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Matt Seib  
Process and Research Engineer  
Madison, Wis.

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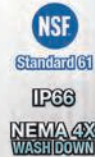
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**ON THE COVER:** Matt Seib goes to work each day focused not just on the quality of effluent leaving the Nine Springs Wastewater Treatment Plant but on how the plant can do even better. As a process and research engineer with the Madison (Wisconsin) Metropolitan Sewerage District, he works with colleagues on projects to enhance sustainability, recover resources, boost energy production and efficiency, and improve overall treatment performance. (Photography by Mary Langenfeld)

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let's be clear

## What World Will We Leave Them?

OUR WORLD FACES MULTIPLE CHALLENGES. SOLVING THEM FOR OUR KIDS AND GRANDKIDS REQUIRES NOT JUST TECHNOLOGY, BUT DILIGENT EFFORTS ON THE PART OF EVERYONE.

By Ted J. Rulseh, Editor



**O**n a warm April day 38 years ago, my first child, daughter Sonya, was born. The next day, I hiked a trail in a favorite park and, in a north-facing hillside, found the last vestige of winter's snow. My thoughts then revolved around what Sonya would be like and what kind of father I would be; I didn't ponder anything of cosmic significance.

Several years ago, Sonya gave birth to my grandsons, Tucker and Perrin. As I held each child for the first time, I pondered how as a grandpa I would fulfill the sacred and essential job of spoiling those two beautiful boys. Lately, though, my thoughts about them tend toward the cosmic side: In what kind of world will they live after I'm gone?

It's hard as a grandparent to rest easy and say, "The kids and grandkids will be fine." Consider that the world's population is now about 7.6 billion, projected to approach 10 billion by 2050. A basic question is whether our planet can provide food, water, clothing, housing and other necessities for that many people.

### TOWARD MIDDLE CLASS

A bigger question is whether it can support the middle-class lifestyles to which people in many now-impovertised countries aspire. They want to live in comfortable homes and have cars, nice clothing and thriving cities, just as we in the developed world do. Where will we get the wood for the houses? The metals for the cars and appliances? The fuel for heating and transportation?

Furthermore, how will we deal with the issues we face right now? Consider food. The United Nations says one in nine people today — that's 815 million — are undernourished. Turning to water, the UN says about 1.2 billion people live in areas of scarcity.

In our oceans, global fish stocks are being overexploited and depleted. In the Pacific, a swirling pile of trash has grown to twice the size of Texas. All over, coral reefs are dying from warming water and pollution.

You've heard about peak oil. What about peak phosphorus — one of three primary nutrients (with nitrogen and potassium) that crops need to grow? Most of the phosphorus farmers use today comes from mines, many of which are depleting. How will we feed a world of 10 billion people with inadequate phosphorus supplies?



## PROPHETS OR WIZARDS?

Then there's global climate change, about which volumes have been written and multiple alarms sounded. If all this sounds like doom and gloom, maybe it should, but all is not necessarily bleak. In addressing these concerns, two basic schools of thought are illuminated in a book, *The Wizard and the Prophet*, by Charles C. Mann.

Mann characterizes prophets as those who believe we must drastically curtail consumption of resources and limit our population. Their mantra, Mann says, is: Cut back! The wizards, meanwhile, are optimists who believe science and technology will help us maneuver through the challenges. Their mantra, Mann says, is: *Innovate!*

If we're going to solve real problems, perhaps we need to be a little bit of both. The prophet in us, for example, can encourage us to be less wasteful. Today in our society vast amounts of water, food, energy, paper and resources of all kinds are wasted every day. We all know commonsense ways to use resources more wisely and waste less.

As for the wizardry, solar and wind power have been made much more affordable. Electric and hydrogen-fueled cars are gaining momentum. Water? As *Treatment Plant Operator* readers well know, reverse osmosis and other technologies can make drinking water from wastewater. On the food front, scientists are working to impart to rice plants a new kind of photosynthesis that lets them grow with less water and fertilizer, yet produce more food.

For any of this promise to be fulfilled, we need to break political gridlock. Substantial progress requires individual action as well as big-government policies. The latter can't happen when two sides of the spectrum can't even agree on the objective realities. For example, how can we deal with global warming when some in power deny its existence?

Substantial progress requires individual action as well as big-government policies. The latter can't happen when two sides of the spectrum can't even agree on the objective realities.

## SCIENCE FOR GUIDANCE

So, what to do? To name one essential point: We need to trust science as a basis for sound policies. When I think of science, I liken it to flying an airplane in heavy, disorienting fog: You have to trust your instruments. There is an extremely high probability your instruments are right and a similar probability that your gut feel or intuition is wrong. Science is like those instruments, helping guide us through crises.

Meanwhile, in our own industry, we can do our part by advocating zealously for the government actions and the funding needed to restore water infrastructure, build new capacity where needed and support research to bring new, more effective and more efficient water treatment processes into the commercial sphere.

As individuals, we need to work in our communities in support of all manner of prophetic and wizardly endeavors. Our world can solve its problems. That world is us. It doesn't just take a village. It takes a human race. We can do it. For the sake of Tucker and Perrin, and your kids and grandkids, we have to.

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# No Stone Unturned

THE WISCONSIN VILLAGE OF SLINGER LOOKS TO PROCESS FINE-TUNING, PRETREATMENT AND ADAPTIVE MANAGEMENT TO MEET A TIGHTENING PHOSPHORUS LIMIT WITHOUT A PLANT UPGRADE

STORY: **Ted J. Rulseh** | PHOTOGRAPHY: **Michael McLoone**

**T**he Slinger (Wisconsin) Wastewater Treatment Plant will face a monthly average phosphorus limit of 0.075 mg/L in 2023.

Since the village (population 5,500) can't afford a multimillion-dollar plant upgrade, including the installation of tertiary filters, the operations team is attacking the challenge on multiple fronts, so far with considerable success. During 2018, the plant's effluent met the future limit during six out of 12 months.

The frontline in the battle is converting the three-ring oxidation ditch to biological phosphorus removal and then continuously fine-tuning the process. Down the line, there's the opportunity to limit phosphorus discharges to the receiving stream through bank stabilization projects under the state's adaptive management provision.

Then there's tackling the problem upstream by surcharging large entities that release substantial phosphorus, in the hope that they'll respond by changing their behaviors. Finally, there's the prospect of trading phosphorus credits with a neighboring city.

The process optimization effort has been underway for a little more than three years. Slinger's experience shows what smaller treatment plant teams can do to meet the increasingly strict phosphorus limits being imposed across the country. "Every year we've shown improvement," says Greg Moser, utilities superintendent. "We just need a little time."



Lab analysis lies at the heart of the Slinger team's efforts to reduce effluent phosphorus.

## SIMPLE DESIGN

Slinger, in southeast Wisconsin, built its treatment plant in 1980 with a 0.75 mgd design flow. A 2004 upgrade added a new headworks. In 2008 the plant received a capacity upgrade to 1.5 mgd. It included a new oxidation ditch (Evoqua Water Technologies), two new clarifiers and a UV disinfection system (TrojanUV3000Plus) to replace chlorine. In addition, an old clarifier was converted to a gravity thickener for biosolids, and a second biosolids storage tank was added, boosting total storage capacity to 1.8 million gallons.

Wastewater (0.8 mgd average flow) first passes through a mechanical bar screen (Andritz Separation) with a quarter-inch-hole perforated plate. The flow then enters a wet well and is pumped up to a PISTA Grit system (Smith & Loveless); the grit moves on to a Coanda washer (HUBER Technology). The liquid flow goes to the oxidation ditch, which uses disc aerators (Evoqua Water Technologies), and then to the secondary clarifiers, the disinfection system and on to discharge to a Rubicon River tributary.

Waste activated sludge goes through the gravity thickener and then into storage to await land application, handled by contractor Badger States Waste. The storage tanks have decant valves spaced every 3 feet of height; decant is fed back to the headworks.

The facility's excess capacity helps in optimizing the bio-P process, and so does a significant volume of holding tank waste and septage, up to 50,000



“ You really have to do the lab work. And you have to do the documentation, so you know that when a change is made, this is what you got.”

TIM PFEIFER

The team at the Slinger Wastewater Treatment Plant includes, from left, Joe Kell, utility operator; Greg Moser, utilities superintendent; and Silas Sopkowicz, Brian Hansen and Tim Pfeifer, utility operators.



## Village of Slinger (Wisconsin) Wastewater Treatment Plant

[www.vi.slinger.wi.gov](http://www.vi.slinger.wi.gov)

**BUILT:**  
1980, upgraded 2004, 2008

**POPULATION SERVED:**  
5,500

**FLOWS:**  
1.5 mgd design, 0.8 mgd average

**RECEIVING WATER:**  
Rubicon River tributary

**TREATMENT LEVEL:**  
Secondary

**TREATMENT PROCESS:**  
Oxidation ditch with biological phosphorus removal

**BIOSOLIDS:**  
Land-applied by contractor  
Annual budget: \$1.55 million (operations)

**ANNUAL BUDGET:**  
\$1.55 million (operations)



As part of reducing phosphorus in the wastewater, the aeration discs were turned off in part of the oxidation ditch and a small submersible mixer was installed.



gpd. That high-strength material helps provide the volatile fatty acids that the bio-P microorganisms need. “We can take grease trap waste to a certain extent, and that’s another source of VFAs,” Moser says. “But too much of that and we get filamentous growth and other problems.”

## CONTROLLING PHOSPHORUS

The effort to meet the phosphorus limit began before the first adjustment at the plant. The state Department of Natural Resources at first proposed a phosphorus limit of 0.04 mg/L on the grounds that the Rubicon River flows into Pike Lake, a largely spring-fed lake with a state park on its shoreline.

Through extensive testing in the stream, the village documented that the phosphorus in the plant’s effluent was so diluted on its journey that the stream was restored to background levels by the time it reached the lake several miles downstream. “To the DNR’s credit, they accepted our data and relaxed our limit to 0.075 mg/L,” Moser says. Until 2023, the limit is 1.0 mg/L.

The work on effluent phosphorus began in 2016 after Moser and Tim Pfeifer, utility operator, attended a three-day DNR-accredited seminar given by Greg Paul of Op2Myz, a company based in Texas with a specialty in helping clean-water plant operators troubleshoot and optimize biological nutrient removal processes. “Our eyes lit up,” Moser says. “A lot of what he taught fit our situation. We came back with a whole bunch of ideas.”

Since then, one by one, they have put them to work, on a trial-and-error basis, backed by rigorous lab analysis. “You really have to do the lab work,” Pfeifer says. “And you have to do the documentation, so you know that when a change is made, this is what you got. And then look at trends to know what happened over a period of time.”

## STEP BY STEP

Moser notes that the oxidation ditch provides flexibility to test var-

---

Greg Moser climbs a tank of polyaluminum chloride (Chemtrade), which is fed into the oxidation ditch. This is one of several measures the Slinger team has taken toward driving down effluent phosphorus.

“In this entire process we’ve been told that a lot of things we want to try aren’t going to work. We’ve been paddling upstream against most advice.”

TIM PFEIFER

ious methods of bio-P optimization. One of the first steps was to install an ORP probe in the outer ring, where the influent enters the system, and tie it to the SCADA system. “That gave us our snapshot of whether we were getting the environment we wanted for those bio-P bugs,” Moser says.

A next step was to revisit the addition points for coagulant chemical that enhances settling and removes phosphorus-bearing particulate in the clarifiers. Traditionally, alum had been injected into the return activated sludge stream introduced in the outermost ditch ring.

“We decided to try adding it in the middle ring,” Moser says. “That showed marginal improvement. Then we tried the inner ring. Ultimately, we landed at the splitter box at the center of the oxidation ditch, right before the flow splits to the two clarifiers. Just changing the chemical addition point was very beneficial.”

At present, the team adds Hyper+Ion 1997 poly-aluminum chloride (Chemtrade) at the splitter box. “In the past we played with dual addition points,” Moser adds. “We had good results adding the Hyper+Ion 1997 in the middlemost ring and aluminum chlorohydrate in the splitter box, but that was a little diffi-

cult to maintain in winter. We may try it again in warmer weather to see if we can duplicate the results.”

The team also replaced the original chemical feed pumps with Tacmina Smoothflow pumps and variable-frequency drives to deliver more finely tuned dosing. The pulsefree nature of the Smoothflow pumps helped deliver a consistent flow that blended earlier in the process, reducing the amount of chemical needed.

Another process adjustment is the addition of lime to the outer ditch ring at about 100 pounds per day. That amount doesn’t meaningfully affect pH. Its main benefit is to aid in coagulation and so enhance settling; it also helps

## WORKING UPSTREAM

The Slinger (Wisconsin) Wastewater Treatment Plant team doesn’t limit its lab testing to the process stream. Regular sampling in the collections system is part of the team’s effort to bring down effluent phosphorus.

“We have 30-some sites where once a month we take grab samples and analyze them for phosphorus,” says Tim Pfeifer, utility operator. “That way we see where our problem areas are.” In 2018, the village instituted a surcharge of \$19 per pound of phosphorus on entities that discharge more than 6 mg/L.

A large service station and convenience store is among those surcharged; plant team members suspect the store personnel dump expired milk down the drain, leading to phosphorus spikes.

The team hopes that in time the large contributors will establish some form of pretreatment instead of paying the surcharges. To date, that hasn’t happened, but Pfeifer observes, “Anything we can do upstream helps. A lot of times we have things reversed. We tend to think we can fix things at the plant because the municipality has the money. But really, the issue is upstream. Keep it out before it gets to the plant.”

## HOW EFFICIENT IS YOUR AERATION REALLY?



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Joe Kell adds lime to the oxidation ditch twice a day as another technique for phosphorus reduction.

oxidize BOD. “The problem right now is that we’re dumping it in bulk,” Pfeifer says. “It works, but it would be better to meter it in.”

### video profile



To learn more about the Village of Slinger (Wisconsin) Wastewater Treatment Plant, watch a video profile at [www.tpomag.com](http://www.tpomag.com)

### SPLITTING THE RAS

“We were encouraged with the results we were getting, and then Tim did some further research,” Moser says. “Typically we sent the return from the clarifiers to the outermost ditch. Tim suggested we try splitting the flow, sending some of it to the middle ditch.”

The outer ring of the ditch, with a roughly 24-hour detention time, essentially functions as an equalization basin and anaerobic system. In the initial stage, the wastewater is stirred slowly by a two-blade submersible mixer (Flygt - a Xylem Brand); the surface aerators run about 95% of the time, but most of the discs have been removed. At the next set of aerators, all the discs are in place but run only about 10% of the time.

The flow becomes increasingly anaerobic as it moves around that first ring. By the time it hits the middle ring, the ORP typically measures about -300. The middle ring functions as an anoxic zone with relatively aggressive mixing; the flow there steadily picks up oxygen. The inner ring is entirely aerobic and provides the bulk of BOD and ammonia removal.

The diversion of some RAS from the outer ring serves to help keep that ring more anaerobic and enhance bio-P removal. “We weren’t seeming to get to the low ORP numbers we needed in the outer ring,” Pfeifer says. “We couldn’t get it below -200, when the wheelhouse for our plant is really -250 to -350.”

