overlooks one of the larger ponds, which range from 3.5 acres to nearly 20 acres. Appropriate signs are posted throughout the area.

TREATMENT FIRST

One large deep-water pond contains largemouth bass and is a favorite for fishermen. “They are allowed to fish only on a catch and release basis, though,” Southard says. No motorized vehicles are allowed on the berm, but horses are allowed and are more popular during winter.

Water entering the wetlands is highly treated at the 2.5 mgd (average) advanced treatment plant. Effluent travels by gravity through the wetlands for further natural treatment. Residence time is 27 days to 163 days, depending on inflows to the plant. Samples for dissolved oxygen, pH and conductivity

“People from all over come to the plant to watch the birds and enjoy the wildlife. The local Audubon Society members are particularly involved.”

TERRY SOUTHARD

are regularly taken at each of 32 water control structures. Wetland effluent is used primarily for golf course watering. Excess flow is diverted to a channel that discharges into a canal system that leads to the Indian River Lagoon.

It is important to Southard to accommodate the wishes of the Audubon Society and other visitors. For example, he has honored a request not to mow an area of berm before the nesting season of a particular bird species and not to interrupt photography sessions with maintenance activity. “But first and foremost, we are a treatment facility,” Southard says. “Our priority is the treatment of the water and lowering the nutrients before it flows to the lagoon.”

An egret fishes along the shoreline of one of the 14 wetland cells at the West Regional Wastewater Facility.



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The team at Indian River Utilities West Regional Wastewater Treatment Facility includes, from left, Nick Casalina, operator; Brian Horne, mechanic; Amanda Koch, operator; Tony Etter, chief operator; and Mike Loveday and Jay Hargraves, operators.

NEIGHBORLY STAFF

Southard and his staff consider it important for the plant to be a good neighbor to the residential area developed on land next door after the plant was built in 1988: “We’ve spent a lot of money planting oak trees and other



The boardwalk spans one-half mile and includes a covered pavilion.

vegetation to create a buffer between us and the development, and it has paid off. Something we’ve learned over the years is that being open with the community and inviting them inside the fence to see and explain what we’re doing really works. It stops any potential issue before it starts.”

The West Wetland is part of the Great Florida Birding Trail, which stretches for 2,000 miles and contains more than 500 locations of protected bird habitats. “We are really proud of all our facilities, but we are especially proud of our West Facility,” Southard says. “It has always been a real show-place for the public.” **tpo**

MISSION CRITICAL

EARL STEWMAN LEADS A CREW KEEPING SOME OF ALASKA'S FIRE HYDRANTS IN WORKING ORDER, BATTLING THE ELEMENTS TO MAINTAIN PUBLIC SAFETY, AND BUILDING AN AWARD-WINNING CAREER

STORY: Jack Powell | PHOTOGRAPHY: Brian Adams

EARL STEWMAN IS ON A MISSION: MAKE SURE THE FIRE HYDRANTS in Anchorage, Alaska, work when they're needed — all 7,400 of them. It's a tall order, especially when the snow flies, Alaskan temperatures dip to 25 below zero, and an eight-member crew covers a 125-square-mile territory in a city of 290,000.

Fortunately, Stewman, an 11-year veteran of the Anchorage Water & Wastewater Utility (AWWU) is up to the challenge. In fact, he has built a solid career in the Operations and Maintenance Division, becoming systems maintenance foreman (hydrant operations) in 2014 and winning the 2016 Large Water System Maintenance/Operations Person of the Year award from the Alaska Water Wastewater Management Association.

An association news release about the award describes Stewman as “a reserved gentleman, respected by his crew and customers at AWWU alike. He takes his responsibilities and those of his crew very seriously. He has made it his personal mission to ensure the Anchorage hydrants are serviceable and provide sufficient pressure for public safety. Since taking over the hydrant crew two years ago, he has reduced the number of out-of-service hydrants from 166 to 80, with 50 of those being private hydrants.”

Stewman, a utilityman III, works with Distribution Operations to maintain water quality through flushing programs, the Engineering Department on construction of new hydrants, and Customer Service on providing hydrants of adequate size to accommodate contractors for street cleaning, landscaping and contract maintenance.



Earl Stewman, systems maintenance foreman, Anchorage Water & Wastewater Utility

LEGACY KNOWLEDGE

“I was surprised to win the award,” says Stewman. “My goal has always been to do a good job of maintaining the 7,400 hydrants in the Greater Anchorage area. To me, that meant getting the number of out-of-service hydrants down to less than 1 percent. You have to coordinate with a lot of people to repair, excavate and replace the hydrants, and that’s what my crew and I are committed to doing. The award reflects a lot of hard work by a lot of great people.”

The award represents a major milestone in a career that saw Stewman follow his father to AWWU, Alaska’s largest water and wastewater utility with 52,000 commercial, residential and military water customers. He joined the ranks of 260 utility employees a decade after his father retired, bringing what hydrant crew member Marshall Kennon calls “legacy knowledge of operations and customer service.” Kennon adds, “You can’t grow up in the household of a utility worker without some of those smarts rubbing off.”

A five-year utility employee, Kennon services 820 hydrants in a territory that stretches from midtown 6 miles north to Anchorage International Airport. “Earl knows a lot about hydrants and shares it with us, which is priceless. Often

you can’t tell if a hydrant needs repair because it may look OK, so you have to know what to look for and what to test for to make sure it’s working, and then move on.”

Before joining the utility, Anchorage native Stewman did a variety of construction, maintenance and retail jobs. That included a 10-year stint with



Stewman's duties include maintaining water quality through flushing programs, working on construction of new hydrants, and providing hydrants sized to accommodate contractors for street cleaning, landscaping and maintenance.

“ My goal has always been to do a good job of maintaining the 7,400 hydrants in the Greater Anchorage area. To me, that meant getting the number of out-of-service hydrants down to less than 1 percent.”
EARL STEWMAN

his then-wife running a general store in Crooked Creek, a remote village (population 105) about 300 miles west of Anchorage, accessible only by small plane or barge. He calls that “a real Alaskan experience, where temperatures could reach 60 below zero. I did a lot of hunting and fishing. We sold groceries, four-wheelers, snowplows and just about anything else customers needed, and we lived in an apartment above the store.”

Back in Anchorage, a friend saw an ad for positions with the AWWU. He and Stewman applied and got jobs. Stewman was determined to learn all aspects of the business. In time, he earned Water Distribution 2 and Wastewater Collections 2 certifications and made it a practice to study utility operations. AWWU operates the 35 mgd Eklutna Water Treatment Facility, the 24 mgd Ship Creek Water Treatment Facility, numerous wells, and three wastewater treatment plants.

MAKING THE ROUNDS

AWWU’s unique cross-training work culture facilitated his learning. The 90-member Operations and Maintenance Division has four crews: line cleaning, manhole/valve, excavation, and hydrants. Employees make their way around each crew over three- or four-year periods, so they become well-versed and ready to respond to any situation.

AWWU is Alaska’s largest water and wastewater utility with 52,000 commercial, residential and military water customers.



Earl Stewman, Anchorage (Alaska) Water & Wastewater Utility

POSITION: | **Systems Maintenance Foreman**

EXPERIENCE: | **11 years with the city**

DUTIES: | **Oversee maintenance of 7,400 fire hydrants.**

EDUCATION: | **Graduate of East Anchorage High School.**

CERTIFICATIONS: | **Utilityman III, Water Distribution 2 and Wastewater Collections 2**

GOALS: | **Finish his career with AWWU**

GPS COORDINATES: | **Latitude: 61°11'33.23"N; longitude: 149°53'57.35"W**



While Stewman’s first job was cleaning waterlines, he rotated around the job circuit and ended up on the hydrant crew, long before he thought about becoming foreman. “I realized all the work involved in maintaining these thousands of hydrants,” he says. “Plus, I reasoned that my boss, Eric Braendel, would retire in a few years. That’s why I decided to focus my energy on hydrants, so I could eventually move up, which is exactly what happened.”

Today, Stewman’s crew is responsible for all hydrant repairs and maintenance, funded under a \$1 million budget provided by the Anchorage Fire

Department. His maintenance crews work four 10-hour days that overlap Monday through Friday. Upon arriving at 6:30 a.m., Stewman meets with the team and hands out assignments for the day. Then he takes calls about broken hydrants and other issues, handles work orders, and lets the Fire Department know which hydrants are out of service — an all too common issue.

CHALLENGING WEATHER

Given all the snow and ice Anchorage gets in winter, drivers sometimes lose control and hit the hydrants, supplied by American Valve & Hydrant and Mueller Co. The hydrants are designed to break cleanly and leave the waterlines undisturbed so that water is not wasted.

Sometimes, snowplows strike the hydrants. In other cases of extremely cold weather, groundwater can seep into a hydrant at the base; then freeze; expand; and damage valves, rings, rods or other internal parts.

When those incidents happen, crew members shut the hydrant down and file an excavation request so they can repair it. With lines running 10 to 12 feet below the frozen ground (and the deepest being 23 feet down), the task can be daunting, yet Stewman remains undeterred.

“Earl is a good foreman — reliable and one of my go-to guys who I can always count on,” says Tim Forbus, superintendent of the Operations and Maintenance Division, who supervises 22 employees, including three foremen. “He can make a decision and stick to it without caving in to peer pressure. That’s essential to making things run well. His crew likes working for him because he’s so straightforward. They know exactly what he’s thinking. And he lets them do their jobs without micromanaging.”

Beyond his strong management style, Stewman’s focus on hydrants has made a big difference. Forbus notes that the city had many out-of-service hydrants, both public and privately owned. Since Stewman took over the hydrant crew, the number of such hydrants has fallen steadily to about 1 percent of the total.

THE PRIVATE SIDE

Utility workers typically shovel out private hydrants and do some routine maintenance, but the owners — auto body shops, small manufacturers, or big companies like BP or Conoco — are responsible for major repairs. Many of these hydrants are out of service because the owner could not or did not spend money: up to \$3,000 for repairs and up to \$15,000 for replacement. Stewman had a better idea.

“We had plenty of standard parts we weren’t using, so Earl came to me and said, ‘Let’s use them to fix these private hydrants,’” Forbus recalls. “And that’s just what we did. We took them apart, replaced leaking rings and such, so now they’re available if the Fire Department needs them. Because of the success of our hydrant program, we’ve earned an A1 insurance rating — the highest there is. That saves us money on our premiums. It’s a real tribute to the job Earl and his crew do and one of the main reasons I nominated him for the Person of the Year award.”