He cites research showing that bio-P microorganisms are not strictly anaerobic. “Because we have a long sludge age, it’s likely we’re accumulating nitrate. The aerobic bugs will use that as an oxygen source when they

### Slinger Wastewater Treatment Plant PERMIT AND PERFORMANCE

	INFLUENT*	EFFLUENT*	PERMIT**
<b>BOD</b>	258 mg/L	3.4 mg/L	15 mg/L
<b>TSS</b>	299 mg/L	3.8 mg/L	225 pounds/day January, March, May, July, August, October, December 249 pounds/day February 233 pounds/day April, June, September, November
<b>Ammonia</b>	13.64 mg/L	0.04 mg/L	2.6 mg/L April 1.0 mg/L May-September 3.6 mg/L October 4.1 mg/L November-March
<b>Total phosphorus</b>	6.0 mg/L	0.085 mg/L	1.0 mg/L

\* Annual averages \*\* Monthly averages

“Every year we’ve shown improvement. We just need a little time.”

GREG MOSER

are starved. So now we’re sending about one-third of the RAS to the outer ring and two-thirds to the middle ring. That seems to allow enough return of anaerobic bugs, but not too much return of nitrates that would kill the bio-P system.”

### BEYOND THE PLANT

Work on the plant process continues. One modification being explored is to change the coupling of the disc aerator shafts. At present, the middle and outer ring aerators are coupled. “It would be better to have the middle and the inner ones hooked together because that’s where we want to be introducing air,” Pfeifer says.

Meanwhile, Moser and his team are looking to stream bank stabilization to take another bite out of the phosphorus load to the Rubicon River. “We’ve located a couple of sites that could benefit and could give us a few pounds of phosphorus per year,” Moser says. “Even if it’s 20 to 25 pounds, that might suffice; we feel we are that close right now.”

The journey has been challenging but also exciting. “In this entire process we’ve been told that a lot of things we want to try aren’t going to work,” Pfeifer says. “We’ve been paddling upstream against most advice. There is a resistance to anything new. That’s a human condition, and in our industry it’s even more profound.

“The big cities can do what they want. They can hire legal teams to fight the regulation, or they can throw resources at meeting it. We can’t do that here. Our approach is an option for smaller communities and plants that are cash-strapped. We can see day to day the little changes we make and how they affect things.” **tpo**

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Water-saving landscape education traditionally was limited to xeriscaping designs with mostly cactus and rocks. The WaterSmart contest promotes alternative water-conserving landscapes that are inviting and colorful.

# Beyond Xeriscaping

A LANDSCAPE CONTEST AMONG CALIFORNIA UTILITIES ENCOURAGES RESIDENTS TO REPLACE LAWNS WITH WATER-SAVING PLANTS AND FLOWERS

By Sandra Buettner

Most of the water use in Southern California goes to urban landscapes. That's why the Vista (California) Irrigation District and other San Diego region water agencies sought ways to promote water efficiency through California-friendly landscape design.

In the process, Vista district staff discovered that four other San Diego County water agencies had created a contest to promote the beauty of lower-water-use landscapes. Word about the success of that quickly spread to a dozen other water agencies that had the same objective.

The WaterSmart landscape contest, now in its 15th year, promotes the beauty of water-saving landscapes and rewards homeowners who chose to install them.

## MORE THAN CACTI

The idea for the contest took root in 2004, when utility leaders discovered there were few good examples of attractive, water-saving landscapes for the public to emulate. Before the contest began, water-saving landscape education was limited to xeriscaping designs, which included mostly cactus and rocks.

"The WaterSmart contest helped to promote alternative landscape designs that were inviting, colorful and beautiful and offered residents another option besides xeriscaping," says Brent Reyes, water conservation specialist for the district. "The majority of our customers were not interested in this desert-style look for their yards."

With a population of about 133,000, the Vista Irrigation District serves 28,600 accounts. It promotes the contest annually through its website, a newsletter, door hangers and direct mail, along with flyers at nurseries.

## RULES OF ENGAGEMENT

The contest starts every year on Jan. 1, and the entry deadline is April 26. Entrants must be residential customers of one of the 13 participating San Diego County water agencies and must submit an entry form and pictures of their landscapes, preferably before and after shots. Residents who replace lawns with WaterSmart landscaping are eligible to receive a rebate of \$2 per square foot up to 5,000 square feet for the area they transform. The rebates are provided by the Metropolitan Water District of Southern California.

Entries are judged on overall attractiveness, plant selection, design, appropriate maintenance and efficient methods of irrigation. Plants must be well maintained and weeds kept to a minimum. Landscapes must be able to thrive with less water, have adequate plant coverage using permeable soils and take advantage of features like shade, microclimates and low-lying flood areas.

Designs range from simple to elaborate, but all are judged by the same criteria. Some residents hire contractors to create their landscapes, and others do the work themselves with help from neighbors and friends.

Some agencies have board members who judge the entries and some use agency staff. The first-place winner receives a \$250 gift certificate to a home-



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Some winning entries in the WaterSmart landscape contest.

“The WaterSmart contest helped to promote alternative landscape designs that were inviting, colorful and beautiful and offered residents another option besides xeriscaping.” **BRENT REYES**

supply or gardening store. All winners' photos are displayed at various locations for the public to view. The winning entries also are promoted through news releases, agency newsletters, websites and social media.

## HAPPY TRAILS

Many entrants have removed grass lawns and replaced them with WaterSmart plants and flowers, adding beauty, variety and color to their neighborhoods. One entrant made paths throughout the new landscape by pouring colored concrete and forming it into pavers in different shapes and sizes. Each paver was handcrafted before being placed in the ground.

Residents who have replaced their lawns with WaterSmart landscapes

have seen, in most cases, an estimated 20% to 40% reduction in water usage and therefore lower water bills. Last year, more than 100 entries were received by the 13 water agencies taking part in the contest.

Some residents have shared in the spoils of their winning neighbors: When the perennial water-saving plants become overgrown, entrants share them with people next door to help them transform their own yards.

“The contest has been a wonderful way to connect with our customers,” Reyes says. “It has also enabled participants to connect with their neighbors. Many of the winners have had people in their neighborhood follow along with their landscape installations. Some have even changed out their own landscaping after seeing how well the contest winners' landscapes turned out.” **tpo**

## What's Your Story?

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

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## A COOL CAREER

### Retiring After 43 Years

Craig Lawniczak graduated from high school in 1975 and wasn't sure what to do next. After a leisurely summer, he applied to his local wastewater treatment plant in Green Bay, Wisconsin, embarking on a 43-year career that challenged him, rewarded him and provided him with plenty of income for a good living.

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## THE GODFATHER OF CONSTRUCTED WETLANDS

### Recognizing a Great Mind

You may not have heard the name Robert Gearheart, but it's not for lack of achievement. He's been too busy doing groundbreaking research and building new effluent wetlands to gain recognition the way a traditional academic might. Gearheart — a retired emeritus professor — recently was awarded by the Environmental Law Institute for excellence in scientific research.

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## OPERATOR RETIREMENTS

### Utilities Can Ride the Wave

Forty years ago, a surge of resources and new recruits flooded the treatment industry due to the Clean Water Act amendment.

Now, that generation of operators is rapidly nearing retirement age, which will leave behind a major vacuum in the industry workforce. Some utilities, like Lancaster Area (Pennsylvania) Sewer Authority, are none too worried, however, due to the steps they've taken to secure new operators.

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# Devoted to Training

TO JOE CRIBBS, NOTHING IS MORE SATISFYING THAN SEEING WATER OPERATORS HE TAUGHT REACH NEW LEVELS OF PROFESSIONAL CERTIFICATION

STORY: **Steve Frank**

PHOTOGRAPHY: **Denny Medley**

Like many people in the world of water, Joe Cribbs didn't come into the field straight out of high school. In fact, the way he got into water was "kind of roundabout."

Cribbs is an online analyzer technician with WaterOne in Johnson County in northeastern Kansas. The analyzers he works with and maintains provide critical data for process control and compliance for WaterOne treatment facilities.

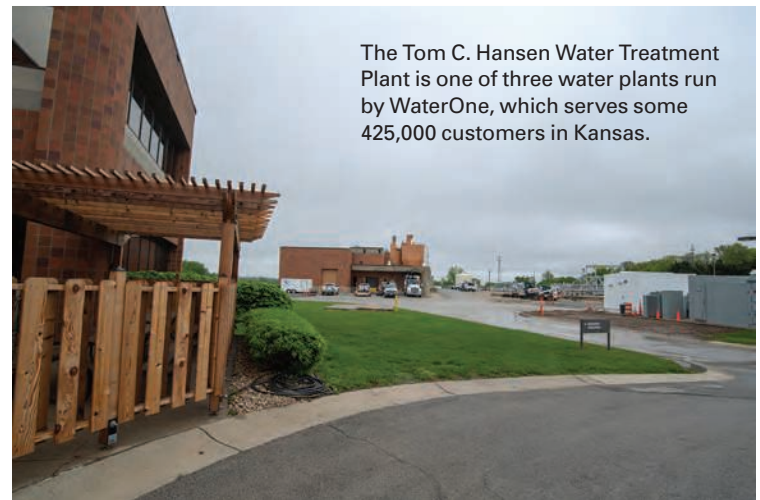
The analyzers look at pH, conductivity, hardness, alkalinity, turbidity, ammonia, fluoride and other parameters. Most of them report data to a SCADA system in the raw water control room for the three water treatment facilities run by WaterOne — which, with 425,000 customers, is the largest water utility in Kansas.

Cribbs grew up in Lawrence, where he went to elementary and high school and met his wife of 43 years. In 1980, he went to work as a boiler operator at the Sunflower Army Ammunition Plant near De Soto. He got his early water treatment experience there, treating boiler water.

The plant shut down in 1993, and Cribbs found himself needing a job. So he went to work at the City of De Soto that same year as a water and wastewater operator.

## MORE TRAINING

Cribbs worked at De Soto for several years as he progressed to water and wastewater superintendent. Feeling a need for more training in the water field, he began



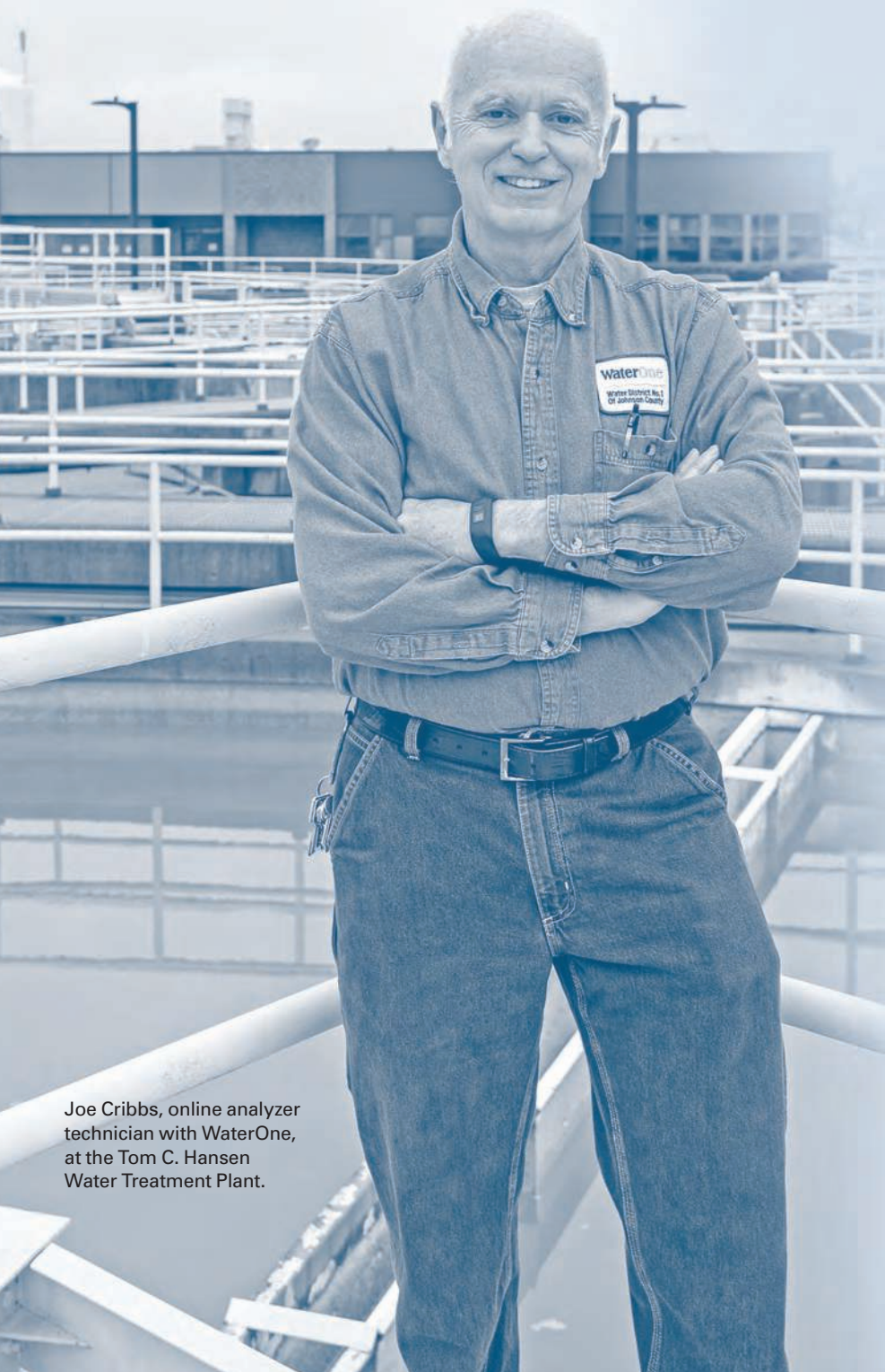
The Tom C. Hansen Water Treatment Plant is one of three water plants run by WaterOne, which serves some 425,000 customers in Kansas.

taking classes at nearby Fort Scott Community College, earning an associate degree in environmental water technology. He also earned his Kansas Class IV certifications in water, wastewater, collections system and distribution system.

The degree and certifications "really opened the door for me, and I eventually started teaching for Fort Scott," Cribbs says. He found the Fort Scott program both broad and deep, providing good preparation for him. "It's a growing industry," he says. "When I started, there were a lot of middle-aged and older people in the courses. Now I'm seeing people in their late 20s to mid-40s. They're younger than when I first got into it."

“One of the most fulfilling things to me is when an operator who has been struggling to learn can take that next step and pass that next certification.”

**JOE CRIBBS**



Joe Cribbs, online analyzer technician with WaterOne, at the Tom C. Hansen Water Treatment Plant.

## MAKING MUSIC

Besides heading the men's group at his church, Joe Cribbs is a musician. He plays banjo and guitar for worship on Sundays. "I have a lot of fun with that, and I enjoy being part of that worship team," he says. "We play contemporary Christian music, the kind you'll hear on almost any Christian radio station."

He got his start in music as a teenager. He wanted a guitar and lessons when he was 14, but his mom told him they couldn't afford it. Then she gave him an old ukulele and told him if he learned to play it, she'd see about getting him guitar lessons.

So he learned to play that ukulele — "three or four songs" — and his mom kept the bargain. With his lessons, he learned rhythm guitar and bass, and he played in a gospel group led by his aunt and uncle. Now his church group wants him to play lead guitar. Cribbs chuckles. "I've never done that, so it's pushing me. I've just got to get those fingers working."

Joe Cribbs,  
Johnson County, Kansas

**POSITION:**

**Online analyzer technician with WaterOne**

**EDUCATION:**

**Associate degree, environmental water technology, Fort Scott Community College**

**CERTIFICATIONS:**

**Class IV water operator, Class IV wastewater operator, Class IV collection systems operator, Class IV distribution systems operator**

**AWARDS:**

**Kansas Section of the American Water Works Association Operator Meritorious Service Award**

**AFFILIATIONS:**

**Northeast Kansas AWWA Operator Training Committee**

**GOAL:**

**Help Kansas water operators be successful**



Joe Cribbs checks the 9210p Online TOC Analyzer (OI Analytical, a xylem brand) in the Tap 1 analyzer room.