Hydrant crew member Christopher Blastick is equally high on Stewman: “Earl is one of the most professional bosses I’ve ever worked for. He lets you use your skills and encourages you to self-learn, but he’s always there to answer your questions.”

For Blastick, such support is crucial. He has serviced about 2,900 hydrants in his three years working for Stewman, covering three territories. Stewman even helped him put on a presentation about hydrants for the 2016 AWWMA conference. Blastick demonstrated how the crew checks hydrants’ health by

“Earl is one of the most professional bosses I’ve ever worked for. He lets you use your skills and encourages you to self-learn, but he’s always there to answer your questions.”

CHRISTOPHER BLASTICK



Since Stewman took over the AWWU hydrant crew, the number of out-of-service hydrants has fallen steadily, to about 1 percent of the total as of last summer.

tapping them to detect any water inside that could freeze and crack the hydrant. If that happens, crews open the hydrant, pump out the water and repair any leaks. That can be time-consuming, but it's essential for preventing widespread damage from extreme cold.

HYDRANTS, BEES GET PERSONAL CARE

Although Stewman appreciates the recognition, he much prefers the day-to-day work with his crew, which he calls "the best in the utility," and the nonstop opportunities to learn new techniques and technologies. An avid outdoorsman, he likes hunting, fishing and four-wheeling. At present, his passion is beekeeping: He has run seven hives and gives most of the honey to co-workers.

Growing up, he had a neighbor who kept a beehive and let him sample the honey. Thirty years and a lot of research later, Stewman finally got his own hives, which he treats like the hydrants he services — with plenty of care. Before winter, he feeds the bees well, wraps the hives with polyurethane insulation and provides a moisture box to get them through the winter.

As for the future, Stewman plans to spend the rest of his career with the AWWU. "We have a great work environment, great leaders and an excellent team. Because people move from crew to crew, they don't get stale or burned out. The Fire Department is good to work with, and I really get satisfaction knowing that we're making a contribution to keeping Anchorage residents safe." **tpo**

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'BUNGING' PAYS OFF

Throughout the year, Earl Stewman's hydrant crew performs "bunging," a hands-on process of tapping fire hydrants to make sure they ring hollow — a sound that's music to their ears.

"We usually slap the hydrant's large steamer nozzle with our hand to see if we get a deep hollow sound, which would indicate that the hydrant barrel has little to no water left in it," says Stewman. "The guys call that bunging. If we hear a dense or sloshing sound, we know there's water in there, most likely from a leak. Water in the hydrant will freeze and cause the hydrant to break and be out of service, something nobody wants, so we have to take action."

If they find water in a hydrant, they immediately remove the bonnet (cap), pump it out, check the bonnet assembly and valves for leaks, and make any needed repairs. Winter poses more challenges because of the hard ground. Crews must clear snow from the hydrant, dig a 6-foot-diameter trench around it and get to work, draining water and defrosting the bonnets and other parts. Bunging can take a couple of hours if problems are found, but typically, it's a fast slap-and-listen process.

Stewman's busy crew does bunging on all of Anchorage's 7,400 hydrants six to nine times per year, mostly in winter, to make sure the Fire Department can access the hydrants under any conditions. Most of the summer work involves a variety of hydrant repairs.

Each member of Stewman's crew is responsible for about 900 hydrants. Stewman says, "Keeping the hydrants in working order is especially important. In 2016, we seem to have had more apartment and house fires than I've seen in several previous years, so having water to fight them is vital."

Bang for the Buck

THE DIXIE DRAIN PROJECT IN IDAHO IS AN EXAMPLE OF INNOVATIVE APPROACHES TO REDUCING PHOSPHORUS LOADINGS ON STREAMS AT AFFORDABLE COST

By Jim Force

Water-quality professionals are confirming what fishermen and boaters on U.S. waterways already know: Nutrient pollution is increasingly damaging the water environment.

In its National Water Program Guidance report in 2014, the U.S. EPA called nutrient pollution one of the country's most serious and pervasive water-quality problems in the U.S. But while the threat is confirmed, questions remain about the cost of nutrient control and the impact of point versus nonpoint sources.

While many municipal treatment plants have invested heavily to limit phosphorus in their discharges, new total maximum daily loadings (TMDLs) may call for even more expenditures.

It's a huge bill. For example, a 2012 consultant's report to the Wisconsin Department of Natural Resources predicted the cost of effective phosphorus control at all municipal treatment plants in the state could range from \$860 million to \$925 million. Other studies and reports suggest that nonpoint sources are the bigger problem.

The Idaho city of Boise has taken a novel approach to the issue. As new phosphorus removal requirements loomed for the lower Boise River to prevent further nutrient pollution of the Snake River, the city faced a choice: continue to invest in phosphorus removal technology at its two wastewater treatment plants or seek alternative, less-costly solutions.

Working with stakeholders that include the state and federal regulatory agencies, Boise came up with a plan to remove phosphorus from runoff by constructing a treatment facility at one of the agricultural drains downriver from the city. Shawn Wilson, project manager for the Dixie Drain facility, explained the approach in an interview with *Treatment Plant Operator*.

tpo: What is the Dixie Drain and where does that name come from?

Wilson: We have lots of agriculture and irrigation in this area. In the early 1900s, the federal government built canals and drainage areas that flow into the Boise River. The early settlers gave the name Dixie to this particular drainage area. The drain also pulls groundwater.

tpo: What precipitated the current Dixie Drain project?

Wilson: A TMDL for phosphorus is in effect for the lower stretches of the Boise River. Our West Boise and Lander Street Water Renewal Facilities, with a total capacity of 39 mgd, were converted to enhanced biological phosphorus removal about two years ago, and we have achieved 93 percent removal at the point sources. But adding more treatment to achieve 98 percent removal would have been very costly and provided a diminished return on investment.

tpo: How did the Dixie Drain idea come about?

Wilson: About 80 percent of the wastewater discharged from our facilities is diverted for agriculture. Our Environmental Division in Public Works decided the TMDL might be better met by reducing nonpoint source phosphorus draining to the river from the fields. It was a watershed approach, based on the understanding that all the drainage canals flowed back into the river. The concept was first discussed in 2009. Meetings were held with parties including the EPA and Idaho Department of Environmental Quality as well as our local politicians and nonprofit groups. It took everybody's support to get the concept approved and implemented. We realized it would make more sense to treat the high-load water downstream. It was a common-sense approach with a better environmental return on our investment.



Shawn Wilson

tpo: Tell us about the facility. How does it remove phosphorus?

Wilson: The Dixie Drain is a few miles downstream from Boise. It's about a quarter-mile from the river and covers 49 acres. It's similar to a water treatment plant, using decades-old technology. That's what I like about it — the simplicity. It consists of sedimentation followed by an addition of poly-aluminum chloride and flocculation. The floc settles to the bottom of a large,

“It took everybody's support to get the concept approved and implemented. We realized it would make more sense to treat the high-load water downstream. It was a common-sense approach with a better environmental return on our investment.”

SHAWN WILSON

lined settling pond. Then, it is dredged and removed to drying beds. Settling time is about three hours. The capacity is 135 mgd, and it will ultimately remove 140 pounds of phosphorus a day, or about 10 tons a year. Two operators staff the facility. Its SCADA system is connected to the SCADA systems at our water renewal facilities, allowing for remote operation.

tpo: How much did the facility cost?

Wilson: The total cost was \$21 million, paid for through user rates. The capital cost would have been much higher for ratepayers had we made the mechanical upgrades at our facilities.

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tpo: What about the operating costs?

Wilson: We don't have much data yet. It varies because the primary cost is for chemicals, and that will change when we bring the facility fully into compliance. Right now, we're removing about 25 pounds a day of phosphorus at a chemical cost of roughly \$150,000 a year. That will increase when we get to 2022 and our phosphorus removal requirements increase to meet the offset targets.

tpo: Aren't the capital costs similar to what Boise would have had to spend at its treatment plants?

Wilson: The life cycle costs are similar and the capital costs are much lower for the Dixie Drain Facility, but the environmental benefits of removing phosphorus at Dixie Drain far outweigh those of adding more phosphorus removal technology at our water renewal facilities. We're getting more phosphorus out of the river for the same amount of dollars.

tpo: What have been the results?

Wilson: It's in the second year of operation, and it's working well. The facility is required to remove at least 1 1/2 pounds of phosphorus for every pound of phosphorus not removed at the treatment plants. So far, we've met all our requirements for pounds of phosphorus removed.

tpo: What lessons have you learned from the first couple of years of operation?

Wilson: We've encountered more vegetation than we expected, and we're still learning how much phosphorus can be removed. The facility performed above our expectations in the first year of operation, so we are hopeful that it may have more than the design capacity of 140 pounds per day. Also, the dried floc contains a small amount of aluminum and has further phosphorus removal capacity. We're pilot testing it and trying to find a market for it.



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“It's in the second year of operation, and it's working well. The facility is required to remove at least 1 1/2 pounds of phosphorus for every pound of phosphorus not removed at the treatment plants. So far, we've met all our requirements for pounds of phosphorus removed.”

SHAWN WILSON

tpo: How has vegetation affected the operation?

Wilson: This is an agricultural drain, so in the spring, we get small clippings as the fieldwork starts. As the year goes on, we get big chunks of milfoil. Then during harvest, we see another flush of small clippings and agricultural products. The material blinds our screens. We are installing an automated traveling rake to clean the screens.

tpo: How is groundwater drawn into the drain?

Wilson: It occurs naturally. The groundwater table gets pretty shallow here, and groundwater infiltrates into the drain. It's really high in phosphorus — as much as 500 micrograms per liter.

tpo: Why was this particular drain selected for treatment?

Wilson: Fundamentally, it was chosen because it has pretty regular flows and a high concentration of phosphorus. It's a major contributor of phosphorus to the lower Boise River. It was a perfect candidate to knock out a big chunk of phosphorus. **tpo**



1. Older impellers and other major components can significantly impair pump performance and efficiency.
2. Re-engineered components like this pump impeller can restore old pumps to their original level of performance.