“Because we cover several different areas, I stay busy studying to keep up my knowledge of the industry.”

**JOE CRIBBS**

Training Committee for four years now, along with about a dozen other water people. The committee meets once a month and produces about five training workshops a year.

“When I first started out, I didn’t intend to get that involved in training,” Cribbs says. “But I enjoy interacting with people, and I saw the need for the training after my experience in Florida. One of the most fulfilling things to me is when an operator who has been struggling to learn can take that next step and pass that next certification.”

Although it doesn’t happen often, occasionally someone will come up and thank him for help in climbing the certification ladder: “It’s fulfilling to me to hear them say that.”

By 2003, Cribbs was feeling a bit of wanderlust and moved with his family to Florida. There he learned about reverse osmosis, among other things, but he didn’t find good training: “What opportunities they had were few and far between. People had a hard time passing the certification exams.”

### FRIENDS HELPING FRIENDS

Florida did not offer certification reciprocity with Kansas, so Cribbs had to take his certification exams again. When he passed his certification the first time he took the exam, friends were surprised. They had taken the exams three and four times and still not passed.

So Cribbs started helping friends prepare for their exams. He moved back to Kansas a few years later, and his Florida experience helped nudge him toward getting involved with training and the Kansas Section of the American Water Works Association. He’s been a member of the Northeast Kansas AWWA Operator

Cribbs helps train and mentor his own team members, like analysis technician Mark Marston (right) as well as operators around Kansas.





Training of Kansas treatment plant operators is a passion for Joe Cribbs.

“When I started, there were a lot of middle-aged and older people in the courses. Now I’m seeing people in their late 20s to mid-40s.”

JOE CRIBBS

### EARNING RECOGNITION

The Kansas Section of the AWWA recognized his contribution, naming him a winner last year of the Operator Meritorious Service Award, presented at the annual conference of the Kansas Section of the AWWA and the Kansas Water Environment Association. One criterion for the award is that the winner must demonstrate special efforts in training Kansas treatment plant operators.

Cribbs and his fellow training committee members put together workshops in different places around the state, particularly in northeastern Kansas. He and a few other members have traveled extensively, volunteering their time to bring training to operators. Sometimes, committee members do presentations, but they often bring in subject matter experts from outside Kansas.

In addition to his duties with WaterOne and the Operator Training Committee, Cribbs teaches at Fort Scott. “Because we cover several different areas, I stay busy studying to keep up my knowledge of the industry,” he says. The program includes maintenance, water and wastewater treatment,

utility management, collections and distribution. The college offers 16-week courses and two-day workshops.

Cribbs lives in Eudora and commutes to his job at WaterOne in Johnson County. In his spare time, he likes to run. “About 10 years ago, I noticed I was putting on weight and was out of shape,” he says. So he started to run again. He has done several half-marathons and recently completed his first full marathon since he was in his 30s.

During his layoff from running, he coached Little League and did other “dad things” with his wife and four children. He also has 11 grandchildren. Cribbs is active in his church as well, where he’s head of the men’s ministry. He’s planning a fishing trip for the men’s group this summer. Maybe that’s another teaching opportunity.

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The Corvallis (Oregon) team identified some 60 potential energy-saving projects and then sorted them according to priority.

# On the Hunt for Savings

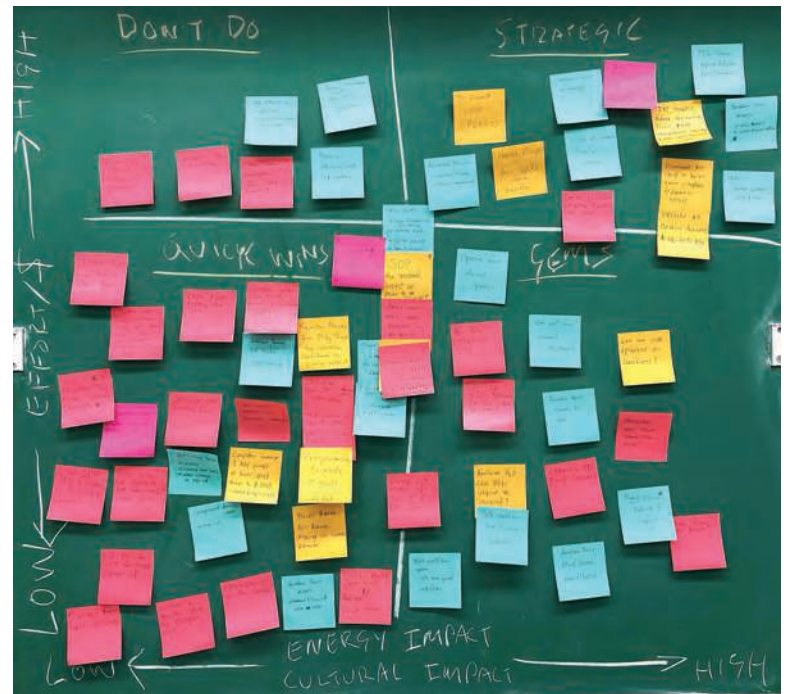
A TREASURE HUNT CONDUCTED BY TEAM MEMBERS DIGS UP SUBSTANTIAL ENERGY-SAVINGS OPPORTUNITIES AT THE CORVALLIS WASTEWATER RECLAMATION PLANT

By Patrick Rollens

On a gray day in January, workers at the City of Corvallis (Oregon) Wastewater Reclamation Plant fanned out across the facility, carrying notebooks and flashlights.

Their goal: to identify operational improvements that could yield significant energy savings and improve sustainability. This Treasure Hunt was organized by the Public Works Department through a partnership with the Energy Trust of Oregon Strategic Energy Management program, which encourages large municipal utilities to reduce energy usage.

The wastewater reclamation plant, on the east side of Corvallis along the Willamette River, is one of the largest electricity users in the city. Plant work-



ers challenged themselves to find energy savings equivalent to 5% of the facility's total energy usage, which equates to approximately 223,000 kWh annually — no small feat at a facility that runs 24 hours a day and treats 4 billion gallons of wastewater annually (about 11 mgd).

## THOROUGH APPROACH

The energy savings initiative was led by Bob Esch, James Green, Max Hildebrand and Tom Hubbard. During the Treasure Hunt, team members examined systems and procedures throughout the plant, asking tough questions and thinking outside the box whenever possible.

In one example, team member Gabe Clark identified a large 5 hp air compressor that was set to run automatically for about 70 hours each week to provide compressed air for actuating a series of control valves. These valves are used to flush out a set of four quadrants in the bottom of an anaerobic digester. Line flushing minimizes grit buildup in the digester.

A closer examination showed that this compressor could be replaced by a smaller 1.6 hp unit running fewer hours to achieve the same goal. Annual savings from this change could reach \$800 with a payback time of roughly six months.

## DIGGING DEEPER

Workers identified dozens of other energy saving opportunities, large and small. Some, like swapping out the air compressor, represented quick wins. Others will

Plant operators James Green and Bob Esch were among the leaders of the energy-savings Treasure Hunt at the Corvallis treatment facility.







One project replaced this 40 hp compressor with a lower-powered unit, achieving a payback of six months from energy savings.

“The goal of the program was to change the culture and optimize the systems and equipment we already have. We’re looking at things through a new filter and breaking the old ways of thinking.”

**JAMES GREEN**

require more extensive work to implement, but the potential payoffs are more substantial. Some may even qualify for grants from the Energy Trust of Oregon. In all, the workers identified more than 60 potential energy-savings projects. Among them:

- **Optimize reclaimed water usage.** By reducing the amount of reclaimed water used, the staff can operate using just one 40 hp pump, eliminating a second identical pump.
- **Optimize aeration basin blower usage.** By modifying the operating strategy used for the aeration basin and by replacing air piping that had leaks, the staff is able to use one blower instead of two, saving 60 to 75 hp, depending on which blower is running.
- **Optimize the grit pumping strategy.** Modification of the grit pump timers enabled a reduction of up to 50% in pumping times, saving 10 hp.
- **Optimize the primary sludge pumping strategy.** Modification of the sludge pump timers enabled a 5% reduction in pumping time.

## OTHER PERSPECTIVES

“The goal of the program was to change the culture and optimize the systems and equipment we already have,” says Green, a plant operator. “We’re looking at things through a new filter and breaking the old ways of thinking.”

The Corvallis team members were joined by public utility employees from Albany and Salem who had gone through their own Treasure Hunts. Inviting neighboring agencies encouraged everyone to take a fresh look at long-standing practices.

City officials praised the leadership and buy-in shown by the participants. “I was really impressed by the energetic and enthusiastic teamwork I saw during the Treasure Hunt,” says Hubbard, Utilities Division manager. “Staff members were engaged and excited to make a difference, both for their co-workers and for the Corvallis community.”

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This was the second energy-reduction initiative undertaken recently in Corvallis. Last year, workers at the Taylor Water Treatment Plant conducted a Treasure Hunt that identified 37 potential energy reductions. That program wrapped up with a 5.5% reduction in overall plant energy usage, representing \$17,000 in annual savings.

## ABOUT THE AUTHOR

Patrick Rollens ([patrick.rollens@corvallisoregon.gov](mailto:patrick.rollens@corvallisoregon.gov)) is public information officer with the City of Corvallis, Oregon. **tpo**

## Share Your Ideas

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# Propelling Progress

MATT SEIB APPLIES RESEARCH TO HELP THE MADISON METROPOLITAN SEWERAGE DISTRICT MAKE STRIDES IN SUSTAINABILITY, ENERGY EFFICIENCY AND PROCESS PERFORMANCE

STORY: **Ted J. Rulseh**

PHOTOGRAPHY: **Mary Langenfeld**

**M**att Seib goes to work each day focused not just on the quality of effluent leaving the Nine Springs Wastewater Treatment Plant, but on how the plant can do even better in the future.

As a process and research engineer with the Madison (Wisconsin) Metropolitan Sewerage District, Seib works with colleagues on projects to enhance sustainability, recover resources, boost energy production and efficiency, and improve overall treatment performance.

In three and a half years with the district, he has worked to improve an innovative nutrient recovery process, increase activated sludge treatment efficiency, investigate co-digestion of food waste to boost biogas production, explore elevating biosolids from Class B liquid to a more versatile Class A product, and more.

He came to the position well equipped, with a Ph.D. in civil engineering. The following fall, he received his Professional Engineer credential. His industry peers have noticed his contributions: He was recognized in 2018 as the Outstanding Young Professional of the Year by the Central States Water Environment Association and as Newcomer of the Year by the Wisconsin Wastewater Operators' Association.

Alan Grooms, operations manager and Seib's predecessor as process and research engineer, observes, "The district has supported research for three or four decades at least. Not all projects pay off, but even some that do not can save you from making high-dollar mistakes down the road. Matt is certainly meeting expectations. He's been very valuable with the research work we're doing to evaluate future processes."

---

Matt Seib, process and research engineer, Madison (Wisconsin) Metropolitan Sewerage District



Seib and University of Wisconsin-Madison undergraduate Morgan Keck discuss an ammonia measurement from one of the district's pilot plants.

“It became clear after a few classes that structural engineering was not my strength or my interest. Environmental engineering and wastewater were much more my thing.”

MATT SEIB

Matt Seib, Ph.D., P.E.,  
Madison (Wisconsin)  
Metropolitan Sewerage District



**POSITION:**  
Process and research engineer

**EXPERIENCE:**  
8 years in the industry

**EDUCATION:**  
Bachelor's degree, civil engineering, University of Wisconsin-Platteville; master's degree, environmental engineering, Michigan Technological University; Ph.D., civil engineering, Marquette University

**CERTIFICATIONS:**  
Operator in Training Wastewater Operator

**AWARDS:**  
2018 Outstanding Young Professional of the Year, Central States Water Environment Association; 2018 Newcomer of the Year, Wisconsin Wastewater Operators Association

**GOAL:**  
Advance sustainable practices and design to recover more water, nutrients and energy



The Madison Metropolitan Sewerage District serves 26 customer communities covering 184 square miles and a population of 380,000.



Matt Seib and operations team colleagues are constantly on the lookout for ways to improve performance at the Nine Springs treatment facility.

## CHANGING COURSE

Seib, a native of Waukesha in southeastern Wisconsin, enrolled at the University of Wisconsin-Platteville to study structural engineering. “It became clear after a few classes that structural engineering was not my strength or my interest,” he recalls. “Environmental engineering and wastewater were much more my thing.”

“What really drew me to that area was the double idea of helping to protect the environment and public health while also being able to do things like apply anaerobic digestion to recover resources from waste and use them beneficially. I liked the idea that I could take something that had no value and make value out of it.”

After earning his civil engineering degree at UW-Platteville, he went on to complete a master’s in environmental engineering at Michigan Technological University, in the process

spending two years in the Peace Corps in Mali in West Africa, as a water and sanitation engineer under the Master’s International program.

While completing his Ph.D. in civil engineering at Marquette University, he worked as a research assistant with the university’s Water Quality Center, investigating low-energy alternatives to activated sludge, evaluating different fixed-film anaerobic bioreactor configurations and performing energy audits to compare the energy demands of wastewater process equipment.

On completing his degree, he was drawn to his current position with Madison Metropolitan Sewerage District: “It was a way to be engaged in the higher-level aspects of engineering with research but also be involved in day-to-day problem-solving. It was a chance to take my knowledge and use it.”



## TOWARD BETTER BIOSOLIDS

The Madison (Wisconsin) Metropolitan Sewerage District has one of the nation’s oldest and most successful biosolids recycling programs, but there’s no reason it can’t be better. Matt Seib, process and research engineer, and colleagues are looking at enhancements.

For many years, the district has applied its liquid Class B biosolids, called Metrogro, to cropland. “But it’s becoming more challenging every year because we’re having to haul it longer distances, our equipment is starting to age and there are issues with phosphorus application on fields,” Seib observes.

The team has pilot-tested dewatering to produce a Class A cake product, but so far it hasn’t lent itself well to spreading on land. “We’re exploring how we can turn that into something people will really want,” Seib says. “Because we do bio-P here, our biosolids have a pretty high phosphorus content, and that could be a problem for farmers, who would be overapplying phosphorus if they used our cake.

“We’ve looked at composting it with wood chips, bedding straw or crop residues to see if we can create a material that has the right handling properties and the right nutrient balance. If we can compost it with other material and balance the carbon, nitrogen and phosphorus ratio, then we’ll have a final product that’s easier to use and has wider applications.”

Seib with UW-Madison Ph.D. student Rachel Stewart (right) and post-doctoral researcher Rania Bashar, reviewing the results of a settling test from a pilot plant.

He works closely with operations group team members including Aaron Dose, operations supervisor; Matt Allen, assistant operations engineer; Matt Erbs, process control system programmer; Drew Suesse, regulatory and process engineer; and Eric Dundee, director of wastewater operations and reliability.

### PROGRESSIVE FACILITY

The Nine Springs plant (57 mgd design, 42 mgd average) has 30 aeration basins and uses an enhanced biological phosphorus removal system with two process configurations.

The plant's activated sludge facilities consist of two complexes. The east complex includes 18 aeration basins configured as six three-pass aeration trains with 11 secondary clarifiers. The west complex includes 12 aeration basins configured as four three-pass aeration trains with eight secondary clarifiers.

Both complexes operate an enhanced bio-P process. Most of the plant, except for two treatment trains in the east complex,

“Matt is certainly meeting expectations. He's been very valuable with the research work we're doing to evaluate future processes.”