New Life for Old Pumps

REVERSE ENGINEERING OF IMPELLERS AND OTHER COMPONENTS CAN BE A COST-EFFECTIVE SOLUTION FOR PUMPS THAT ARE NO LONGER MANUFACTURED AND FOR WHICH OFF-THE-SHELF PARTS ARE NOT AVAILABLE

By Ted J. Rulseh

Big pumps at older water and wastewater treatment plants often show their age by way of lost efficiency and unreliability. Pumps perhaps 30 to 40 years and older may no longer be in production, and critical components may not be on the shelf at the manufacturer.

When that happens, there are options short of replacing the entire pump. One is to ask the manufacturer to fabricate a replacement part or engage a local machine shop to do the same. Another is to ask a third-party pump manufacturer to reverse engineer the part in question.

Reverse engineering can be an attractive option, especially given today's manufacturing technology. Often, reverse engineering is faster and less costly than working with the original equipment manufacturer, which is likely focused on producing current pump models and cannot give priority to one-off fabrications.

Sulzer Pumps Solutions, a major pump manufacturer based in Switzerland, offers a dedicated reverse-engineering service. Jesse Jackson, a customer service manager, talked about the offering in an interview with *Treatment Plant Operator*.

tpo: What is the role of reverse engineering in pump operations?

Jackson: Large pumps are designed to perform for decades, requiring only periodic maintenance. But when the performance of an older pump begins to deteriorate, that may be a sign that the impeller is worn or the volute has become corroded. By the time this happens, finding new parts can be a considerable challenge. Access to spare parts becomes more and more difficult until the manufacturer has none available. In some cases, the company may have gone out of business. Fortunately, modern design techniques and manufacturing processes make it possible to create a vast range of components using reverse engineering.

tpo: What are the pros and cons of working with the original manufacturer of the pump to have a replacement component fabricated?

Jackson: In cases where the original equipment manufacturer is available, it may be possible to order new components, even if they have to be manufactured from the original drawings as a special build. The advantage here is the drawings, which provide all the necessary detail to create a new component.

The problem is usually the lead time. Most manufacturers' fabrication facilities are dedicated to current pump models, and reassigning them to a one-off task may incur an additional delay. The second issue can be cost. OEM parts are unique to their products and manufactured to certain stan-

“Today, with sophisticated coordinate measuring machines, 3-D solid modeling software and laser scanning, it is possible to recreate not just simple parts, but also components with complex geometry.”

JESSE JACKSON

dards, so they carry a price premium. As the stock of spare parts for the older pumps diminishes, creating new parts has a higher cost threshold, and that can increase prices further.

tpo: How does reverse engineering differ from working with the OEM?

Jackson: Reverse engineering provides the capability to create a new component without drawings or reference material, which may not be available, especially if the OEM is no longer in business. In the past, reverse engineering has been a common practice for less intricate components, but the complex geometry of pumps has made this very difficult. Today, with sophisticated coordinate measuring machines, 3-D solid modeling software and laser scanning, it is possible to recreate not just simple parts, but also components with complex geometry.



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tpo: Are there other potential advantages to reverse engineering?

Jackson: Yes. In addition to new manufacturing technology, there have been significant developments in materials. Older pumps are often created using materials that cannot be easily welded such as cast iron and bronze. In many cases, the original materials can be upgraded.

tpo: Why might an upgrade in materials be beneficial or necessary?

Jackson: Pumps, especially large ones, are often used in abrasive or corrosive conditions, and that can significantly reduce the expected operational life of components, such as the impeller. Upgrading the base material causes a relative increase in the initial repair cost, but the payoff is that it improves the pump service life and reduces the overall cost of ownership. The replacement of bronze with stainless steel is a common material upgrade.

tpo: Can the reverse-engineering process include making design improvements?

Jackson: Yes, it can. In addition to the materials used to create the pump, the detailed design can also be improved as part of the process. Since the original pump was installed, its purpose or its performance requirements may have changed, and that can be addressed in creating a reverse-engineered component. The hydraulic design is critical to the performance of the pump, and the latest design software and techniques such as computational fluid dynamics can be used to deliver the optimum design.

tpo: Outside of design, what other factors can make reverse engineering advantageous?

Jackson: Modern technology has improved manufacturing processes. For example, it is no longer necessary to build a wooden pattern for the part and ship it to the foundry for production of a casting. A computer model of the part can now be emailed. Foam cores and patterns can be made for one-off components, reducing both the time and cost to complete the process. In



FOR NEARLY 40 YEARS CLEARSPAN FABRIC STRUCTURES has been providing waste and water treatment facilities with structural solutions that promote efficiency.

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addition, 3-D printing can be used to create molds for smaller components, again speeding up the process to create replacement parts.

tpo: How much time does it take for delivery of a reverse-engineered replacement part from the time the customer orders it?

Jackson: That depends in part on the component's size and complexity, but six weeks is a good rule of thumb. Delivering reverse-engineered projects takes time, but the process can be estimated accurately. This enables equipment owners to plan any process shutdowns and minimize the impact of the project. In some industries, a pump failure may have to be rectified with a temporary solution until a scheduled outage can occur, when the pump can be removed and repaired with a more robust solution. In such cases, the detailed measurements and modeling can be done during the initial repair process, allowing the new component to be manufactured before the scheduled outage to minimize downtime.

tpo: How would you characterize Sulzer Pumps Solutions' qualifications to perform reverse engineering on pump components?

Jackson: Sulzer Pumps Solutions has adopted all of the technological advances in pump component manufacturing and has applied them to projects around the world. We are an independent service provider for repair and maintenance of rotating machines including turbomachinery, pumps and electromechanical equipment with a global network of 150 technically advanced manufacturing and test facilities. Our core aim is to deliver a flexible and cost-effective service that optimizes customers' operational efficiency and minimizes downtime. **tpo**



Treatment and Filtration

By Craig Mandli

Aeration Equipment

FLUENCE CORPORATION SMARTAERATOR TORNADO SURFACE AERATOR

The SmartAerator Tornado Surface Aerator from Fluence Corporation uses controls, sensors and variable-frequency drives to significantly reduce the energy required to aerate wastewater. Its adaptive AI is designed for hydrodynamic performance in wastewater processes to provide energy savings while maintaining aeration and mixing performance during all parts of the daily diurnal cycle throughout the year. It can be sold as a retrofit kit or with new Tornado aerators. Significant energy savings can be seen, particularly with projects that require high-horsepower aerators and projects with multiple aerators. The payback period for a typical installation is approximately two years or less. **800/879-3677; www.fluencecorp.com**



SmartAerator Tornado Surface Aerator from Fluence Corporation



In-line Aeration System from Mazzei Injector Company

MAZZEI INJECTOR COMPANY IN-LINE AERATION SYSTEM

The In-line Aeration System from Mazzei Injector Company provides a maximum transfer of oxygen with low energy usage and minimum operator involvement and maintenance, especially in pressurized systems. With no moving parts, it's a solution that offers trouble-free operation

in a small footprint. A sidestream is taken off an effluent pipeline, directed through a booster pump, and then through Venturi injectors to mix atmospheric air or oxygen with the water. The aerated sidestream is then mixed back into the effluent pipeline through a Pipeline Flash Reactor for greater oxygen transfer and mixing in order to reach dissolved oxygen limits before being discharged into receiving waters. **661/363-6500; www.mazzei.net**

REAL TECH REAL SPECTRUM

Real Spectrum UV-VIS sensors from Real Tech provide instant visibility into wastewater by delivering real-time, accurate BOD data. The sensors can monitor up to 120,000 mg/L BOD with an optional dilution system to meet the demands of various wastewater applications. Automatic chemical cleaning and purging systems minimize maintenance and ensure reliability in harsh environments. The sensor and optional accessories connect to a central controller that offers multiple communication options for easy integration to a SCADA system. With up-to-the-minute BOD insights, important events can be detected prior to the five-day laboratory results,



Real Spectrum UV-VIS sensors from Real Tech

helping operators to control and optimize wastewater treatment processes. As a result, energy and chemical usage can be reduced to save costs while improving water quality. **905/665-6888; www.realtechwater.com**

VANAIRE MICROAIRE MOBILE DISSOLVED AIR FLOTATION SYSTEM

The MicroAire Mobile DAF System from VanAire is fully self-contained and houses a complete DAF system. The unit uses the customer's existing plant voltages and provides its own compressed air source, recycle aeration system, flocculation mixing system, chemical feed pumps, lift pumps and hoses. Plants employing the unit for testing waste streams will quickly see that the key to excellent DAF performance is consistently small bubbles. **800/826-2473; www.vanaireinc.com**

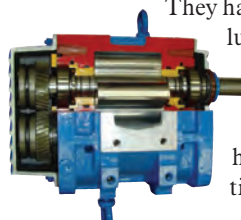


MicroAire Mobile DAF System from VanAire

Blowers

EURUS BLOWER ZG

ZG tri-lobe aeration blowers for MBBR, biosolids and/or equalization tanks from Eurus Blower are rated to 15 psig and flows to 6,000 cfm.