ALAN GROOMS

use the modified University of Cape Town process. In this configuration, wastewater enters an anaerobic zone where it is combined with mixed liquor from the downstream anoxic zone.

Return activated sludge is pumped to the anoxic zone, where nitrate is reduced to nitrogen gas before a portion of the mixed liquor is pumped to the upstream anaerobic zone. Flow from the anoxic zone that is not returned goes to the aerated zone for BOD removal and nitrification. The modified UCT configuration maintains the integrity of the anaerobic zone by denitrifying the RAS in the anoxic zone before it enters the anaerobic zone, and so improves phosphorus removal.

Two treatment units in the east complex use the anaerobic/aerobic process, which includes an anaerobic zone upstream of an aerated zone and does not have a nitrified mixed liquor recycle.

### TACKLING A PROBLEM

The Nine Springs plant was among the first in the world to deploy the Ostara Nutrient Recovery Technologies nutrient recovery process, which captures phosphorus from waste activated sludge before thickening and from biosolids dewatering filtrate and converts it to pellets that can be marketed as a phosphorus-rich struvite fertilizer. Working with a first-generation technology, plant staff encountered several challenges with achieving the desired struvite yields as they gained familiarity with the process. Seib and colleagues went to work troubleshooting and fine-tuning the process to optimize the struvite yield.

“One thing I worked on was finding a way to minimize scale in the system,” Seib says. “We produce struvite as pellets, but we also get struvite scale in the process that needs to be cleaned out.” That means

soaking the reactors overnight in a low-pH solution to redissolve the scale.

“We had been using powdered citric acid, taking 10 to 12 sacks up to the tops of the reactors — about three stories off the ground — and pouring it in,” Seib says. “There were issues with material handling and safety that we weren't particularly comfortable with.”

Testing determined that the same amount of acetic acid would dissolve more scale, and at a lower cost. The next step was to find a safe way to introduce the acid to the reactors. The answer was a pumping system that lets operators deliver the acid without climbing the reactors and with minimal risk of spilling or spraying.

### IMPROVING AERATION

Lately, Seib devotes most of his attention to a pair of pilot treatment plants being used to explore energy-saving low-dissolved-oxygen options in

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the activated sludge process. “One option is basically to mimic our current setup and see how low we can turn the air down and still get good treatment,” he says. The other is an innovative process called nitrite shunt, recommended by a consultant as part of facility planning for future upgrades.

Grooms notes, “Matt has been heavily involved in laying out and working that case. His work will basically determine whether we go with the nitrite shunt or another low-DO process.”

Seib states, “Nitrite shunt is a process that only has one full-scale example in service right now, and that’s in Florida. We’re concerned that in the colder Wisconsin climate the process may not be able to perform reliably.



Matt Seib (center) is shown with his closest collaborators at the Madison Metropolitan Sewerage District. From left, Alan Grooms, operations manager; Aaron Dose, operations supervisor; Seib; Matt Allen, assistant operations engineer; and Drew Suesse, regulatory and process engineer.

“What’s also interesting about the process is that it uses much more sophisticated controls and sensors than we currently use. A practical benefit of the pilot project is that we will gain experience and insight with more sophisticated instruments that we are likely to use in the future, regardless of what type of activated sludge process we continue with.”

## BOOSTING GAS PRODUCTION

Another of Seib’s projects ties in with the district’s long-term goal to achieve energy neutral operation, mainly through co-digestion of hauled organic waste to increase biogas production. One option studied is to form a partnership with the City of Madison to take household organic waste from curbside collection, process it into a slurry and feed it to the digesters.

“There are a lot of questions in terms of how to collect the material, how to process it, how to remove contamination, where to put it into our digestion process, how much gas we can get out of it, how it affects biosolids production and to what extent it increases sidestream loading for nitrogen and phosphorus,” Seib says.

Seib produced an internal white paper that laid out all those issues. He also used reports from the city to estimate the tipping fees needed to receive and preprocess food waste on a break-even basis. “We also collected some curbside organic material from the city and used it to run bench-scale digesters in our lab. This is all preliminary exploration to help point us toward what we might be able to do in the future.”

The results of that study will help inform an energy master plan for Nine Springs, looking at priorities to rehabilitate or replace the facility’s energy infrastructure over the next 10 years. Another component of that plan will examine the potential for a change in biogas utilization — from using it as an energy source on site to processing it for sale to the gas utility grid to generate renewable energy credits.

On the process side, Seib and colleagues are conducting a digester tracer study to help optimize maintenance practices, including how frequently or aggressively to take digesters out of service for cleaning.

“Working in wastewater helps bring benefits to the people in my community and to everybody else downstream.

It touches the lives of a lot of people, and that’s very rewarding.”

**MATT SEIB**

We’ve been piloting that for about two years in different iterations to see how effective it is.”

The traditional nitrification-denitrification process converts ammonia in the wastewater to nitrite, then to nitrate and finally to nitrogen gas. “The nitrite shunt process is designed to achieve higher total nitrogen removal,” Seib says. “Instead of taking ammonia first to nitrite and then to nitrate, you’re going from nitrite directly to nitrogen gas, shunting out the biological step that creates nitrate.

“In essence it’s a simultaneous nitrification-denitrification process that relies on fostering anammox bacteria and other heterotrophic organisms in a single tank under specific conditions. It’s a sensitive process that may be very challenging to operate effectively. We’re trying to see if we can get it to work and how well.

“The primary benefit is even greater energy savings by being able to operate the aeration basins at a lower DO. In addition, we believe that somewhere down the road, this facility will get a total nitrogen limit, and nitrite shunt would help us get ahead of that.

## ACTIVE IN THE INDUSTRY

Outside his day-to-day duties, Seib is active in professional organizations at the state, regional and national levels. “It’s really important to be involved,” he says. “There’s always somebody doing something a little bit better or a little bit greater.”

“Historically, wastewater has been a very collaborative industry. People from different plants are always happy to share stories. When a plant is having trouble, it’s very common to call the people around you and say, ‘Have you seen this issue as well? What have you done about it?’ Professional organizations give you more people to talk to when you’re trying to work through challenges.”

Looking back, Seib is happy with the change of career direction he made early in college: “The work I do impacts a lot of people, much more so than if I were a structural engineer designing an office building. Working in wastewater helps bring benefits to the people in my community and to everybody else downstream. It touches the lives of a lot of people, and that’s very rewarding.” tpo

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# A Pipeline for Professionals

A NATIONWIDE APPRENTICESHIP PROGRAM FOR PROSPECTIVE WATER AND WASTEWATER TREATMENT OPERATORS HAS POTENTIAL TO EASE THE IMPACT OF IMPENDING RETIREMENTS

By James Didawick

The National Rural Water Association has established an apprenticeship program for the water and wastewater operation profession.

The roots of the program go back to 2011, after the nationwide economic downturn. At that time, I was assigned to sit in on a Technical Advisory Committee at Lord Fairfax Community College in Middletown, Virginia. The college's Office of Workforce Development was in the initial stages of instituting a water and wastewater training program and wanted help in developing the curriculum and course requirements.

The objective was to train displaced workers and others who needed to upgrade their skills, and then offer them apprenticeships of several weeks at a water or wastewater treatment plant where they could receive on-the-job training. Those who completed the program were not guaranteed a job but had a distinct advantage when openings became available.



The program ran for a few years with moderate success until it was discontinued as the focus of the college shifted into other areas. Fast-forward to today: What was

once a somewhat isolated idea has grown into a flourishing nationwide National Rural Water Association apprenticeship program.

## FULFILLING A NEED

Much has been written about the coming shortage of operators. Various sources indicate that within the next 10 years, the water industry will lose up to 50% of its workforce to retirement: Half the women and men who now operate water and wastewater treatment facilities will be gone.

That is a sobering statistic for any profession, let alone one tasked with protecting public health and safety, environmental quality and infrastructure integrity. There is a risk that enormous amounts of institutional knowledge will be lost. In addition, replacing the retired operators will be time consuming and expensive for many systems.

The National Rural Water Association apprenticeship program will help utilities fill critical positions and prepare for retirements on the horizon. It aims to ensure that competent, qualified people will have access to the training and licensing needed, thus helping to stave off a shortage of water and wastewater operators.

## WIDELY ADOPTED

The program, developed according to standards recommended by the U.S. Department of Labor, is made available through state Rural Water Associations. At present, according to the National Rural Water Association website, the following 17 states have approved the program: Alabama, Arizona, California, Colorado, Idaho, Illinois, Indiana, Michigan, Missouri, North Dakota, Ohio, South Carolina, Utah, Vermont, Washington, West Virginia and Wyoming. Thirteen other states are at various stages of the approval process.

The program is administered through sponsors who take responsibility for all aspects of the curriculum. Sponsors include the state's Rural Water Association or the water/wastewater system in whose name the apprentice-

ship is registered or approved. The National Rural Water Association oversees quality and consistency through an apprenticeship program manager and may assist local sponsors as needed.

The qualifications for admission are similar to those for general employment in the water and wastewater field. Applicants must:

- Be at least 18 years old
- Have a high school diploma or GED
- Be physically able to perform the essential duties of their positions
- Pass a drug screening upon acceptance
- Submit to a background check per federal guidelines for public water systems employees
- Have a valid driver's license.

Some sponsors may have additional requirements. Once accepted, applicants enter a written agreement with the sponsor that spells out the terms and conditions of the apprenticeship and the expectations and requirements for successful completion.

## ADVANTAGES OF APPRENTICESHIP

Apprentices can expect a defined pathway to careers in water and wastewater operations. Their wages are likely to increase as they acquire new skills. For high school students interested in vocational/technical careers, an apprenticeship can be an alternative to a time-consuming and costly college degree.

Meanwhile, utilities can expect well-trained people who can be productive right from the start. Sponsors can train apprentices on specific equipment relevant to their treatment processes while following their established standard operating procedures. The program also presents opportunities for employee advancement and retention, the filling of vacancies and the passing of crucial institutional knowledge along to new workers.

All apprentices work under the supervision of their system sponsors. The supervisor makes work assignments, provides on-the-job instruction and ensures a safe work environment. Apprentices typically work the same hours as full-time operators. They can receive work credit for previous relevant experience.

## FLEXIBLE OFFERING

The typical apprenticeship takes two years to complete. The combination of on-the-job training and classroom instruction prepares the apprentices to be fully qualified in multiple aspects of water and wastewater operations while preparing them for the various levels of licensing examinations.

Some sponsors offer full-ride and half-ride scholarships to help applicants with the cost of in-class training, conference attendance, licensing exam fees, and manuals and study guides. The program provides a degree of flexibility to meet the needs and goals of sponsors and apprentices alike.

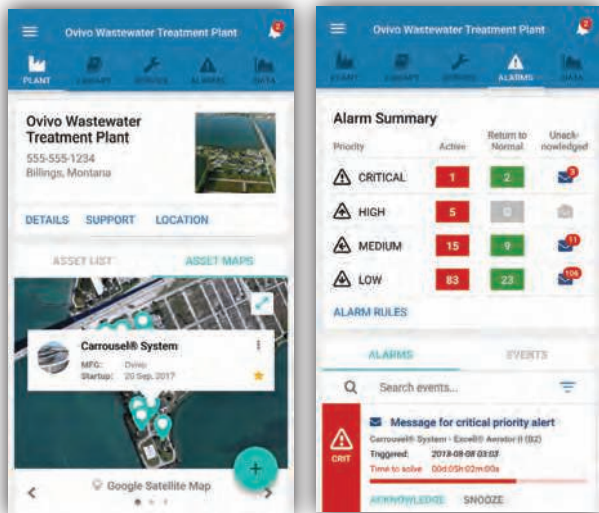
More information about the apprenticeships is available on the National Rural Water Association website ([www.nrwa.org](http://www.nrwa.org)) and from state Rural Water Associations.

## ABOUT THE AUTHOR

*James Didawick (james.didawick@townofwoodstockva.gov) is superintendent of Public Works for the Town of Woodstock, Virginia. tpo*

1

2



1. The WaterExpert application uses a simple, clear interface.
2. One screen presents current alarms and priorities.
3. Videos of maintenance procedures can be attached to corresponding assets.
4. A web visualization creation tool requires no programming and lets operators build widgets on a smartphone.



3



# Digital Management Made Easier

WATEREXPERT TOOL HELPS OPERATORS MANAGE ASSETS, MAINTENANCE AND ALARMS AND MONITOR EQUIPMENT PERFORMANCE ON A SINGLE SIMPLE PLATFORM

By Ted J. Rulseh

Treatment plant operators today face increasingly complex plant systems while the workforce ages and a wave of retirements approaches. Digital tools help plant teams manage operations while preserving institutional knowledge with online libraries of manuals and standard operating procedures. The challenge has been to find digital systems that can be used without extensive training and without costly programming and system integration.

Now Ovivo has introduced the WaterExpert digital platform. It is designed as an all-in-one solution that combines asset, maintenance and alarm management with real-time data monitoring on a common platform. Users can access the system from their own desktop or mobile devices, enabling teams to stay connected in the office and the field.

David Williams, director of digital solutions with Ovivo, talked about the technology in an interview with *Treatment Plant Operator*.

**tpo:** What need is this platform designed to fulfill?

**Williams:** We conducted an in-person survey involving a number of treatment plants. One key problem we identified is that our industry has an aging workforce and is having trouble attracting new younger people. We're also losing an incredible amount of knowledge when older operators leave their organizations. As a result, we saw that we needed to up our game as it relates to users' experience with equipment.

**tpo:** How does WaterExpert differ from other plant management tools available today?

**Williams:** Many management tools are overengineered in an effort to fit every industry. There are a variety of tools operators can use to run their plants, but often the applications were built separately and are not connected. We tried to bring a simpler, cleaner interface that combines not just asset and knowledge management, but maintenance management. We took a holistic view and built something from the ground up that was purposely connected as it was built. It's a sleek, simple interface that can be driven out of the palm of an operator's hand.

**tpo:** In a basic sense, how is the WaterExpert platform structured?

**Williams:** The core skeleton is modeled around the asset tree of the treatment plant. If you look at various SCADA, maintenance management and asset management systems, you see that they share the same folder structure, which is asset based. You have a headworks section, a primary treatment section and so on. So on WaterExpert, the assets are the bones and architecture of the whole application.

**tpo:** How do the various assets communicate with this technology platform?

**Williams:** We use an Internet of Things gateway device. It can pull data from the plant network and host it in the cloud. Then operators can do smart connected asset management. They're not only doing time-based asset management, but are able to see the equipment condition in real time based on parameters they are measuring.



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“ We took a holistic view and built something from the ground up that was purposely connected as it was built. It’s a sleek, simple interface that can be driven out of the palm of an operator’s hand.”

DAVID WILLIAMS

**tpo:** What information is available for each asset?

**Williams:** Within each asset there are a few key things. One catalogs what assets they have and what their useful life is. There’s a maintenance management component that serves as a computerized maintenance management system. Knowing what you have is one thing. The other is knowing where it is. WaterExpert can map everything visually on a real-time Google interface or using what we call image maps. Users can take their assets and drag and drop them onto a drawing or design. Another component is support, identifying the person to call if a particular asset goes down. Plant teams can add their own support contacts.

**tpo:** How does this system help support standard operating procedures and the preservation of institutional knowledge?

**Williams:** That’s the role of the knowledge capture and library component. It was pretty clear to us that no one was reading paper-based manuals. We live in an age of YouTube where if you want to fix your washer or dryer, you pull up a two-minute video and have a complete visual of exactly what to do. WaterExpert lets operators harness those same kinds of multimedia teaching tools for their entire plant. If they need a maintenance procedure for a given asset, they can take a video from the media library and attach it to that asset, so it’s always available when needed.

**tpo:** How is data monitoring accomplished with this platform?

**Williams:** We built a web visualization creation tool that requires no programming experience to use. Operators can build widgets right out of their phones to see in real time what their equipment is doing and follow operating trends.

**tpo:** What role does alarm management play within this platform?

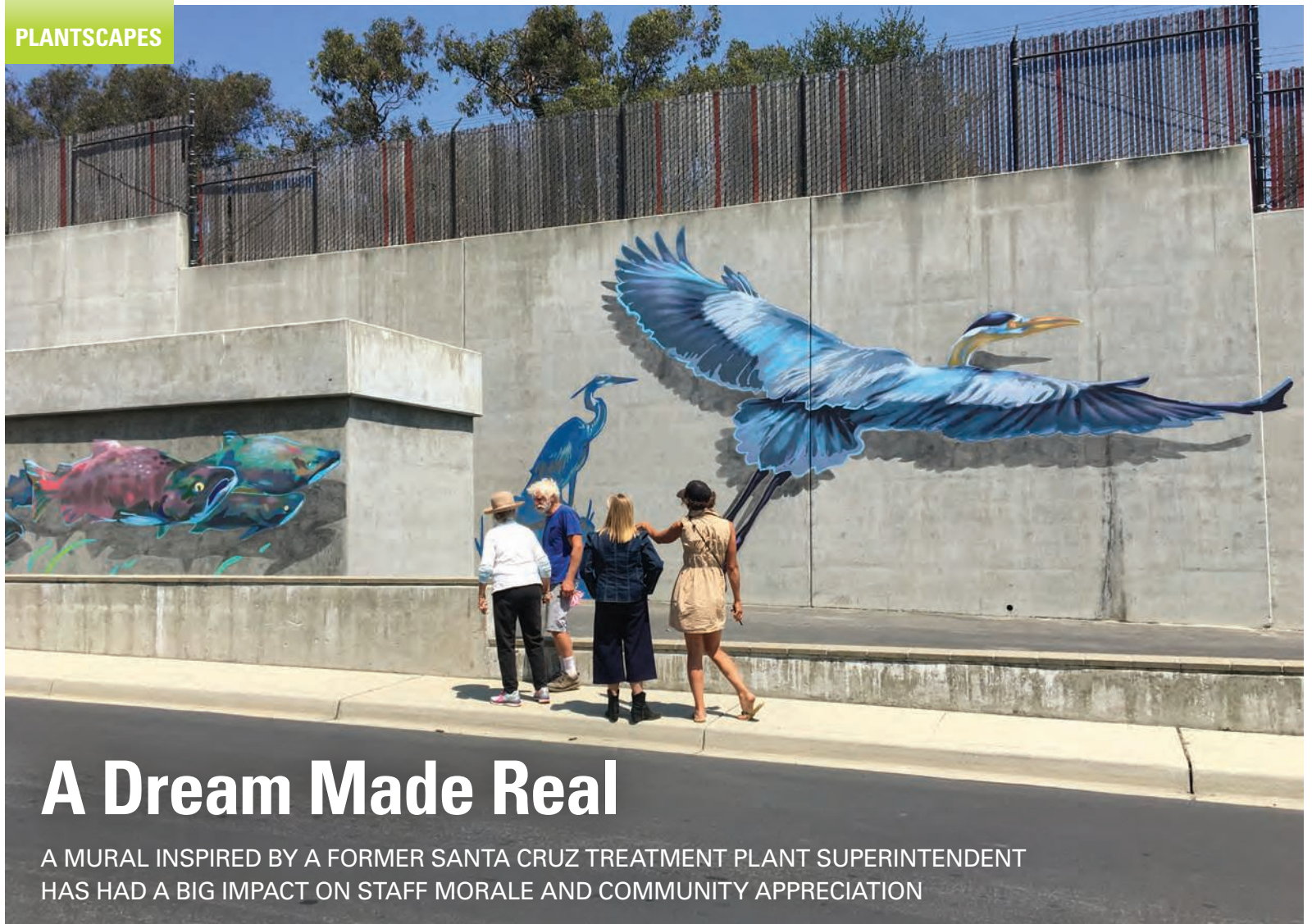
**Williams:** We’ve built what is essentially a replacement for an alarm dialer. Users can set up an alarm philosophy and define who gets to access and change the alarm rules, again without any programming experience. They can create a rule to say, for example, that if the permeate flow exceeds 35 gpm, these people at the plant are going to receive a text message.

**tpo:** What would you say is the most significant benefit of this platform?

**Williams:** This platform really opens a new level of smart connected asset management to small and medium-sized treatment plants. Previously, that capability had only been available to well-financed, large municipalities through major investments in integration time. That’s the breakthrough we’re bringing to the market. It’s simplifying facility management and making it easy to use in a way that adds real value to operators.

**tpo:** How is this technology offered for sale?

**Williams:** We have native applications for Android and iOS. The technology is offered on software as a service subscription model. It’s offered as a site license for each plant, but if you are an operating company, or a municipality that operates multiple plants, you have the ability to see all of the plants in one view. From there you can go to a specific plant and drill down into the details. **tpo**



# A Dream Made Real

A MURAL INSPIRED BY A FORMER SANTA CRUZ TREATMENT PLANT SUPERINTENDENT HAS HAD A BIG IMPACT ON STAFF MORALE AND COMMUNITY APPRECIATION

By Jeff Smith

Fulfilling a long-held dream of a retired wastewater treatment plant superintendent, a large mural in the California city of Santa Cruz greets visitors at the plant entranceway to the 17 mgd tertiary treatment facility.

Featuring ocean and estuary animals typical of the oceanside community of 64,000, the mural at the Santa Cruz Wastewater Treatment Plant was created along nearly 400 feet of sloping driveway walls that lead from the entry gate to the plant. Some walls reach 24 feet high.

Completed in 2018 by local artist Elijah Pfothenhauer, the mural presents blue whales, a giant red octopus, coho salmon, egrets and other creatures in graphical and whimsical form. One image contains a cameolike appearance of Dan Seidel, honoring the past superintendent for his 40-year career with the city.

## BY PROJECTION

“For a long time, Dan wanted the wall to be softened and more welcoming,” says Mike Sanders, plant manager. “Several times he shared his dream with me, and I liked it, but we couldn’t get the funding for a mural.”

The artist completed the mural project in consultation with plant staff. Tom Pretzer, plant maintenance supervisor, assisted with on-site needs. Prep work on the concrete sectional wall included power washing and crack sealing. The surface was primed with Rust-Oleum concrete stain spray and Sherwin-Williams moisture blocker paint.

PHOTO ABOVE: Visitors stop to observe the wildlife mural at the Santa Cruz Wastewater Treatment Plant.

Over five weeks, working on a scissors lift, Pfothenhauer created the mural using cans of Montana Colors’ Hardcore aerosol high-pressure spray paint. The images were projected onto the walls at night to enable Pfothenhauer to outline the areas to be painted during the day. The dappled water shadows on the blue whales were created with brushes immediately after spraying. Because the mural is not normally accessible to the public, no protective coating was applied.

## MAKING IT VISIBLE

The mural design was intended to underscore the plant’s environmentally friendly process. Several sections of the 8-foot-tall metal security fence mounted on top of the concrete walls were removed to make the mural more visible.

“While considering the prime issues of security and safety foremost, some of the slats in the latticework of the top fence were able to be removed so the public could see the mural from the Neary Lagoon Park,” Sanders says. The park is an 850-acre wildlife refuge next to the facility that includes hiking and biking trails, playgrounds, athletic fields, picnic areas and tennis courts. A parking area shares the entryway access road.

“The murals will surely delight Rail Trail users and anyone visiting the wastewater treatment facility,” says Janice Bisgaard, city community relations specialist. The treatment plant entrance is next to the soon-to-be constructed Coastal Rail Trail, a multiuse trail that parallels an unused railroad track and runs the length of Santa Cruz County.

## PUBLIC ART

The mural was a project of the seven-member Santa Cruz Arts Commission, and the \$20,000 cost was funded through the city’s 1% for Art Program. One percent of the capital projects’ cost is designated to the arts. The commission chose the artist for his expertise in portraying ocean and estuary animals.

Near the end of the project, the treatment plant became the finish line for more than 200 community members in a uniquely humorous and educational 5K walk called Follow the Flush. Developed by affiliates of the University of California, Santa Cruz and the regional arts community, the walk followed the approximate path that human waste travels in underground infrastructure to the award-winning treatment facility.

Along the way, 20 informational kiosks, interactive art exhibits and games became part of the journey to raise awareness of the water footprint,

“Most of the staff have embraced [the mural] as a positive way in which they view their job. It’s uplifting. Its impact has been significant.”

**MIKE SANDERS**

intended but welcome consequences of the mural are the positive impact and influence it is having on the community. The public loves it, the vendors love it and the staff loves it.

“Most of the staff have embraced it as a positive way in which they view their job,” Sanders says. “It’s uplifting. Its impact has been significant, and it’s all because of a dream fulfilled.” tpo

sustainability and the psychological dimensions of modern human waste sanitation. All event participants were entered into a prize raffle. Bisgaard says kids had fun looking for the “Dan Seidel Fish” hidden in the artwork. A plant tour conducted by operators and staff was a grand finale.

## MAKING A DIFFERENCE

“Dan wasn’t aware of his likeness in the mural,” Sanders says. “When he found out, he was really excited and appreciative.” Unin-



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Mark Dettle, Santa Cruz Public Works director, points to the image of Dan Seidel, retired plant superintendent, whose image appears in the painted fish that is part of the mural.

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Rob DuBoux, Public Works  
director for the City of Malibu



# A Local Solution

A NEW MEMBRANE BIOREACTOR TREATMENT PLANT HAS SET THE CALIFORNIA CITY OF MALIBU ON A COURSE FOR WATER RECYCLING AND DROUGHT MITIGATION

STORY: **Jim Force** | PHOTOGRAPHY: **Aron Eisenberg**

Property owners in the coastal California city of Malibu preferred a local wastewater treatment solution to a regional approach. The choice is proving to be beneficial.

Under government orders to phase out of septic systems, the oceanfront community of 13,000 chose to construct its own collections system and deliver wastewater to a state-of-the-art treatment and recycling plant. The alternative would have been to hook up to the neighboring Los Angeles County sewer system.

“Even though residents get their drinking water from the LA Water, I think they felt the extension of sewer lines from Los Angeles would lead to unwanted development and would ruin the small-town character of the community,” Rob DuBoux, P.E., Public Works director.

The Civic Center Water Treatment Facility, so-called because it serves the area around the Civic Center, is rated at 200,000 gpd. It began operating last October, staffed by the private firm Integrated Performance Consultants. “The company provides a Grade 5 lead operator and two Grade 3 operators during normal business hours,” DuBoux says. “During off hours, they are able to monitor plant operations remotely.”

The plant was named 2018 Project of the Year by the American Public Works Association Southern California Chapter and 2018 Plant of the Year by the WateReuse Association.

## PHASED APPROACH

The plant and its companion collections system represent phase one of a long-term plan to rid the area of septic systems and operate a community-based water treatment and recycling facility. The plant, designed by Woodard & Curran, serves 57 properties in the Civic Center area, mainly commercial establishments with a few residential properties mixed in.

In phase two, a larger area of the community, consisting of houses and condominiums, will be

“The facility represents a meaningful and responsible way to produce recycled water that will help ease the impacts of future drought cycles.”

ROB DUBOUX, P.E.

added to the collections system by 2024. Phase three, which would expand the system to the rest of the community, depends on water-quality testing in phases one and two. The phased approach was laid out in a memorandum of understanding between the city and the state’s regional water control board.

DuBoux praises a collaborative approach that helped both the utility and property owners understand the problem and the solution. “We had a number of stakeholder meetings with property owners,” he says. “We kept them informed and dealt with questions they had about project unknowns. I think it eased their minds.”

## Civic Center Water Treatment Facility, Malibu, California

[www.malibucity.org](http://www.malibucity.org)

BUILT:  
**2018**

AREA SERVED:  
**City of Malibu**

FLOWS:  
**200,000 gpd design,  
50,000 gpd average**

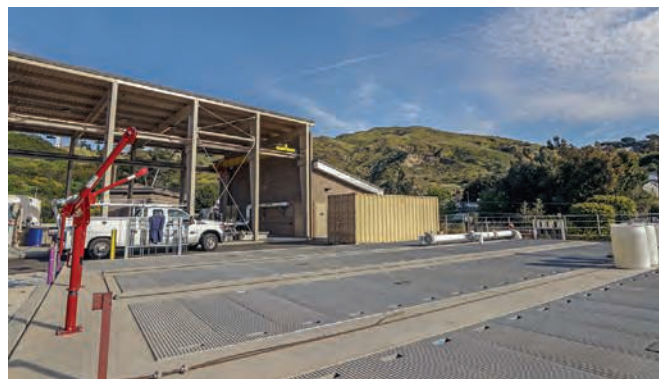
TREATMENT PROCESS:  
**Membrane bioreactors**

TREATMENT LEVEL:  
**Tertiary**

EFFLUENT DISPOSITION:  
**Recycling, deep-well injection**

BIOSOLIDS:  
**Composted, land-applied  
or landfilled**

ANNUAL BUDGET:  
**\$1.45 million (operations)**



This structure houses the 200 gpd (design) membrane treatment units at the water treatment facility.



The membrane treatment facility contains two membrane units with built-in capacity to expand to four units. Membrane treatment is the final stage before disinfection and delivery to the recycled water system.

property to measure usage. Excess effluent can be discharged to three deep injection wells, which reach a buried ancient riverbed.

Because it receives potable water directly from Los Angeles County, Malibu had to devise a different system for billing sewer customers. Flow and concentration estimates have been worked out and agreed upon for each customer, and billing goes on the property tax bill for each parcel.

Based on the allowable development for each property, the city can also develop estimates for the flow and concentration of wastewater for each customer. “Wastewater and recycled water rates have been established

via a Proposition 218 process and estimated operation and maintenance expenses,” DuBoux says. “After the first year, these rates will be reevaluated based upon actual expenses.”

### LESSONS LEARNED

DuBoux says the city has already learned lessons that will prove valuable as the project heads into phases two and three: “We have a number of drains around the plant. They collect and return the stormwater to the influent pump station for treatment.”

While the system prohibits any untreated water from leaving the site, the drains also collect rainwater. In heavy storms, rainwater can double the flow of water through the plant. “We’re looking at different ways to address

### Civic Center Water Treatment Facility PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
<b>BOD</b>	283 mg/L	3.4 mg/L	20 mg/L
<b>TSS</b>	424 mg/L	1.1 mg/L	15 mg/L
<b>Ammonia</b>	N/A	3.7 mg/L	8 mg/L
<b>Phosphorus</b>	N/A	1.0 mg/L	N/A

The process also helped the staff get to know the property owners and hear their concerns. In the end, residents were happy the city would process their wastewater and they wouldn’t have to worry about septic systems. “We were a bit surprised they were so receptive to that,” DuBoux says.

### TREAT AND RECYCLE

The new plant is equipped with the latest technologies, enabling it to produce effluent that meets California Title 22 standards for reuse as irrigation or secondary source water. The flow enters through in-channel coarse screens (Veolia Water Technologies) and then passes through a vortex grit chambers and rotary-drum fine screens (WesTech Engineering).