ZG aeration blowers from Eurus Blower

They have integral-shaft ductile iron impellers, dual-splash lubrication, oversized roller bearings, piston ring air seals, Viton lip seals, as well as low vibration and noise characteristics. Packages have an integrated intake filter/silencer with washable filter media, heavy-duty base/integrated discharge silencer, vibration dampers, OSHA guard and a V-belt drive with auto belt tensioner. Options include motors, check valves, safety valves, flexible connectors and sound enclosures. **630/221-8282; www.eurusblower.com**

Filtration Systems

ADEGE WATER TECHNOLOGIES BIOTTTA

The biotTTa biological filtration system from AdEdge Water Technologies leverages nature to offer a sustainable solution for well-head treatment of inorganic and organic contaminants. Its fixed-bed, dual-stage biotreatment cultivates an environment for microbiological organisms to destroy contaminants or reduce elements to simple unarmful forms. The fixed-bed treatment process consistently addresses contaminants at low levels, intermittent or fixed operation, and the dual bed assimilates a complete packaged biotreatment plant. It has regulatory approval for the reduction of nitrate and perchlorate, and it demonstrates hexavalent chromium, VOCs, iron, manganese and sulfide elimination in a single process. The low-volume discharge is easily managed as a nonhazardous waste stream. **866/823-3343; www.adedgetech.com**



biotTTa biological filtration system from AdEdge Water Technologies

DE NORA WATER TECHNOLOGIES TETRA LP BLOCK

The lightweight TETRA LP Block dual parallel lateral underdrain system from De Nora Water Technologies offers distribution of backwash air and water for more efficient bed cleaning and reduced filter operation costs for new or retrofit applications. With no moving or wearing parts, the low-profile design is simple to install and requires mini-

mal maintenance for long life. The GroutGrip design includes six rows of molded dovetail wedges that are embedded in the grout, offering 1.75 times the pullout strength of a conventional underdrain block. The Anchor-Rite option provides additional resistance to uplift forces by fastening the block to the filter floor with a mechanical anchor that is integral to the block. **412/788-8300; www.denora.com**



TETRA LP Block underdrain system from De Nora Water Technologies

EATON MCS SERIES



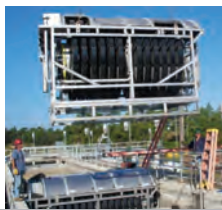
MCS Series strainer from Eaton

The MCS Series magnetically coupled strainer from Eaton is engineered to conserve water while protecting equipment from debris. It offers minimal purge volumes in freshwater applications, allowing operators to save on the cost of make up liquids, chemical treatment, and heating energy. Featuring fast-cleaning magnetically coupled actuation, this design offers an optimized configuration to help improve and reduce maintenance and downtime. This actuation method eliminates the need for cover thru-holes and their

associated seals. It provides quick and easy access for maintenance, reduces potential leaks, and requires few moving parts while providing a long service life. **732/212-4700; www.eaton.com/filtration**

EVOQUA WATER TECHNOLOGIES FORTY-X DISC FILTER

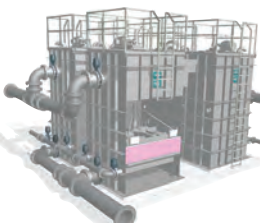
The Forty-X Disc Filter from Evoqua Water Technologies is a high-rate tertiary filter that fits into a fraction of the footprint required by traditional sand filters. It can help increase throughput, improve efficiency and minimize life cycle costs. It helps avoid mechanical operational issues with sand filtration systems and helps when plant capacity exceeds the filter's capacity. It can be used when a plant expansion requires additional filtration. **www.evoqua.com**



Forty-X Disc Filter from Evoqua Water Technologies

SCHREIBER FUZZY FILTER

The Fuzzy Filter compressible media filter for water and wastewater treatment systems from Schreiber is very high-rate, compact and modular, and it is applicable to a wide variety of water and wastewater applications. Operating in an upflow design, it achieves a high rate of solids removal through the use of synthetic fiber spheres. It offers loading rates of 40-plus gpm per square foot. During the wash cycle, influent continues to enter the filter while an external blower supplies air in the bottom of the chamber to agitate the media. The media, which is retained between two perforated plates, is subjected to vigorous air scouring to free captured solids. Freed solids exit the filter by wash water passing up through the vessel. After the washing cycle, media is returned to its compressed state and filtration is resumed. **205/655-7466; www.schreiberwater.com**



Fuzzy Filter media filter from Schreiber

VAF FILTRATION SYSTEMS V-SERIES

V-Series filters from VAF Filtration Systems remove all suspended solids 10 micron and larger from water. Skid-mounted plug-and-play systems include a fully integrated pump, filter, controls and valves for

ease of installation. A bidirectional screw increases cleaning efficiencies and simplifies the self-cleaning process so pistons, electric motors, gears, limit switches and PLC controls are not required. The self-cleaning process provides low-flush waste, which is less than 1 percent of flow. Filter bodies are constructed of 316L stainless steel, providing longevity. They are ideal for applications — particularly prefiltration and water reuse — at industrial and municipal plants. **303/425-4242; www.vafusa.com**



V-Series filters from VAF Filtration Systems

Lagoons/Lagoon Components

AMERICAN PLEASURE PRODUCTS UTILITY SERVICE BARGE

The Utility Service Barge from American Pleasure Products can provide a safe working environment and improve confidence when working on the water. The 8- by 12-foot work platform has ideal stability and flotation from using two 12-foot by 23-inch-diameter pontoons. It has aluminum frame construction with stainless steel hardware. The deck is covered with a nonslip, nickel-plate vinyl for stability and easy cleaning. A heavy-duty protective handrail is included. To maneuver the unit, a heavy-duty outboard motor mount for small gasoline or electric motors is included. Options include a 1,000-pound lifting crane, galvanized float-on trailer with tongue jack, life rings and pivot arms that are used to secure the barge to aerator tubes when service is being performed on diffuser drop tubes. **989/685-2697; www.aquacycleusa.com**



Utility Service Barge from American Pleasure Products

INDUSTRIAL & ENVIRONMENTAL CONCEPTS (IEC) ANAEROBIC COVERS

Anaerobic covers from IEC are custom designed to work on virtually any pond. They are designed to operate at all water elevation changes and most pressures. In colder climates, the covers are offered with an insulation that retains water temperature, which promotes year-round reliability and performance. The design effectively removes rainwater and eliminates problems associated with ponding and ballooning. The system requires minimal maintenance with an unsurpassed service life. Engineers and operators are welcome to call us. **952/829-0731; www.ieccovers.com**



Anaerobic covers from IEC

MARKLAND SPECIALTY ENGINEERING SLUDGE GUN

The Sludge Gun from Markland Specialty Engineering helps operators measure solid-liquid interface levels in lagoons, clarifiers and tanks. It can be used to monitor sludge bed depth for regulatory compliance and prevention of carryover, and to pump/dredge only



Sludge Gun from Markland Specialty Engineering

when necessary. It uses an LED and phototransistor sensor pairing to detect biosolids in densities ranging from light flocs to thick blankets. A thumb-adjustable control allows the user to fine-tune the probe's sensitivity. It emits an audible tone that varies in volume and pitch, depending on the concentration of suspended solids. Users establish the location of both the true settled bed and the overlying unsettled cloudy layer by observing the numbered depth markers on the cable as the probe is lowered into the pond or tank. It is ideal for use from boats and catwalks. No calibration is required. **855/873-7791; www.sludgecontrols.com**



NitrOx lagoon ammonia-removal system from Triplepoint Environmental

TRIPLEPOINT ENVIRONMENTAL MOBILE NITROX

For temporary installations or locations where construction is not feasible, the turn-key mobile NitrOx lagoon ammonia-removal system from Triplepoint Environmental leverages an existing lagoon system and ensures controlled results, even in cold weather. It is simply driven on site and connected

sidestream between the secondary and polishing cells. Influent from the secondary cell — up to 150,000 gpd — is pumped into the 20,000-gallon capacity tanks, where high-surface-area media are mixed and aerated to foster nitrifying bacteria that remove ammonia. Sensors and a digital controller optimize temperature; an insulated cover retains heat. Available DO control, VFD and online monitoring ensure results and minimize energy consumption. It can be rented as needed or leased to own. **800/654-9307; www.tpenv.com**

MBBRs

KRUGER USA ANOXKALDNES MBBR PACK

The AnoxKaldnes MBBR Pack from Kruger USA provides all the advantages of a conventional MBBR system in a standard prefabricated, easy-to-install package for quicker delivery, limited engineering costs and on-site infrastructure, and automatic operation. The technology is based on the biofilm principle, which uses microorganisms for biological treatment of wastewater. The microorganisms grow on the surfaces of plastic carriers in the treatment reactor. As the carriers move through wastewater in the reactor, microorganisms use contaminants present in the effluent for their biological activity. The design of the carriers ensures that maximum surface area is provided for the development of biofilm, enabling high treatment capacity in a small footprint. The flexibility of the technology allows for compact and efficient solutions for new installations as well as upgrades of existing biological processes. **919/677-8310; www.veoliawatertech.com**



AnoxKaldnes MBBR Pack from Kruger USA



Kontakt media from Raschig USA

RASCHIG USA KONTAKT MEDIA

Kontakt media from Raschig USA is a light-weight, durable, rugged and efficient media ideal for new MBBR and IFAS systems or for replacement of media or carrier elements in existing systems. Its design allows the media to freely move throughout the bioreactor and provides a high percentage of protected surface area for microorganisms to adhere. In turn, this allows for an increase

in the overall biomass concentration, which can reduce the tank volume required for wastewater treatment. It can be used in plant upgrades and new construction. **540/862-8426; www.raschig-usa.com**



Modular MBR systems from Newterra

MBRs

NEWTERRA MODULAR MBR

Modular MBR systems from Newterra can bring cost-effective, decentralized sewage treatment to small communities. These modular systems are designed to expand as capacity requirements change, offering flexibility and savings. The high-quality permeate produced by the membrane bioreactor meets regulatory requirements for a wide range of discharge options and reuse applications. Since these modular units arrive on site preplumbed, prewired and pretested, they can be commissioned and operating in a matter of days, requiring minimal site work. The systems are designed and built to ensure all equipment is easily accessible with an intuitive controls interface. Systems can easily be configured as fully self-contained units that can be clad with a variety of materials to blend in with surrounding structures, or integrated into new or existing treatment structures. **800/420-4056; www.newterra.com**

SMITH & LOVELESS TITAN MBR

The TITAN MBR packaged membrane bioreactor system from Smith & Loveless economically delivers high-quality effluent for up to 3 mgd per tank, allowing for water reuse. Fully submerged in the aeration zone of the tankage, flat-plate membranes maintain high permeability and flux rates, even during peak flows. The membranes experience less wear and tear and can simply be cleaned in place. The submerged membrane design eliminates the need for clarifiers and sand filters and produces high effluent quality. Integral zones can be added to meet particular effluent goals, including nutrient removal, disinfection, biosolids holding and post-aeration. Because the system employs air scouring to prevent fouling, it doesn't require back pulsing. The system is available in standard and custom designs and results in a small footprint. **800/898-9122; www.smithandloveless.com**



TITAN MBR system from Smith & Loveless

Membrane/Media Filters/Components



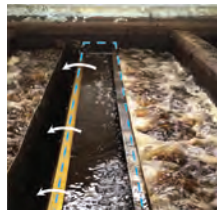
Filter membrane cleaners from International Products Corporation

INTERNATIONAL PRODUCTS CORPORATION FORMULATED FILTER MEMBRANE CLEANERS

Formulated filter membrane cleaners from International Products Corporation are compatible with UF, RO, ceramic and NF systems. They work effectively at restoring 100-percent flux at safe pH ranges. A wide variety of chemistries are available for all membranes and soils. Their use enables fast, effective soil removal and helps reduce or eliminate membrane replacement. They save time, energy, and labor costs and can help eliminate multiple-step cleaning cycles. They are solvent-free concentrated liquid formulas that dilute easier than powder detergents. They are phosphate-free and non-corrosive. **609/386-8770; www.ipcol.com**