An equalization basin regulates the amount of wastewater sent through the system. Biological treatment occurs in a membrane bioreactor containing submersible pumps (Flygt - a Xylem Brand) and fine-bubble diffusers (Environmental Dynamics International). The water is disinfected in a TrojanUVFit UV system. Solids are thickened and trucked to the Joint Water Pollution Control Plant in Carson; the material is ultimately composted, land-applied or landfilled.

With neighbors close by, the plant has odor-control biofilters, which include a mulch bed and ventilating fans. Foul air is drawn from the influent pump station, screening and grit areas, equalization basin, biological reactors and membranes, and the solids handling processes.

### EXTENSIVE RECYCLING

About 70 million gallons of treated water per year is available to contributing customers for irrigation or use in dual plumbing systems. Customers can receive the recycled water free of charge up to the amount of wastewater they discharge. Recycled water meters (Badger Meter) are installed at each



Effluent is disinfected in a TrojanUVFit system.

that,” DuBoux says. One solution might be underground detention tanks to regulate flows to the influent pump station.

While it has begun the process of eliminating septic systems and provided sustainable local wastewater treatment, the plant has also enhanced the city, DuBoux says: “The project has transformed the Civic Center area



Carlos Alvarez (left) and Golan Kfir perform routine maintenance at the treatment facility.

“We had a number of stakeholder meetings with property owners. We kept them informed and dealt with questions they had about project unknowns.”

**ROB DUBOUX, P.E.**

from one dotted with wastewater treatment and disposal systems to a centralized community facility with a robust level of treatment and a recycled water system.”

Even more important, the Civic Center facility promises to save a substantial amount of freshwater that otherwise would have been used to water lawns. “Our treated wastewater will be available to irrigate some of our most popular parks and public spaces, as well as customer sites,” DuBoux says.

“The facility represents a meaningful and responsible way to produce recycled water that will help ease the impacts of future drought cycles. Malibu has always been a step ahead in adopting environmentally focused programs.”

tpo

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## TIGHT PIPES

At just 6.5 miles, the sewers and recycled-water lines serving the Civic Center Water Treatment Facility in California may not be the longest system in the industry, but they are surely the tightest.

The system was designed to be leak-proof because of its location along the shore of the Pacific Ocean, says Rob DuBoux, P.E., Malibu Public Works director. “We have to prevent ocean water intrusion into the system, because our treatment facility is not designed to handle that kind of water. Everything has to be watertight.”

Malibu used high-density polyethylene pipe welded at the joints. Some sections were installed using opencut construction. In other cases, especially where the groundwater table was high, the contractors used tunneling; both sewer and recycle lines were enclosed in 36- to 48-inch steel casings.

The city made sure manholes were tightly sealed as well. “Contractors were able to successfully dewater the excavations,” DuBoux says. “We didn’t have a lot of tunnel failures.”

Two lift stations power the lines. They were built to size but contain enough extra space to add equipment, which will be needed for the next phases of the project.

# Where the Buck Stops

NACWA MAKES THE CASE FOR A GREATER FEDERAL GOVERNMENT ROLE IN SHARING THE BURDEN OF COSTS FOR SUSTAINING WATER QUALITY

By Ted J. Rulseh

After passage of the original Clean Water Act in 1972, federal dollars flowed into the wastewater treatment sector.

With the goal of ensuring fishable, swimmable waters throughout the nation, grants became available for construction and upgrading of treatment facilities, the training of plant operators and a great deal more.

Those investments brought substantial progress, but in time, the federal investment in clean-water facilities faded so that at present it accounts for just a small fraction of the cost of water-quality protection. Meanwhile, massive investments are needed for municipal clean-water utilities to meet federally mandated water-quality goals.

The National Association of Clean Water Agencies is pushing for more federal support for treatment utilities, especially since regulatory compliance makes up a major share of clean-water costs. The association made a case for its position in the winter 2019 issue of its *Clean Water Advocate* publication.

Nathan Gardner-Andrews, NACWA's chief advocacy officer, made the argument for more federal investment during an interview with *Treatment Plant Operator*.

**tpo:** How would you describe the federal government's role just after passage of the Clean Water Act?

**Gardner-Andrews:** At its heart, when the Clean Water Act was passed, the intent was to have a partnership between federal, state and local governments to clean up the nation's water. This year is the 50th anniversary of the Cuyahoga River fire in Cleveland, which was the big public impetus toward getting more aggressive on water pollution. The period from 1969-72 is where a lot of the heavy lifting was done. In essence, a bargain was struck that the EPA would set a baseline technology standard that every public clean-water utility had to meet. In return, the federal government would give out substantial grants to fund the upgrades.

**tpo:** How would you characterize the results of that arrangement?

**Gardner-Andrews:** The construction grants program, over 15 years starting in 1972, gave out many billions of dollars to communities to upgrade their treatment plants. Communities did that, significant investment happened and we saw significant improvement in how municipal wastewater was treated.

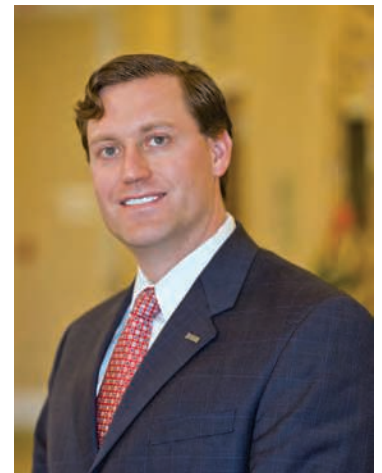
**tpo:** What was NACWA's role in that process?

**Gardner-Andrews:** NACWA was created as the Association of Metropolitan Sewerage Agencies to work with EPA and Congress to help develop the grants program and ensure communities were getting the big-

gest bang for the buck when making their upgrades. Now, almost 50 years later, I would argue that the municipal clean-water sector is the greatest success story of the Clean Water Act in terms of the investments and the incredible reduction of pollutants achieved. A really large part of that was significant federal involvement to provide funds to make it happen.

**tpo:** When did federal investment really start to decline?

**Gardner-Andrews:** In the mid-1980s we saw a shift from grants to a loan-based program. The 1987 amendments to the Clean Water Act created the State Revolving Fund. The idea was that the federal government would give out loans to the states, and the states in turn would loan that money to local governments for the projects deemed the most worthy. It's not uncommon for revolving fund loans to be at lower interest rates than if a utility went to the municipal bond market, but that fundamentally shifted the federal government's role in funding water infrastructure.



Nathan Gardner-Andrews

“Public awareness and public understanding of the value of water systems will be critical to summoning the political willpower to increase the share of federal funding.”

NATHAN GARDNER-ANDREWS

**tpo:** What has been the effect of that change in approach?

**Gardner-Andrews:** From that point forward, we saw the percentage of federal funds going down. On an overall percentage basis, we saw the total federal investment drop to the point where 96% of water and wastewater funding comes from local governments and utilities and only 4% from the federal government. That percentage pales in comparison to the federal money we see allocated for purposes such as highways, mass transit and airports.

**tpo:** In the meantime, what level of investment is needed to sustain the nation's clean-water infrastructure?



**Gardner-Andrews:** The EPA Clean Water Needs Survey reports that some \$271 billion is needed for municipal clean-water utilities to meet mandated water-quality goals. That is the most widely cited number for what we call the infrastructure gap — what current funding will support versus what needs to be invested. But that number is probably on the low end. We think easily twice that amount could be needed for projects that right now don't have a funding source. That's a tremendous burden to put on local ratepayers at the same time utilities are dealing with increasing regulations and other factors driving up their rates.

**tpo:** What impact does all this have on local communities and utilities?

**Gardner-Andrews:** There are at least two pressure points for local utilities. There's regular operations and maintenance, which goes up every year as systems age. Adding to that is the increasing regulatory pressure of tighter and tighter permit limits, dealing with nutrients, toxics and contaminants that were not envisioned when the Clean Water Act was written. The other pressure point is capital cost related to major improvements like combined sewer overflow remediation and adding capacity for growth. Related to that is the growing debt service burden.

**tpo:** Aren't all these costs typically covered by the utilities' user fees?

**Gardner-Andrews:** In many communities, during the 1970s and 1980s, utilities weren't really increasing the rates the way they should have been. So now they have rates that are artificially low. They're playing catch-up in getting the rates up to where they should be in order to maintain their systems. We see communities raising rates by 5%, 10%, 15% or more per year over a three- to five-year period. So now we have an affordability problem.

**tpo:** How does that escalation in rates affect communities?

**Gardner-Andrews:** In many communities, the bottom 20% to 25% of the customer base is facing a crisis in being able to afford their water and sewer bills. I think there needs to be a reckoning in the utility sector and among state and federal regulators on how to deal with this. What is the federal government's role in helping to fund these rate increases?

**tpo:** What kinds of solutions do you envision for this problem?

**Gardner-Andrews:** If you look at the federal government now, there's the Low Income Home Energy Assistance Program, which helps cover heating and cooling costs for a segment of the population below a certain income level. Why not something similar on the water side? We also probably need to reevaluate the accretion of regulatory requirements. It's not right for the federal government to add regulatory requirements on one hand and then give less and less money to utilities to help meet them. We're at a point where all parties recognize the status quo is not sustainable. The question is what rebalancing is appropriate and what can be accomplished politically over the next few years.

**tpo:** How would you assess the political outlook for progress in this area?

**Gardner-Andrews:** I would argue that a federal low-income water assistance program is not an entitlement. It would be essentially a recommitment to the federal government's original role in clean water. This is an issue that doesn't have rural versus urban boundaries and that can cross partisan and geographic divides. It gets sticky when you talk about the money: How will it be paid for? Who is eligible? But the time is right to have the conversation.

**tpo:** Have you seen any positive signs of progress?

**Gardner-Andrews:** My prediction is that we will see the issue of water addressed directly in the next presidential election campaign. Although there was no comprehensive infrastructure package in the last Congress, we



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“I would argue that the municipal clean-water sector is the greatest success story of the Clean Water Act in terms of the investments and the incredible reduction of pollutants achieved.”

NATHAN GARDNER-ANDREWS

were pleased to see, in the proposal from the administration and in the counterproposal from the Senate Democrats, that water was front and center, on par with things like surface transportation, airports and mass transit. That is a victory. We've been able to elevate water as a national priority.

**tpo:** What measures will NACWA take to continue making the case?

**Gardner-Andrews:** We're making a big push to get Congress to reauthorize the State Revolving Fund and at a higher appropriation level. We're pushing to grow the pot so we can pump more money through that fund to the states. To date, that is the most effective way to get federal money to the local level to help support needed projects. We're also working with Congress to further explore the idea of a low-income assistance program for water.

**tpo:** What do you see as the role of public awareness and education in this issue?

**Gardner-Andrews:** Public awareness and public understanding of the value of water systems will be critical to summoning the political willpower to increase the share of federal funding. As a sector, we've almost been a victim of our own success. Ninety-nine percent of the time we deliver service without any problems so that the public takes it for granted. We need to help people realize, day in and day out, the importance of water. When that happens, you start to set the groundwork for a productive political debate about the role of the federal government in helping to fund this vital service. **tpo**

# Detecting Combustible Gases and Smoke

HERE'S SOME PRACTICAL ADVICE FOR WATER AND WASTEWATER TREATMENT PLANT OPERATORS FOR KEEPING THEIR DETECTION DEVICES WORKING PROPERLY

By Aaron Paterson

To make the best choices when replacing or upgrading smoke and gas detectors, plant operators should understand the basics of the fire safety equipment in hazardous areas of their facilities.

The design and installation of fire protection systems generally require the expertise of a fire and gas safety system integrator, but treatment plant operators are often responsible for upgrading or replacing components in their facilities' systems.

Over time, the demands of treatment plant applications can take their toll on combustible gas and smoke detectors, until the choice is to perform extensive maintenance or select replacement units. At this point, some basic knowledge can help operators choose robust new detectors that can meet the site's challenges while requiring minimal maintenance.

## UNDERSTANDING RATINGS

Many combustible gas and smoke detectors in water and wastewater treatment plants are installed in what OSHA calls hazardous locations, defined as "areas where flammable liquids, gases or vapors or combustible dusts exist in sufficient quantities to produce an explosion or fire." These include wastewater collections systems and liquid wastewater treatment processes.

For detailed information, plant operators can refer to the National Fire Protection Association standard NFPA 820 (2016), a 65-page document published for wastewater treatment plants — the standard details for where and how gas and smoke detectors should be installed, along with required product performance attributes and certifications.

Figure 1, a process flow diagram created using NFPA 820 ([www.nfpa.org](http://www.nfpa.org)) as a reference, can help users determine the type of hazard-detection equipment needed at various stages of a typical wastewater treatment facility. More information about hazardous locations can be found in Chapter 5 of NFPA 70: National Electrical Code, which establishes hazardous-area classifications specific to electrical equipment:

- **Class I:** Places where flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.
- **Division 1:** Places where combustible materials are routinely present in ignitable concentrations.
- **Division 2:** Places where the same materials are handled, processed or used but are normally confined and can escape only in case of accident, breakdown or ventilation equipment failure.



Biosolids dewatering is one wastewater treatment area specifically called out in NFPA 820 for fire protection that includes smoke detectors.

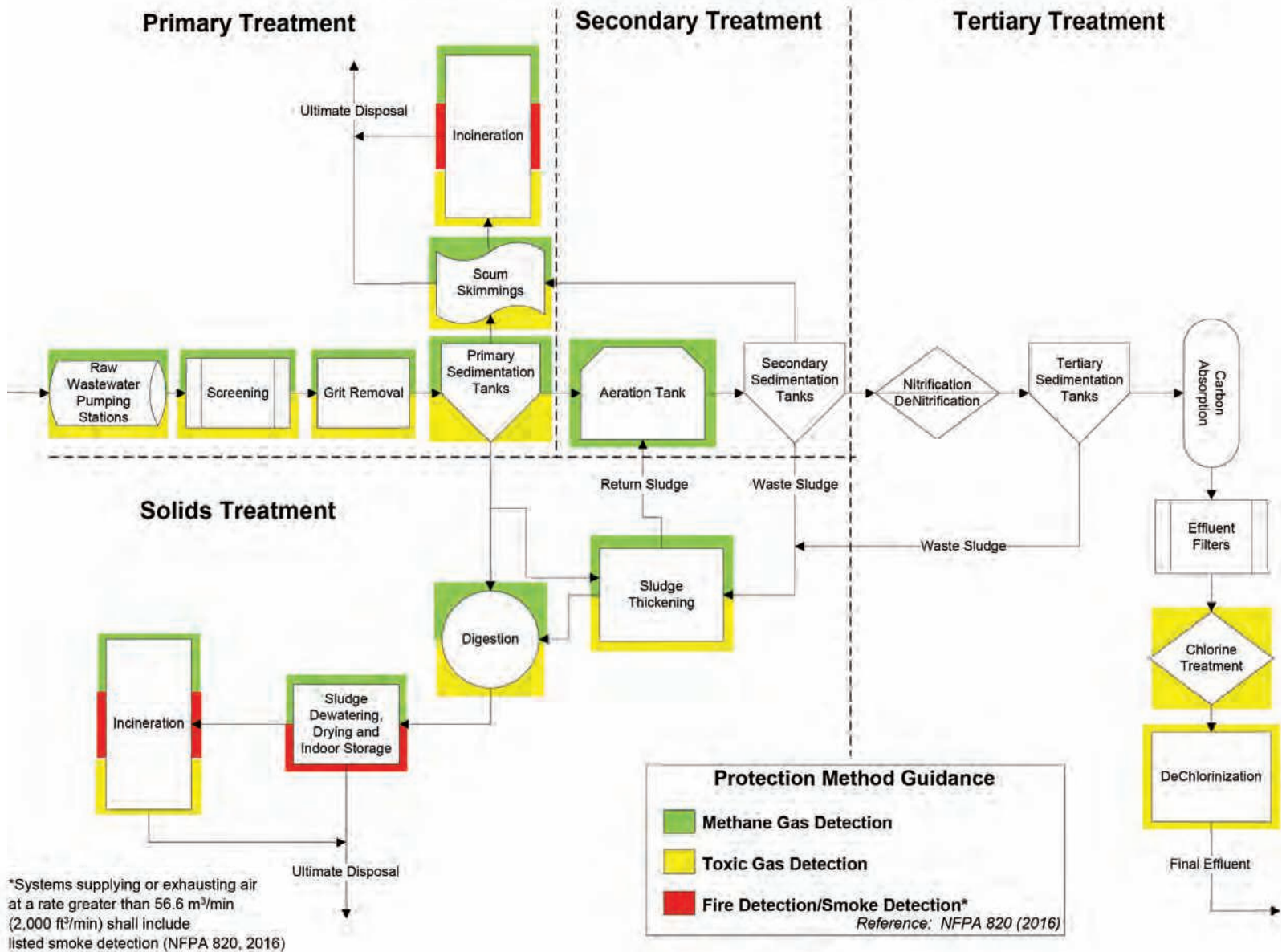
Such areas are common in treatment plants. Per NFPA, electrical equipment such as gas and smoke detectors in these areas must be designed to limit or isolate potential gas ignition sources. NFPA 70 Section 500.7 lists several protection options for electrical equipment in hazardous locations. For Class I Division 1 areas, these include:

- **Intrinsically safe (IS) equipment**, designed with special circuitry that maintains energy levels below that required to cause ignition.
- **Explosion-proof (XP) equipment**, designed so that sparks or explosions are contained within the housing, preventing these from becoming gas ignition sources. While XP detectors may cost more, IS devices are more difficult and costly to install and maintain, usually making XP detectors less expensive in the long run.