ORTHOS LIQUID SYSTEMS ORTHO-WASH

Ortho-Wash troughs with media retention baffles from Orthos Liquid Systems prevent media loss in conventional filter applications using concurrent air-water media cleaning. Anthracite or GAC lifted by air scour is retained, settles and doesn't flow over the trough



Ortho-Wash troughs from Orthos Liquid Systems

The baffles, integrally mounted onto the backwash trough, prevent media loss by deflecting air to provide this adjacent quiescent volume to settle out lightweight anthracite or GAC. Negligible media loss occurs when air scouring and backwashing at prescribed rates. The troughs are one part of the Poseidon Filtration System. **843/987-7200; www.orthosnozzles.com**

Mixers/Mixer Components

AERATION INDUSTRIES INTERNATIONAL AIRE-O2 UNIVERSAL MOUNT

The Aire-O2 Universal Mount from Aeration Industries International simplifies the mounting process for the Aire-O2 Triton aerator/mixer for conventional activated sludge systems and oxidation ditches. No significant construction is required, and the mounting system offers ease of maintenance with the ability to slide the Aire-O2 Triton up the inclined plane to complete routine maintenance safely while fixed to the mount. It can be mounted directly to a walkway or wall in a variety of thicknesses and free-board heights. It is resistant to corrosion and can be mounted at a variety of angles. It allows the Aire-O2 Triton to pivot 180 degrees. All metal components are made of 304 stainless steel for durability. It offers an integrated retrieval system and routine maintenance position. A hand winch allows for simple maintenance. **800/328-8287; www.aireo2.com**



Aire-O2 Universal Mount from Aeration Industries International

The Nozzle Mix System from JDV Equipment Corporation is a dual-zone mixing system that provides uniform mixing patterns, producing even distribution and a stable environment. The system is designed with pumps installed outside the tanks to facilitate maintenance. The pumps are typically chopper pumps or pumps incorporating inline grinders that prevent fibrous materials from accumulating and causing plugging problems. The application dictates which type(s) of the many varied pump options can be used. High-velocity nozzles are mounted inside the tank and oriented to discharge in a flow pattern that completely mixes the tank contents. **973/366-6556; www.jdvequipment.com**

JDV EQUIPMENT CORPORATION NOZZLE MIX SYSTEM



Nozzle Mix System from JDV Equipment Corporation

The Nozzle Mix System from JDV Equipment Corporation is a dual-zone mixing system that provides uniform mixing patterns, producing even distribution and a stable environment. The system is designed with pumps installed outside the tanks to facilitate maintenance. The pumps are typically chopper pumps or pumps incorporating inline grinders that prevent fibrous materials from accumulating and causing plugging problems. The application dictates which type(s) of the many varied pump options can be used. High-velocity nozzles are mounted inside the tank and oriented to discharge in a flow pattern that completely mixes the tank contents. **973/366-6556; www.jdvequipment.com**

KSB AMAPROP 1000

Mid-sized Amaprop 1000 hybrid mixers from KSB can serve as part of an optimized mixing procedure that can reduce operational energy needs, increasing energy output and revenues for the plant.

EnviroDisc® Rotating Biological Contactor

Lowest Installed Energy For the Right Process



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They are optimized for each mixing task to ensure a specific flow volume and that they deliver enough thrust to move the medium through all sections of the fermenting tank. Use of multiple, properly positioned mixing units — each of which processes the reduced, diluted material created by other units — can help prevent short-circuiting flow paths and support the best possible transformation process. They combine all the benefits of an agitator with the turbulence generation of a traditional mixer. If substrate viscosity increases, they can adjust the conveying action to offset the increase and maintain optimal flow. **804/222-1818; www.ksbusa.com**



Amaprop 1000 hybrid mixers from KSB

LAKESIDE EQUIPMENT CLOSED-LOOP REACTOR

The Lakeside Equipment closed-loop reactor process, a modified form of the extended aeration complete mix process, provides biological nutrient removal using energy-efficient designs. It produces removal efficiencies that exceed those of advanced tertiary



Closed-loop reactor process from Lakeside Equipment

treatment processes. Configurations are available with in-basin designs for nitrification and denitrification as well as an external selector configuration for Bio-P and Total N removal. Process monitoring and control systems can be provided to continuously monitor and adjust the operation of the biological reactors to optimize process performance and reduce power costs. The horizontal-bladed Magna Rotor Aerator provides oxygen and mixing to the basin with reliable operation and high efficiency. **630/837-5640; www.lakeside-equipment.com**

LANDIA AERIGATOR

The AeriGator from Landia breaks through lift station scum, macerating rags and debris while injecting air. With no need for compressors, bottom-mounted diffusers or advanced controls, it is a low-cost, low-energy chopper pump equipped with an ejector system that removes the requirement for vacuum trucks to remove lift station scum. Air (and thus oxygen) is automatically sucked into the ejector and then mixed with the wastewater from which it is pumped, under pressure, into the lift station/tank. No additional chemicals are needed. As well as reduced maintenance costs, its use means less mess for site operators. Manufactured with an external knife system, the chopper pump ensures that the aerator doesn't get clogged due to contaminants in the wastewater. **919/466-0603; www.landiainc.com**



AeriGator mixing system from Landia



Conditioning pump from Vaughan Company

VAUGHAN COMPANY CONDITIONING PUMP

The Vaughan Company conditioning pump is a Vaughan submersible chopper pump mounted on a portable stand that's fitted with a high-velocity mixing nozzle. The unit recirculates the contents of the wet well, chopping and mixing to produce a homogeneous mixture that is more easily pumped out. Floating mats are removed, and solids accumulated on the floor are resuspended. The pump is mounted on a portable stand, easily used in multiple applications at a single job site, facility or municipality. **888/249-2467; www.chopperpumps.com**

Nutrient Removal

BIOSCIENCE MICROCAT-ANL

MICROCAT-ANL from Bioscience is a liquid blend of preselected, adapted microorganisms for use under microaerophilic, anoxic or anaerobic conditions. It has specialized microbes that reduce sulfides under anaerobic or anoxic conditions to elemental sulfur, which is occluded by the cells, thus suppressing odors. It is formulated for use in sludge, compost, contaminated soils and wastewater to suppress H₂S odors and enhance biodegradation and contaminant removal where oxygen is of limited availability. **800/627-3069; www.bioscienceinc.com**



MICROCAT-ANL from Bioscience



FILTRASORB from Calgon Carbon Corporation

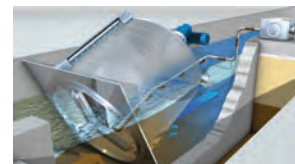
CALGON CARBON CORPORATION FILTRASORB

Developed for the removal of organic compounds from water, wastewater, and industrial and food processing streams, FILTRASORB from Calgon Carbon Corporation is a highly active, reagglomerated, durable granular activated carbon. Made from select grades of bituminous coal, it is capable of withstanding the abrasion

associated with repeated backwashing, hydraulic transport and reactivation. It can be used to remove DBPs; PFCs; 1,2,3-TCP; VOCs; other emerging contaminants; and taste and odor compounds as well as industrial organic compounds, such as TCE and PCE. **800/422-7266; www.calgoncarbon.com**

HUBER TECHNOLOGY ROTAMAT RPPS STAR

The Rotamat RPPS STAR from Huber Technology addresses increased equipment protection requirements with a 1- or 2-mm pleated perforated plate geometry that significantly increases throughput and allows for a smaller footprint. This results in a reduced capital expenditure for the screen and structure. The fold provides additional stiffness critical to larger drum designs. **704/949-1010; www.huberforum.net**



Rotamat RPPS STAR from Huber Technology



SludgeKing AquaCat dewatering container from Park Process

PARK PROCESS SLUDGEKING AQUACAT

The SludgeKing AquaCat roll-off dewatering container from Park Process uses filters that radius to the bottom of the container, leaving no corners for cake to stick to and no residual water left in the container. This radius also increases the length of the wall

filters, providing additional filtration surface area. The two center panels increase the filtration area by 33 percent more than containers with only one center filter wall. The increased filter surface area and the more narrow biosolids compartments formed by the additional filter wall translate into drier cakes formed in less time. With the decreased distance between two filter walls, water has less distance to travel before exiting the container, which means faster dewatering times. **855/511-7275; www.parkprocess.com**

SCHWING BIOSET NUTRIENT-REMOVAL SYSTEM

Schwing Bioset's nutrient-removal system recovers ortho-phosphate and ammonia nitrogen from wastewater while offering benefits to the treatment plant. This controlled struvite formation significantly reduces phosphorus loads within the plant and prevents unwanted scaling and accumulations while creating a valuable end product. The phosphorus forms a stable struvite crystal that can be marketed and sold for beneficial reuse, thus keeping excess phosphorus out of the local waterways and helping close the phosphorus recycling loop. Three primary configurations are available, each designed and configured to solve specific issues encountered in wastewater treatment plants. **715/247-3433; www.schwingbioset.com**



Nutrient-removal system from Schwing Bioset



JDV LEVEL LODOR™

Design for Even Distribution
&
Odor Control

www.jdvequipment.com



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TREATMENT PLANT OPERATOR tpo CLASSIFIED ADVERTISING NOVEMBER

COVERS

POND & TANK COVERS: Industrial & Environmental Concepts (IEC) makes gas-collection covers, odor-control covers, heat-retention covers and clarifier covers. Call 952-829-0731 www.ieccovers.com (o07)

PARTS & COMPONENTS

New US Filter/Envirex 6" air cups for an RBC plant. Part No. 06975. Item code number 09-00034. Material: 9018/W/Black CC. 468 pieces available. 281-499-6254 (o12)

DEWATERING

FOR SALE: Two (2) Andritz 2.2-meter belt presses, unused after complete refurbishing to Andritz factory specifications throughout. Dyer Equipment Co. 970-454-3784, Ault, CO or dyerequipment@aol.com (o11)

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Liquid vacs, wet/dry industrial vacs, combination jetter/vacs, vacuum street sweeper & catch basin cleaner, truck & trailer mounted jettors. All available for daily, weekly, monthly, and yearly rentals. **VSI Rentals, LLC, (888) VAC-UNIT (822-8648) www.vsi rentalsllc.com** (CBM)

EDUCATION

RoyCEU.com: We provide continuing education courses for water, wastewater and water distribution system operators. Log onto www.royceu.com and see our approved states and courses. Call 386-574-4307 for details. (oBM)

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Dynamic Repairs - Inspection Camera Repairs: 48 hour turn-around time. General Wire, Ratech, RIDGID, Electric Eel Mfg, Gator Cams, Insight Vision, Vision Intruders. Quality service on all brands. **Rental equipment available.** For more info call Jack at 973-478-0893. Lodi, New Jersey. www.dynamicrepairs.biz (CBM)

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SWAN ANALYTICAL USA AMI TURBIWELL

The SWAN Analytical USA AMI Turbiwell is an EPA-approved noncontact system that uses a white LED method to measure turbidity in potable water, surface water and wastewater. It provides precise readings over a broad 0.000 to 100.0 NTU range. Its optical windows are not in direct contact with the sample, eliminating fouling and time-consuming cleaning.