## FIRST LINE OF DEFENSE

Combustible gas detection systems, which alert personnel to a leak before it ignites, constitute the first line of defense in a fire safety system. When used in treatment plants, they measure methane to determine whether it has

# Wastewater Process Flow Diagram



Based on NFPA 820 (2016), this diagram shows the stages in a typical wastewater treatment process and the types of detection needed at those stages.

## DETECTOR CERTIFICATION

For use in hazardous-classified areas of water treatment plants, both combustible gas and smoke detectors must be Class I Division 1 hazardous-area certified to ensure explosion safety.

They must also be performance-certified for the specific attributes and functions required in hazardous areas. The performance, selection, use and location of gas and smoke detectors are covered in general terms in Chapter 17 of NFPA 72: National Fire Alarm and Signaling Code.

Performance testing and certification verifies that a device will operate as specified by the manufacturer under worst-case conditions. Some detector manufacturers self-certify product perfor-

mance, meaning they rely solely on their own evaluation to certify that their products meet applicable standards.

Other detector manufacturers seek certification from accredited third-party testing organizations to get an independent evaluation of performance. A number of independent organizations have documented safety and performance criteria for gas detectors.

Certification information about a particular detector can be found on the device label and in its accompanying manual. If the manual or label states that the device is certified for Class I Division 1 areas, there are no restrictions on where it can be placed.

(Continued on page 45)



The solar array includes 668 panels and is expected to produce 377 MWh per year.

# Right On Track

A SOLAR POWER ARRAY IN A SMALL NEBRASKA CITY IS AIMED AT FULFILLING THE ENTIRE ELECTRICITY DEMAND AT THE WASTEWATER TREATMENT PLANT

By Steve Lund

**W**hen officials in the Nebraska city of Atkinson decided to install solar power at the wastewater treatment plant, they didn't aim to reduce the electric bill. They aimed to eliminate it.

The solar array, installed by GenPro Energy Solutions, consists of 668 panels with a total capacity rating of 200 kW. It is expected to produce 377 MWh per year, which should be enough. Built in 2014 by Fluidyne, the plant has a design capacity of 149,000 gpd and an average flow of 130,000 gpd.

Mayor Paul Corkle, concerned about keeping rates down, came up with the idea of using solar power. "We use a lot of electricity," Corkle says. "A long time ago, I was one of the founders of an ethanol plant in the same town, and we were looking at wind turbines, but they weren't very efficient. When solar came out, I saw that it possibly would work for us."

## FOLLOWING THE SUN

Atkinson's solar array is a tracking system. The panels are mounted and powered so that they follow the path of the sun. That boosts energy production by about 30% compared to fixed systems, according to Molly Brown, vice president of energy production at GenPro. The tracks were made by Array Technologies. The site next to the treatment plant where city officials placed the solar array presented some unusual construction problems.

Gary Thurlow, city maintenance supervisor, says the site had limited potential uses because of its history: "It was an old gravel pit, and it had been filled up with old trees and busted-up concrete. It was just basically bad ground. We couldn't build anything on it. It was the perfect site to give this thing a try."

Digging out some of the debris and filling in the pit would have been extremely expensive. So Corkle suggested setting posts in the ground and putting them on a stringer. GenPro did something similar but with a twist:



The panels are mounted on a mechanism that enables them to maximize exposure to sunlight through the day, boosting energy production by about 30%.

Instead of posts, the company used large aluminum screws. The depth of embedment was 30 feet, three times what is normal for a solar array foundation. "They look like gigantic screws like you would use at your house," Corkle says. "By the time it was all done, it was cheaper to do it this way to make it level."

The ribbon-cutting for the solar array was held last January, so it's still too early to tell if Atkinson's venture into solar power will perform as well as expected, but Corkle is confident. The array is connected to the power

“We use a lot of electricity. A long time ago, I was one of the founders of an ethanol plant in the same town, and we were looking at wind turbines, but they weren’t very efficient. When solar came out, I saw that it possibly would work for us.”

**MAYOR PAUL CORKLE**

grid with net metering, so if the panels produce more power than the plant needs, the excess goes to the grid.

### SEVEN-YEAR PAYBACK

The solar array cost \$484,000. The city got a grant from a state energy program to buy down the interest rate and borrowed the money from a local bank. “The payback for this system, because of the grant and some other money we got, is seven years,” Corkle says.

If that works out it will be good for ratepayers and the city, which made significant investments in wastewater treatment in recent years. The city (population 1,200) spent about \$4 million on the new treatment plant. The old plant was obsolete and was not meeting permit requirements. “We looked at a lagoon system, but because of our high water table, we weren’t able to do that, so we had to put in a mechanical plant,” Corkle says.

The new sequencing batch reactor plant is built with two identical trains so one can be taken offline for maintenance or inspection without shutting down operations. Biosolids are applied to farm fields. The effluent is UV disinfected from May 1 through September and is discharged to the Elkhorn River. Operator Scott Fix says the plant processes three or four batches per shift.

### SURVIVING A FLOOD

The treatment plant survived the major flooding in Nebraska last March. “We had the world’s worst storm,” Corkle says. “The frost wasn’t out of the

ground yet, we had 15 inches of snow on the ground, and we got 3 inches of rain. The warm rain melted the snow and broke up the ice on the rivers. Ice started jamming up on the rivers, and we just had a domino effect.”

The streets were underwater in Atkinson, and the treatment plant was overwhelmed with stormwater, among other problems. “The river rose so much that the discharge pipe was underwater,” Corkle says. “I’ve never seen anything like it.”

When the flood receded, the plant and the new solar field were still intact. The city passed a half-percent sales tax to provide some relief from sewer rates after the plant was built. He hopes the solar system will reduce operating costs significantly: “Nobody will live in this town if the rates are through the roof.” **tpo**

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*(Continued from page 43)*

reached a combustible level. These systems can also trigger alarms, record events, provide time for intervention or evacuation, activate ventilation, and release water mist or carbon dioxide to suppress ignition if a gas cloud is forming. Gas detector options suited to wastewater applications include:

- **Line-of-sight (or open-path) gas detection**, using laser, infrared or UV technology. These detectors, which monitor combustible gas levels between two points, are most often used to monitor open spaces above valves, tanks and pipelines.
- **Fixed-point gas detection** by electrochemical, catalytic or infrared technology. Detectors using these technologies activate when gases contact them. Typically installed in high-risk areas, these detectors also come in hand-held variations for spot-checking or for use by crews entering high-risk zones.

Each technology has benefits and limitations, so plant teams sometimes combine various technologies, placing detectors in locations that maximize their effectiveness.

### PLACING SMOKE DETECTORS

In water and wastewater treatment plants, smoke detection is recommended for sludge-processing areas, incinerator buildings and underground tunnels. The detectors are usually hung on walls or ceilings. Like gas detectors, smoke detectors in hazardous areas must have hazardous-location approvals.

Smoke detectors sense particles produced by combustion, using technologies that include ionization, photoelectric light obscuration and video image detection. They should be located in anticipation of airflow from sources likely to present fire risks, but not where potentially costly or inconvenient false alarms are likely to be triggered.

To help treatment plants comply with the latest version of NFPA 820 (2016), which requires smoke monitoring in high-velocity ventilation ductwork, some smoke detectors are designed for mounting within ductwork.



To help treatment plants comply with the NFPA requirement for in-duct smoke monitoring, SmokeWatch U5015 (Det-Tronics) explosion-proof, self-monitoring smoke detectors are available with a duct-mount accessory.

When smoke is present, these detectors activate smoke dampers or fire dampers to protect personnel and help prevent the spread of fire through the HVAC system.

Some smoke detectors periodically self-test; the system controller informs users whether the devices are functioning properly. Still, plant personnel should test these devices regularly.

### CONCLUSION

Water and wastewater treatment plants require an effective fire and gas safety system to protect personnel, equipment and structures from the risk of fire. Plant operators often leave the initial system selection and installation to a fire and gas safety specialist. However, as combustible gas and smoke detectors age, knowledge of detection equipment can help plant operators make decisions to keep their workplaces safer and maintenance easier.

### ABOUT THE AUTHOR

Aaron Paterson ([aaron.paterson@det-tronics.com](mailto:aaron.paterson@det-tronics.com)) is an applications engineer with Det-Tronics, a supplier of flame detection, gas detection and hazard mitigation systems for high-risk processes and critical industrial operations. **tpo**

# Conveyance and Distribution Systems

By Craig Mandli

## Blowers

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Robuschi RB-DV rotary lobe blower from Gardner Denver



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### HOWDEN 827 DVJ

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or weir is required, as a submersible ultrasonic sensor measures velocity and level simultaneously to calculate flow, so there are no moving parts to wear, foul or clog. It has a built-in five-button keypad, intuitive menu, and large backlit LCD. At a glance, view flow rate, velocity, level, totalizer, relay status and important diagnostic information on the LCD. It has three isolated 4-20mA outputs for flow rate, velocity and level, and two relay outputs for pulse output or alarm. It can monitor flow rate, volume total, run hours and diagnostic information through only two wires with the optional Modbus RTU serial communication output. **888-473-9546; www.greyline.com**

## HALOGEN VALVE SYSTEMS TERMINATOR ACTUATOR

The Terminator Actuator from Halogen Valve Systems is a safety device that automatically closes a chlorine cylinder or ton container valve in case of a leak or emergency. It is easily installed on either cylinders or ton containers that use standard U.S.-style chlorine valves. It is a DC-powered impact device that provides 40 to 50 ft-lbs of emergency closing torque as recommended by the Chlorine Institute. It uses the Gemini controller to provide power and logic to the actuator. The Gemini is a two-channel controller with an integral 12-volt battery that provides main and backup power. It provides a remote activation input for panic switches, gas detectors or activation via SCADA, and also offers a relay output that indicates when an emergency close operation has been performed. **949-261-5030; www.halogenvalve.com**



Terminator Actuator from Halogen Valve Systems

## MELTRIC DSN SERIES

DSN Series switch-rated plugs and receptacles with Decontactor technology and push-button circuit disconnection from MELTRIC provide safety and convenience. Type 4X/IP69 environmental ratings help ensure watertight connections ideal for water and wastewater applications.

Silver-nickel contacts, stainless steel components and chemical-resistant housings help withstand corrosion. Butt-style pressure

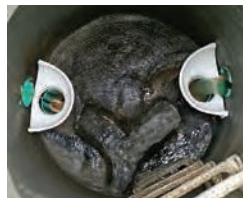
contacts ensure effective electrical connections, even in dusty or dirty environments. They are UL/CSA switch- and HP-rated and available in models from 20 to 150 amps. Lockout/tagout capability and optional integral pilot contacts help make plant operations safer and more efficient. They are NFPA 70E "line-of-sight" compliant and are suitable for fast, easy plug-and-play equipment changeouts. **800-433-7642; www.meltric.com**



DSN Series plugs and receptacles from MELTRIC

## RELINER/DURAN INSIDE DROP BOWLS

Eliminate troublesome outside drops and clean up failed inside drops. RELINER/Duran Inside Drop Bowls and stainless steel pipe support brackets simply bolt to the manhole wall and can be cleaned and inspected from above. The compact, low-profile bowls are available in dozens of sizes to fit any application. Modular Manhole Invert Channels improve manhole hydraulics, reducing maintenance, turbulence and odor. **800-508-6001; www.reliner.com**



Inside Drop Bowl from RELINER/Duran

## Pumps

### BOERGER BLUELINE ROTARY LOBE PUMP

The BLUEline Rotary Lobe Pump from Boerger is a self-priming, valveless, positive displacement pump used to convey viscous and abrasive materials. There

are 21 pump models in six series with pulsation-free operation, fully reversible rotation, dry-run capabilities and flow rates up to 7,500 gpm. The pumps are stable and wear-resistant with a maintenance-in-place design that allows for all wetted parts to be easily replaced through the front cover without the removal of pipe or drive systems. **612-435-7300; www.boerger.com**



BLUEline Rotary Lobe Pump from Boerger

### CAT PUMPS 3545

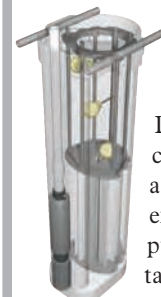
A Cat Pumps 3545 can help boost the filter press cleaning process. After the filter cakes are removed from the press, the clogged filter cloths need to be washed. Adequate cleaning is achieved by using an integral, automated spray arm mechanism that applies water at high pressure. The high-pressure pump system provides 45 gpm at 700 psi to quickly and thoroughly remove obstructive sediment. Out-of-service time can be reduced, leading to more uptime and higher productivity. **763-780-5440; www.catpumps.com**



3545 pump from Cat Pumps

### DELTA TREATMENT SYSTEMS ECOFILTER PUMP VAULT

Filter media in the ECOFILTER Pump Vault from Delta Treatment Systems reduces biological loading and clogging, prolonging the life of downstream drainfields and other treatment systems. Quick to install in new or existing tanks, it is a completely integrated system for pumping effluent from single- or double-compartment tanks. It draws effluent from the clarified zone of the tank



ECOFILTER Pump Vault from Delta Treatment Systems

to minimize suspended solids passing through the pump system. The easy-access design maximizes the

filter surface area and simplifies filter inspection and maintenance by enabling filter cartridge removal without pulling the pump or vault, according to the manufacturer. Featuring a dual-compartment housing for simplex or duplex applications, the unit is constructed of high-density polyethylene with UV inhibitors for longevity. The float stem bracket allows easy removal and adjustment of the float assembly. The unit is customizable for any project need, including septic tank effluent pump collection systems. **800-219-9183; www.deltatreatment.com**

### FLYGT - A XYLEM BRAND EXPERIOR

The Experior pump from Flygt - a Xylem Brand has state-of-the-art hydraulics and premium efficiency motors, and its N-technology and SmartRun control provide optimal wastewater pumping. Other features include adaptive N-hydraulics for clog-free, energy-saving performance. Its self-cleaning functionality operates independently of rotational speed. The pump's SmartRun control is pre-programmed to meet specific wastewater requirements. **855-995-4261; www.xylem.com**



Experior pump from Flygt - a Xylem Brand

(continued)

### FRANKLIN ELECTRIC PIONEER PUMP VORTEX SERIES

Pioneer Pump Vortex Series pumps from Franklin Electric pass through the most challenging solids using a recessed impeller that avoids direct contact. The pumps are suited for applications where fluid conditioning, macerating or mix-prevention is unnecessary. The vortex technology eliminates internal wetted parts, like wear plates and chopper blades, which would otherwise have to be monitored, adjusted and replaced. A range of electric and diesel packaging options are offered for fixed and portable installations and can be fitted with the Pioneer Prime vac-assist system for suction lift applications. The pumps are available in 4-by-4, 6-by-6 and 8-by-8 sizes and cover flow rates up to 3,600 gpm and heads up to 150 feet. **260-824-2900; www.pioneerpump.com**



Pioneer Pump Vortex Series pumps from Franklin Electric



JaecoPAK metering pumps from JAECO Fluid Systems

### JAECO FLUID SYSTEMS JAECOPAK

JaecoPAK metering pumps from JAECO Fluid Systems are most commonly used for chemical metering and desalinization in multiple applications. They are available in both simplex and duplex configurations with pump capacities ranging from 0.38 to 150 gph at operating pressures up to 2,000 psi with an accuracy of plus or minus 0.5%.