AMI Turbiwell system from SWAN Analytical USA

An optional auto-drain feature can further reduce cleaning requirements. Heated optics help avoid

condensation that would otherwise introduce errors. The LED light source provides an approximately 100,000-hour operating lifetime; meaning there's no need for annual tungsten lamp change. Checking performance is easy with an optional VERI-KIT optical prism, providing quick reliable verification. The transmitter features electronic drift stabilization to mitigate drift. **847/229-1290; www.swan-analytical-usa.com**

Reverse Osmosis

GE WATER & PROCESS TECHNOLOGIES PROFLEX

The PROFlex reverse osmosis system from GE Water & Process Technologies is configurable using the company's online product configurator, which allows customers to select the exact flow rate required from a range of systems. It is a fit for a variety of applications, including general industrial, power, drinking water, food and beverage, mining, refining and petrochemical industries. The most frequently requested features are available now as prepriced options. GE Water & Process Technologies has minimized the overall footprint to use less space and moved key components to the front of the unit for more accessibility. **866/439-2837; www.gewater.com**



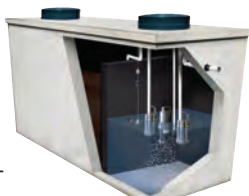
PROflex reverse osmosis system from GE Water & Process Technologies

(continued)

SBRs

ANUA PURASYS SEQUENCING BATCH REACTOR

The PuraSys SBR from Anua batches treatment in cycles, including aerobic and anaerobic steps, to clean water and reduce total nitrogen. It allows nitrification and denitrification to occur in the same chamber, saving space. The smart controls adjust aeration for varying flows, eliminating excessive air that can lead to system failure through sludge bulking. Flexible tank configurations include the retrofit of existing tanks. The system can reduce BOD₅ and TSS to less than 10 mg/L and provide greater than 50 percent total nitrogen reduction, according to the manufacturer. It can be scaled up for commercial applications. **336/547-9338; www.anuainternational.com**



PuraSys SBR from Anua

and nutrient removal. The system eliminates the need for the influent control valves associated with conventional SBRs while providing quiescent settling and decanting that is not possible with continuous-fill batch processes. It requires a small footprint and allows the ability to take an SBR offline while providing full treatment. It can handle flows from as low as 10,000 gpd up to 20 mgd. Pre-engineered package plants are available for smaller flows. **319/266-9967; www.fluidynecorp.com**

PARKSON CORPORATION ECOCYCLE SBR

The EcoCycle SBR from Parkson Corporation combines DynaPhase Control technology with efficient treatment schemes. It uses true batch operation, which produces high-quality effluent since no raw wastewater enters the basins during the settle and decant process steps. A flow control manifold is used to distribute raw influent across the floor of the tank during fill periods to ensure intimate contact between the raw wastewater and the settled biomass. Aeration options include VariOx jet aeration, fine bubble, coarse bubble and floating aerators. The DynaCanter floating decanter excludes solids from the decant piping without requiring electromechanical components inside the basin. Check valves in the decanter drawtube remain closed during mixing and aeration and are opened simply by hydraulic force when the effluent valve (located outside the basin) is opened. DynaPhase Control technology optimizes treatment sequencing during high-flow events and is available with numerous instrumentation options. **888/727-5766; www.parkson.com tpo**



EcoCycle SBR from Parkson Corporation



SAM wastewater treatment process from Fluidyne Corporation

FLUIDYNE CORPORATION SURGE ANOXIC MIX (SAM)

The SAM biological wastewater treatment process from Fluidyne Corporation provides high effluent quality while handling variable flows and loadings without the need for final clarifiers or RAS pumping and piping. The process includes

built-in flow equalization to buffer peak and organic loading while also incorporating anoxic and aerobic zones for energy efficient BOD, TSS

FREE INFO ON THESE PRODUCTS — RETURN FOLLOWING FORM

For FREE information on these treatment and filtration products, check the box(es) below:

Aeration Equipment

- Fluence Corporation SmartAerator Tornado Surface Aerator
- Mazzei Injector Company In-line Aeration System
- Real Tech Real Spectrum UV-VIS sensors
- VanAire MicroAire Mobile Dissolved Air Flotation System

Blowers

- Eurus Blower ZG aeration blowers

Filtration Systems

- AdEdge Water Technologies biotta biological filtration system
- De Nora Water Technologies TETRA LP Block underdrain system
- Eaton MCS Series strainer
- Evoqua Water Technologies Forty-X Disc Filter
- Schreiber Fuzzy Filter media filter
- VAF Filtration Systems V-Series filters

Lagoons/Lagoon Components

- American Pleasure Products Utility Service Barge
- Industrial & Environmental Concepts (IEC) anaerobic covers
- Markland Specialty Engineering Sludge Gun
- Triplepoint Environmental NitrOx lagoon ammonia removal system

MBBRs

- Kruger USA AnoxKaldnes MBBR Pack
- Raschig USA Kontakt media

MBRs

- Newterra modular MBR systems
- Smith & Loveless TITAN MBR system

Membrane/Media Filters/Components

- International Products Corporation filter membrane cleaners
- Orthos Liquid Systems Ortho-Wash troughs

Mixers/Mixer Components

- Aeration Industries International Aire-02 Universal Mount
- JDV Equipment Corporation Nozzle Mix System
- KSB Amaprop 1000 hybrid mixers
- Lakeside Equipment closed-loop reactor process
- Landia AeriGator mixing system
- Vaughan Company conditioning pump

Nutrient Removal

- Bioscience MICROCAT-ANL
- Calgon Carbon Corporation FILTRASORB
- Huber Technology Rotamat RPPS STAR

- Park Process SludgeKing AquaCat dewatering container
- Schwing Bioset nutrient removal system
- SWAN Analytical USA AMI Turbiwell system

Reverse Osmosis

- GE Water & Process Technologies PROflex reverse osmosis system

SBRs

- Anua PuraSys SBR
- Fluidyne Corporation SAM wastewater treatment process
- Parkson Corporation EcoCycle SBR

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By Craig Mandli

Membrane modules allow for easy retrofit

Problem

The Butler (Missouri) Water Treatment Plant draws from an impoundment fed from Butler Lake, the Marais des Cygnes River and Miami Creek. The plant supplies water to more than 300 businesses, four schools, 4,100 residents and four water districts. To combat failures, the city decided to replace membrane modules in three of its four ultrafiltration membrane trains.

Solution

In 2014, Butler conducted a nine-month pilot study with 21 **Aqua-Aerobic Systems MultiBore membrane modules** retrofitted into Train 2. Train 2 then outperformed the other three UF trains. The city retrofitted the other trains in 2014 and 2015.



RESULT

The membranes remove 13 to 36 percent more turbidity than the old filters at 24 to 33 percent higher permeability. In addition, the membranes pass continuous indirect and daily direct air integrity testing. The ability to retrofit into the old membrane module racks reduced the upgrade cost and minimized system modifications. **800/940-5008; www.aqua-aerobic.com**

Biostimulant helps reduce odor and carryover

Problem

A New Hampshire industrial plant experienced high sludge levels in its aerated basin and polishing pond. The sludge contained cellulose fiber and secondary biosolids. Summer odors and carryover led to neighbor complaints and poor plant performance. State regulators required the facility to implement a solution.

Solution

The plant was treated with **Byo-Gon PX-109 biostimulant**, applied with a Lagoon Master to mix and help digest sludge in the aerated basin. Additional cellulose-degrading microbes were provided to target fiber buildup, and the process was significantly accelerated by application of the biostimulant, an OMRI-certified natural organic product that increases microbial respiration and improves biological performance.



RESULT

Cellulose analysis completed by North Carolina State University indicated significant reduction in fiber content. Odors were eliminated and biosolids digestion removed 40 to 50 percent of the settled sludge in the aerated basin. An added benefit was elimination of caustic soda to raise pH in the plant effluent. The plant avoided dredging and disposal costs, which could have threatened continuing operations. **888/296-4661; www.byogon.com**

FEATURED case study

ODOR CONTROL

Massive lagoon cover collects biogas, generates revenue and reduces odors

Problem

Melbourne Water Western Treatment Plant in Werribee, Australia, had been harnessing biogas for more than 25 years, but the cover of its anaerobic lagoon was nearing end of life. The replacement cover needed to withstand rugged conditions, manage odors and provide operational efficiencies.

Solution

Geomembrane Technologies partnered with John Holland-KBR Joint Venture to design, fabricate and install a **replacement cover**. The 19-acre cover has two sections connected by a dual arched central panel. The independent operation of the segments allows for maintenance and cleaning while other segments remain in service. The textured nonslip surface is safe to walk on. The cover is connected to the gas plant with 1,640 feet of large-diameter piping, which includes condensate drainage and emergency vent systems.



RESULT

The cover collects 78,500 cubic yards of biogas per day, worth \$2.78 million per year. It contributes to generating more than 40 percent of the site's electricity for treatment processes. Greenhouse gas emissions and odors are reduced. **855/484-4630; www.gticovers.com**

System enables beneficial reuse of winery wastewater

Problem

In 2015, the Riboli family, which owns San Antonio Winery, was looking to expand into the city of Paso Robles, California. The family sought to pretreat the wastewater to residential levels before discharge to the sewer in order to avoid surcharges.

Solution

Cloacina provided a **MEMPAC-I membrane bioreactor** that enabled treatment to less than 10 mg/L BOD and TSS. The system allowed for 100 percent reclamation of process wastewater.



ter, removing the winery discharge from the city treatment plant. The reclaimed water is used for landscape irrigation, dust control and treatment plant sanitary washdown. The bioreactor system controls the entire process, including lift stations, equalization system, primary treatment, activated sludge treatment, a submerged membrane system, sludge drying, effluent equalization, the stormwater system and the irrigation pump system.

RESULT

The facility has been online since summer of 2016 and has produced reuse-quality effluent ever since. **888/483-8469; www.cloacina.com**

New dredge unit allows city to reach drying beds

Problem

The city of Ellensburg, Washington, needed to update its 1991 dredge. The new unit would need increased flow and a higher-pressure pump to reach the new drying beds located farther from the lagoon.

Solution

Mud Cat, Division of Ellicott Dredge Technologies, installed a 40 hp MC-40E dredging system with a 1,000-gpm flow rate at 100-foot TDH and 14-foot operating depth. The slurry pump has an adjustable flow rate, and the unit is equipped with Auto Sense technologies. Remote control allows the operator to see slurry pump pressure, auger cutter-head torque and operating depth in real time.



RESULT

The city is pleased with the quality and performance of the dredge and the completeness of the operations and maintenance manual. **866/467-4010; www.mudcatdredge.com**

Geomembrane system allows cheesemaker to reclaim wastewater

Problem

A U.S. cheese manufacturer sought an eco-friendly way to recycle its wastewater through anaerobic treatment.

Solution

ADI Systems recommended a custom-designed ADI-BVF system to treat wastewater containing solids, whey, fats and oils. The wastewater is discharged into a downstream membrane bioreactor. The BVF reactor had a combination earthen and concrete structure, and the contents had to be sealed to prevent leakage into the soil or emissions from escaping into the air. The company chose **XR Geomembrane Black 8138 XR-5** from **Seaman Corporation** and cream/black XR-5 material for the protective cover.



RESULT

The protective cover was effective in preventing leakage. **800/927-8578; xgeomembranes.com**

Aerators help increase wastewater treatment capacity at winery

Problem

Daou Vineyards and Winery of Paso Robles, California, wanted to expand and upgrade its odorous treatment operation. The company wanted an aerator to sit on top of large, closed-top tanks and saturate the entire volume with dissolved oxygen.

Solution

ClearBlu Environmental installed a package system that uses five 12,000-gallon treatment tanks with a pH balancing system. **VaraCorp turbine aerators** were installed on each tank. While the aerators normally are used on pontoons in open-water lagoons, the aerator can be decoupled and mounted on batch reactors or treatment tanks.



RESULT

The increase in aerobic bacteria made it possible to process 10,000 gpd of wastewater at peak harvest with a BOD of 7,000 mg/L. By season's end the BOD was 78 mg/L, making it suitable for land application. The aerators also helped eliminate odor and produced little noise. **512/847-5026; www.varacorp.com**

High-efficiency media filtration system reduces medical center's operating costs

Problem

Maintenance costs at a medical center in the western U.S. were increasing; cooling tower basins were being cleaned weekly along with constant replacement of the bag filters. More than 95 percent of the particles in a water sample from the cooling tower were smaller than 5 microns, creating heavy dirt buildup in the system.

Solution

A laser particle analysis demonstrated that a **Vortisand system** would solve the problem. The high-efficiency system enabled the medical center to reduce cooling tower operating costs while meeting future filtration demands.

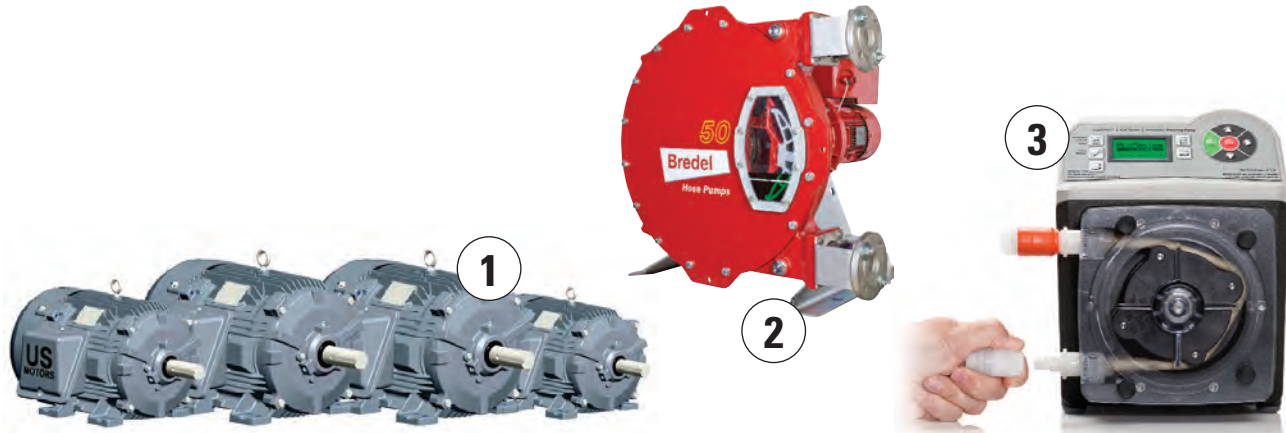


RESULT

Submicron high-efficiency filtration helped reduce particles of less than 5 microns by more than 95 percent. Fine filtration reduced chemical usage. The system helped eliminate the cost of replacing consumable filters. Its small footprint minimized construction costs. Filtration system maintenance was reduced. **888/876-9655; www.evoqua.com/vortisand tpo**

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2. WATSON-MARLOW FLUID TECHNOLOGY GROUP BREDEL HEAVY-DUTY SLUDGE PUMPS

Watson-Marlow Fluid Technology Group's Bredel line of heavy-duty sludge pumps are ideal for centrifuge and belt press feed. They feature only one wearing part — the hose — so there are no rotors, stators or lobes to replace and no mechanical seals or packing to leak. The pumps can handle flows up to 475 gpm with suction lift to 30 feet, and they are dry running and reversible. The pumps do not require degassing or backpressure valves to operate. **800/282-8823; www.watson-marlow.com**

3. BLUE-WHITE INDUSTRIES TUBING

Blue-White Industries' tubing, Flex-A-Prene, Flex-A-Chem and Flex-A-Thane, are used in its FLEXFLO A-100N, ProSeries and ProSeries-M peristaltic metering pumps. The pump tubes come in single and multitube technology, and both include a single inlet and outlet to help provide precision metering of chemicals into critical treatment systems. The tube design provides up to 110 psi, and the tubes feature clampless overmolded fittings with permanently printed model numbers that are visible through the pump head covers, even when the pump is running. **714/893-8529; www.blue-white.com tpo**

For FREE information on these products, check the box(es) below:

- 1. Nidec Motor Corp.'s World Motors
- 2. Watson-Marlow Fluid Technology Group's Bredel pumps
- 3. Blue-White Industries' Flex-A-Prene, Flex-A-Chem and Flex-A-Thane tubing
- Vertiflo Pump Co. Series 1600 sump pump
- Schweitzer Engineering Laboratories SEL-2411P pump automation controller
- FREE subscription to TPO magazine**

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wastewater: product spotlight

Keeping the Solids Out

By Craig Mandli

Clogged pumps not only halt the flow of wastewater, they can also grind work-flow to a halt while maintenance is performed. Using pumps that offer unrestricted flow can help keep things running smoothly. The designers of the **Series 1600 industrial horizontal vortex sump pump** from **Vertiflo Pump Co.** made the unit with the intent of keeping it in operation.

The pump's fully recessed vortex impeller design provides an unrestricted flow since the impeller is not typically in contact with the solids being pumped. Applications for the pump include slurries, fragile food processing solids, pulpy solids, oils, pollution control and wastewater treatment. It can handle solids up to 4 inches in diameter.

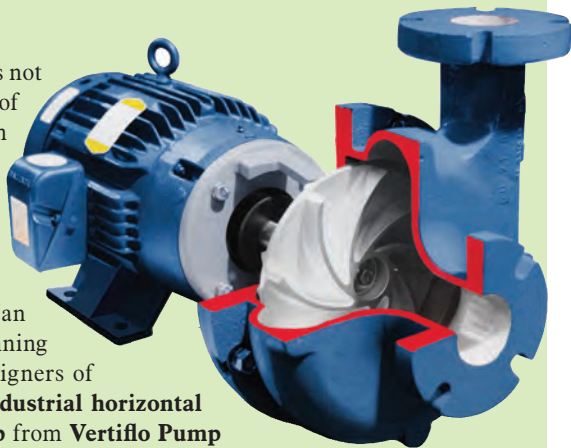
"Pumping sewage, stringy product, light slurries and other soft solids is easily accomplished with the concentric volute design, offering unobstructed flow and smooth passage of the product being pumped," says Bob Goldtrap, vice president of sales and marketing for Vertiflo Pump Co. "Pumping secondary biosolids in wastewater treatment facilities is an ideal application. It is easy and less costly to repair than competitive products."

The Series 1600 offers heads to 170 feet, and it can operate in temperatures up to 250 degrees F with flows up to 1,600 gpm. Construction options include cast iron, 316 stainless steel fitted, all 316 stainless steel, Alloy 20 and CD4MC. The Model 1620 has a 0.875-inch shaft diameter with a 1.25-inch sleeve, while the Model 1626 has a 1.25-inch shaft diameter with a 1.625-inch sleeve. The unit is positively driven and gasketed, protecting the motor shaft from the liquid being pumped. Using any NEMA standard JP shaft motor, its standard JP shaft extension allows for easy interchangeability to packing standard mechanical seal or optional single or double mechanical seals of various designs and materials of construction. All pumps are designed with back pull-out feature, which allows for the easy removal of all rotating components.

"That allows for easy inspection or service/maintenance without disturbing the piping to the pump, which is a cost-saving feature," says Goldtrap.

All the unit's suction and discharge openings are flanged for installation ease and integrity, while the impellers have wiping vanes that reduce axial loading and prevent dirt from entering the sealing area. Its vortex-type concentric design casing has an extra-heavy wall thickness for corrosion protection.

"Its durability and being able to pump 4-inch solids makes it a great fit in a wastewater plant," says Goldtrap. "It's been well-received in the industry." 513/530-0888; www.vertiflopump.com



Series 1600 pump from Vertiflo Pump Co.

water: product spotlight

Total Control in Tough Environments

By Craig Mandli

The **SEL-2411P pump automation controller** from **Schweitzer Engineering Laboratories** is a preconfigured SCADA-ready device built for unforgiving water and wastewater environments.

"It can withstand 15 G of vibration, 15 kV of electrostatic shock, and temperatures from 40 to 185 degrees F," says Farah Habashneh-Brooks, an industrial marketing specialist with Schweitzer Engineering Laboratories. "It has Class 1, Division 2 hazardous area approval and is available with a conformal coating option to protect against atmospheres where corrosive gases, fumes or liquids are present."

Terminal labeling helps make installation easy. The controller provides secure, user-accessible programming to facilitate system upgrades and expand functionality. It can monitor and control liquid levels for simplex, duplex or triplex applications in wells and reservoirs or lift stations. It can also control constant speed, variable speed and alternating pumps, and it is compatible with analog level sensors, floats or a combination of both.

"Is easy to set up and install, and it provides shorter commissioning time for water utilities," says Habashneh-Brooks. "With its pre-loaded template, technicians and operators can easily set it from the operator interface without the need for a computer. The easy-to-understand terminal labeling simplifies installation in new or retrofit pump applications."

In addition, the SCADA-friendly device provides industry-standard communications protocols like Modbus and DNP3 over Ethernet and serial interfaces for scalable SCADA communications using most existing or new communications infrastructure. That's a feature that has impressed users, according to Habashneh-Brooks.

"Customers appreciate its ability to monitor and report power data that can help them protect their assets," she says. "This unit can monitor and locally record power data — like sags, swells, and phase imbalance and loss — and reports to a SCADA system."

Habashneh-Brooks says that customers also like that even if they lose communication with SCADA, the SEL-2411P will keep a record of events and alarms on its internal memory. Some customers are even using the unit to lower electrical bills by programming demand periods into the device to avoid using large pump resources during peak energy demand hours.

"This unit comes fully featured for most industry-standard applications but also has the flexibility to be customized by the user," says Habashneh-Brooks. "We offer free technical support to assist with first-time setup and customized features to meet their specific needs." 509/336-2527; www.selinc.com



SEL-2411P pump automation controller from Schweitzer Engineering Laboratories

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are the greatest
resource at this plant.
They know it.
They've been here forever.
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I'm support staff.
I coordinate what they do,
and the best way for me
to do that is to listen to
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Operations and maintenance supervisor
Beloit (Wis.) Water Pollution Control
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industry news

Hach opens research and development facility and celebrates anniversary

Hach opened a new research and development facility in August, expanding its Loveland campus by more than 90,000 square feet. The new building houses work space for development teams and includes multiple testing and research labs. The company also marks its 70th anniversary in 2017. The company was founded in 1947 by Clifford and Kitty Hach.

Jones named as SEEPEX's next president

SEEPEX announced that Mark Jones will succeed Mike Dillon as company president. Jones will assume chief executive responsibilities in the fourth quarter of this year. He was most recently vice president of engineering and marketing at NORD Gear Corp.



Mark Jones

Gorman-Rupp Co. announces new account

Gorman-Rupp Co. announced Riggs Rental as its newest rental customer, and it will also become a construction and agricultural distributor for the state of Arkansas. Riggs Rental has eight locations in the state.

Water-Right hires new regional sales manager

Water-Right announced the hiring of Brad Walsh as regional sales manager for the Southeast. He will be responsible for the growth and business management of Florida, Georgia, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.



Brad Walsh

HD Supply Waterworks changes name

HD Supply Waterworks announced it is changing its name to Core & Main, effective immediately. The company, previously a division of HD Supply, currently employs about 2,900 associates at 246 branch locations throughout the U.S.

Anue Water Technologies announces new vice president

Anue Water Technologies announced the selection of Tonya Chandler as vice president of sales and marketing. Prior to joining Anue Water Technologies, Chandler was the national sales manager for Veolia Water Technologies – Food and Beverage.



Tonya Chandler

LANXESS doubles membrane production capacity

LANXESS announced it has doubled its membrane production capacity at its plant in Bitterfeld, Germany. The company has been expanding its line of membrane elements since production began in September 2011. tpo

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people/awards

Ed Watt retired from the Hamilton County (Tennessee) Water and Wastewater Treatment Authority Board of Commissioners after 24 years.

The city of **Sandpoint** received a \$65,000 wastewater planning grant from the Idaho Department of Environmental Quality to help prepare a wastewater planning study.

The New Jersey American Water **Canal Road Water Treatment Plant** in Raritan received a 15-Year Directors Award from the Partnership for Safe Water.

The Minnesota **Bloomington and Normal Water Reclamation District** earned awards for two wastewater treatment facilities from the National Association of Clean Water Agencies. The **J Michael Callahan Southeast Wastewater Treatment Facility** received a Platinum Peak Performance Award, and the Howard Southerland West Wastewater Treatment Facility received a Gold Peak Performance Award.

The U.S. EPA Region 10 honored four Pacific Northwest communities for excellence in providing safe drinking water by using the Drinking Water State Revolving Fund program: **Stevens County (Mission Ridge), Washington; and Ashland, Baker City and Garibaldi, Oregon.**

Four **Clayton County Water Authority** water reclamation staff members were honored by the Georgia Association of Water Professionals. **Herlon Fayard, Shoal Creek Water Reclamation Facility** supervisor, received the William D. Hatfield Award. Life Member status for 30 years of service to the association went to **David Blackstock, Northeast Water Reclamation Facility** supervisor; **Dan Doss, W.B. Casey Water Reclamation Pelletizing Operation** plant supervisor; and **Chris Hamilton, water reclamation manager.**

Five wastewater treatment plants on the north Olympic Peninsula in Washington received 2016 awards for outstanding performance in 2016 from the state Department of Ecology: the **Clallam Bay Sewage Treatment Plant, the Sequim Water Reclamation Facility, the Clallam Bay Correction Center Sewage Treatment Plant, the Forks Wastewater Treatment Plant** and the **Port Townsend biosolids program.**

Deepthi Kalyanam, P.E., a Buchart Horn water resources specialist, received the Pennsylvania Water Environment Association Golden Manhole Society Award for promoting wastewater collections system understanding, operation and maintenance, training and continuing education.

Norma Camacho was named CEO by the Santa Clara Valley Water District Board of Directors. She had served as interim CEO since March 2016.

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

events

Oct. 30-Nov. 2

Alaska Rural Water Association Annual Training Conference, Sheraton Hotel & Spa, Anchorage. Call 907/841-2800 or visit www.arwa.org.

Oct. 30-Nov. 2

Water Infrastructure Conference & Exposition, Westin Galleria, Houston. Visit www.awwa.org.

Nov. 2-3

British Columbia Water & Waste Association Yukon Water and Wastewater Conference and Tradeshow, Kwanlin Dun Cultural Centre, Whitehorse, Yukon. Visit www.bcwwa.org.

Nov. 5-8

CIPHI Annual Education Conference, Sheraton Vancouver Airport Hotel, Richmond, British Columbia. Visit www.ciphi2017.ca.

Nov. 7-8

Nebraska Section AWWA Annual Conference, Younes Conference Center, Kearney. Visit www.awwaneb.org.

Nov. 7-9

Nebraska Water Environment Association and Nebraska Section AWWA Joint Fall Conference, Younes Convention Center, Kearney. Visit www.nebwea.org.

Nov. 8

Central States Water Environment Association-Minnesota Section Conference on the Environment, Minneapolis Convention Center, Minneapolis. Visit www.cswea.org.

Nov. 8-10

Water Environment Federation Design-Build for Water/Wastewater Conference 2018, Pennsylvania Convention Center, Philadelphia. Visit www.dbia.org.

Nov. 12-15

North Carolina Section AWWA and the North Carolina WEF Member Association Annual Conference, Raleigh Convention Center, Raleigh. Visit www.ncsafewater.org.

Nov. 12-16

AWWA Water Quality Technology Conference and Exposition, Oregon Convention Center, Portland, Oregon. Visit www.awwa.org.

Nov. 21-22

British Columbia Water and Waste Association SCADA Conference, Radisson Hotel Vancouver Airport, Richmond, British Columbia. Visit www.bcwwa.org.

Nov. 26-30

Florida Section AWWA Annual Conference, Omni Orlando Resort at Championsgate, Florida. Visit www.fsawwa.org.



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Director of Water Pollution Control,
City of Huntsville, Alabama

“In the wastewater industry, you have to have dependable equipment and suppliers. Wastewater doesn’t stop just because a pump goes down.”

“That’s why the City of Huntsville relies on Sulzer’s submersible pumps with the Contrablock Plus impeller. The pumps give our system great day-to-day performance with blockage protection we can really count on.”

“With 53 lift stations and 5 treatment plants, issues are inevitable. But when we need help, Sulzer and their distributor Hydra Service are always there to get us back up and running in the shortest time possible.”



Sulzer’s submersible sewage pumps type ABS XFP are built with regional manufacturing, including in the USA, and come with a comprehensive 5-year warranty for municipal applications.



Learn more about how Sulzer goes the extra mile at:
sulzer.com/extramile

SULZER

Jason Treat
Supervisor
Antioch WWTP
Antioch, IL



Operators EVERYWHERE Trust USABlueBook®

The team at Antioch's Wastewater Treatment Facility is proud to show off their new high-efficiency system. In 2008, Antioch broke ground on their new wastewater treatment facility, which was officially completed in 2011. "The old plant had just run its course," explained Jason Treat, Lead Supervisor.

Thanks to the new facility, Antioch sees itself in a great place going forward. Their use of the Biological Nutrient Removal treatment process has proved highly effective in many ways, including increased control of phosphorus levels. Jason shared that "chemical usage has been greatly reduced from the old facility. This provides huge savings for the citizens of Antioch!"

USABlueBook is dedicated to helping Jason and his team, whether it's through our extensive product selection or our unbiased technical support. "We got a new temperature gauge from you guys, and it's been great. Now we're only out here measuring the temperature about once a month," said Jason.

USABlueBook is proud to support the entire crew out in Antioch. Their commitment to increased facility efficiency shows a great deal of dedication to the folks in their community.

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