They are cast iron with a choice of 316 stainless steel or alloy 20 liquid ends with single ball or poppet check valves. Choose between neoprene, Viton or Teflon packing options and a single- or three-phase 12- or 24-volt electric motor, gas-powered engine or belt-driven option. They are completely serviceable. **877-778-3456; www.jaecofs.com**

### MYERS SETH PUMP DD-6

The DD-6 from Myers Seth Pump pulls the best attributes of four different types of pumps — double diaphragm, centrifugal, piston and rotary lobe — into one solution. It is capable of being used for the six most common methods of dewatering that are typically encountered on a job site, from simple to complex. The 6-inch, high-volume, double-diaphragm pump has a HATZ 1D81Z, 10 hp air-cooled diesel engine, enabling 140 max cfm. It features high head pressure and 3/8-inch steel construction to make it reliable and durable. It can pump 700 gpm, deliver 28 feet of vertical lift and move 4 1/2-inch solids, making it a great sludge and slurry pump as well. The Sound Attenuated Fully Enclosed version reduces noise output by up to 50%, making it ideal for metropolitan and urban environments. **904-389-6114; www.myerssethpumps.com**



DD-6 trailer pump from Myers Seth Pump

### SCREENCO SYSTEMS PATZ SHAFT DRIVE PUMPS

Patz Shaft Drive Pumps, distributed by Screenco Systems, are vertical pit pumps that can be used in above-ground or underground storage tanks and include choices of single- or three-phase electric motors. They have high solids and grit capacities with large centrifugal pumps and hardened steel impellers. High capacities include the 3333 series up to 500 gpm, and the 4444 series up to 1,580 gpm. They can be deployed in depths from 3 feet to 12 feet 8 inches. The 6000 and 8000 series have a three-point hitch with PTO drive and can offer up to 3,500 gpm at depths from 6 to 12 feet. They can be used with an agitator nozzle to mix and pump fast. The 616 vertical prop agitator is capable of mixing at 9,000 gpm, keeping grit and solids mixed at pit depths of 6 to 16 feet. **208-790-8770; www.screencosystems.com**



Patz Shaft Drive Pumps, distributed by Screenco Systems



Series 212 composite valves from ASCO

### Valves

#### ASCO SERIES 212 COMPOSITE VALVE

ASCO Series 212 composite valves meet the EPA's Safe Drinking Water Act standards and are certified by NSF International. They are intended for use in clean-water applications, such as water purification, conditioning and distribution.

The modular FasN end connector design is versatile to include three connection types (solvent bond, NPT thread, turn and lock), giving OEMs more flexibility in their piping installation. They are available in 3/8- to 1-inch pipe sizes and include conduit hub, leaded and DIN electrical connections. **973-966-2082; www.emerson.com**

### SIEMENS PROCESS INSTRUMENTATION SIPART PS100

The Sipart PS100 valve positioner from Siemens Process Instrumentation can be initialized at the touch of a button, automatically adjusting itself to the attached valve. If required, it is possible to optimize the positioner for a specific application with just one touch of a button. It can be set to different modes for precise and fast adjustment, open/close operation and other applications. These functionalities save time, cut the costs of commissioning and increase the return on investment. Its large, easy-to-read display allows users to see the status at a glance. Its four-button operation allows the device to be configured quickly and conveniently. The enclosure comes in polycarbonate or aluminum to withstand the harshest of environments. It uses contactless technology to detect the valve position, eliminating wear, extending service life and facilitating easier, faster commissioning. **800-365-8766; www.usa.siemens.com tpo**



Sipart PS100 valve positioner from Siemens Process Instrumentation

**EAT. SLEEP. SAVE THE ENVIRONMENT. REPEAT.**

**tpo**

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Send your ideas for future articles to [editor@tpomag.com](mailto:editor@tpomag.com)



### Franklin Electric welcomes new managers

Franklin Electric welcomed Chris Downey as its new territory manager for the north-central region. Downey will oversee the distribution and sales for Franklin Electric's Pioneer Pump and FPS brand products throughout the U.S. sales territory of Colorado, Kansas, Missouri, Nebraska, Iowa, North Dakota, South Dakota, Minnesota and Wisconsin, along with the Canadian sales territory of Manitoba. Most recently, he worked as sales director for Hydroflo Pumps USA.

The company also announced Shane Wright as its new territory manager for the Southeast region. Wright will oversee the distribution and sales for Franklin Electric's Pioneer Pump and FPS brand products throughout Mississippi, Alabama, Tennessee, Virginia, North Carolina, South Carolina, Georgia and Florida. His career in the pump industry began as an outside sales representative for Jack Tyler Engineering. Most recently, Wright worked as a national distribution manager for Ruhrpumpen.



Chris Downey

Shane Wright

### Freese and Nichols hires new practice lead

Consulting firm Freese and Nichols hired John Fishburne, a former engineer for the City of Charlotte (North Carolina), as wastewater/water practice lead in Charlotte. Fishburne has 20 years' experience managing pipeline rehabilitation and replacement projects.

### Anue Water Technologies selected as exclusive distributor

Anue Water Technologies was awarded exclusive distribution for Pi2 Technologies Geo-Membrane products for the U.S., Canada and the Caribbean region. The membranes can be used in many applications, such as headworks, tanks, sludge pits, open channels, vessels, manhole covers, truck bays, vertical vents and fugitive emissions from vent covers.

### Jerry Schlicker promoted to engineering manager at Duperon

Duperon announced the promotion of Jerry Schlicker from controls engineer to engineering manager. In his new role, Schlicker is accountable for the design, development, onboarding and implementation of all Duperon products. Duperon product owners and detail manager report to Schlicker, and the team is responsible for managing and maintaining all process, quality, document controls, systems, data, applications rules, drawings and all product-related materials that maintain the integrity of each Duperon product throughout its life cycle.



Jerry Schlicker

### U.S. Water Services acquired by Kurita Water Industries

U.S. Water Services announced that it has joined the Kurita Water Industries companies, an international water management company headquartered in Tokyo. The acquisition was announced in early February 2019 and was completed effective March 26. The acquisition of U.S. Water Services is part of Kurita Group's strategic focus to expand its businesses globally by establishing bases in four regions of the world — Japan, Asia, Europe and the Americas — and is implemented as a measure for strengthening its businesses in North America.



### Aerzen Canada celebrates with open house

Aerzen Canada is in a growth and expansion mode. The company celebrated the opening of a brand-new, 26,000-square-foot building with office space and a production facility. The March 19 event was attended by employees, customers, vendors and members of the national sales teams.

Paul Birdi, Aerzen Canada's president, says, "Aerzen Canada was founded in 1987 with three employees. Since then we have grown steadily to the point where we have outgrown our facility. This new building provides our customers with more capacity, higher quality and even better support with new processes, tools and technology."

### Nuvoda names new CEO

Zain Mahmood was hired as chief executive officer at Nuvoda, a North Carolina-based provider of advanced solutions for biological process systems in wastewater and water treatment.

### Parkson Corp. names Michael Hill as new CEO, president

Parkson Corp. announced the appointment of Michael Hill as its new president and CEO. He succeeds Shamus Hurlley, who is stepping down after seven years as CEO. Hill joined Parkson Corp. in early 2008 and in his 11 years with the company has held various leadership roles in areas that included Six Sigma, Business Process Improvement, Product Portfolio Management and Regional Sales Management. In 2014, Hill was made an executive of the corporation, responsible for the leadership of global sales and marketing functions, and most recently, he saw his role expand to include the general management of Parkson Corp.'s Mechanical Products and Aftermarket Business.



Michael Hill

### OneWater announces first Algaewheel system in Iowa

OneWater announced the award of its first project in Iowa. The project at the West Lake Park Wastewater Treatment Plant includes installation of a 10,000-gpd average dry-weather flow Algaewheel wastewater treatment plant. The Algaewheel process uses daylight for energy and optimizes the mutually symbiotic relationship between algae and bacteria for a low-energy treatment system. The new plant replaces an old activated sludge facility and will provide treatment for all of the Davenport park facilities.

(Continued on page 51)

## Chopper pump helps stop clogging at lift station

### Problem

At a Texas wastewater treatment plant's main lift station, better mixing was needed to break up persistent grease and scum layers. Three small pumps could no longer cope with grease and objects such as mopheads that caused blockages. The maintenance team was always on call to help keep the wastewater flowing and prevent overflows. In some cases, a vacuum truck had to be called at significant cost.

### Solution

After testing, the municipality chose a **Gator submersible chopper pump** from **Landia**. The Gator series was developed to eliminate lift station clogging caused by wet wipes and other debris. It has a hardened steel knife system at its inlet that continuously macerates and mixes solids. Its open impeller enables it to pump even high-viscosity flows.



#### RESULT:

The existing duty pumps are now better protected. The chopper pump picks up the solids from the bottom of the lift station and breaks them up so that they do not accumulate and cause clogging. **919-466-0603; www.landiainc.com**

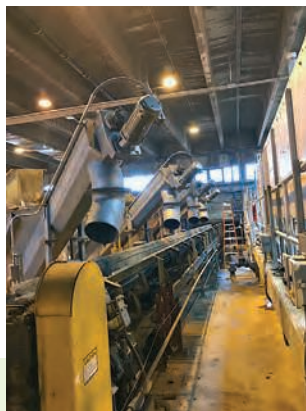
## Grit classifiers reduce maintenance

### Problem

The grit classifiers at DC Water's Blue Plains site had structural defects, causing leaking. Each time, a unit had to be taken offline to open the hatch, take the screw out, get inside to clean it, buckle in a new liner and weld it. Increasing downtime, maintenance and cleaning required fresh investment.

### Solution

The new **grit classifiers** had to match the existing classifier envelope. Using 3D modeling, **Lakeside Equipment** worked with DC Water to match the grit classifiers with the inlet and outlet pipes. Sixteen grit classifiers, each handling a slurry flow of 400 gpm, have significantly reduced maintenance issues.



#### RESULT:

Maintenance is now much easier, as there is much better access. An automatic lubricator on the end of the bearing eliminates the labor of replacing a plastic liner. **630-837-5640; www.lakeside-equipment.com**

## Pinch valves replace plastic ball valves

### Problem

A drinking water plant in Arizona used plastic ball valves on pipelines to transport 12.5% sodium hypochlorite. The valves had problems with the rubber liners swelling, preventing them from shutting off completely. The packing also had problems with leaking hypochlorite on the floor.

### Solution

The valves were replaced with **Flowrox PVEG** polyamide-bodied **pinch valves** with EPDM rubber sleeves. The sleeve is the only component in contact with the flowing medium. The pinch valves do not have stem packing, so no sodium hypochlorite has leaked from them. The valves are lightweight: A 2-inch valve weighs only 17 pounds, and a 6-inch valve weighs less than 60 pounds. The valves are also full port. Pinch valves also save energy and are easy to open and close.



#### RESULT:

The valves have been operational with no repairs or leakage for more than two years. **888-356-9797; www.flowrox.com**

## Aboveground lift station simplifies operations, reduces costs

### Problem

Tough-to-access submersible pumps complicated life and increased costs for maintenance workers at the Royal Cornwall Hospital in Truro, United Kingdom. "Our original submersible pump stations were no longer maintainable by our in-house staff," says Leslie Dey, estates officer. "Keeping up with the training to send anyone down there would have been a massive cost." Routine maintenance like pulling a pump to change a seal or impeller required confined-space entry. "A lot of it was far too costly to do in-house," Dey says. "It was eventually all contracted out."

### Solution

The hospital converted from submersible pumps to the **EVERLAST wet-well-mounted pump station** from **Smith & Loveless**. The station simplifies access and eliminates confined-space concerns by mounting a complete lift station above ground and inside a quick-access enclosure. "The beauty of the equipment all being above ground is that all of our guys can access that fairly easy," Dey says.



#### RESULT:

Dey and his staff inspect the station daily and conduct routine maintenance with ease. Contractor costs have been eliminated. "The aboveground pump station allowed us to take back ownership of our equipment and maintain it in-house," Dey says. **800-898-9122; www.smithandloveless.com**

(Continued from page 49)

## Infiltrator Water Technologies purchases Presby Environmental Inc.

Infiltrator Water Technologies announced the purchase of Presby Environmental Inc. (PEI). Presby Environmental manufactures the Enviro-Septic, Advanced Enviro-Septic, EnviroFin and other wastewater treatment technologies.

“We are excited to be able to expand our products with the proven Presby Environmental product line. The family of Presby Environmental products complements Infiltrator’s core business and helps to strengthen our industry leadership position. The combination of Infiltrator and Presby Environmental supports our vision to reimagine and revolutionize onsite water management,” says Roy E. Moore Jr., president and CEO of Infiltrator Water Technologies.

## ONICON Measurement Solutions announces acquisition

ONICON Measurement Solutions announced it has been acquired by the TASI Group. The TASI Group is a privately owned industrial business focused on test, measurement, inspection, and assembly instruments and equipment. All ONICON Measurement Solutions business units, including ONICON, Air Monitor, Fox Thermal, Seametrics, Greyline and Pulsar Process Measurement, are included in the transaction.

The ONICON Measurement Solutions companies will become part of the existing TASI Flow Group of companies, which are currently comprised of AW-Lake Co., Exact Dispensing Systems, KEM GmbH, Litre Meter, SignalFire Wireless Telemetry, and Vogtlin Instruments. John Norris, current president of ONICON Measurement Solutions, was named president of the TASI Flow Group and will report to John McKenna, TASI Group president and CEO. **tpo**

## Chopper pump used to clear wet well of grease blanket

### Problem

The Otay River Pump Station, which pumps 7 to 9 mgd of raw sewage to the South Bay Water Reclamation Facility for water recovery in San Diego, had a problem in the 50-foot-long, 10-foot-wide, 30-foot-deep wet well. A floating blanket of grease and debris, sometimes as thick as 4 feet, would form regularly. The city was hiring two vacuum trucks to clean the station every three to four months at a cost of \$50,000 to \$100,000 per year.

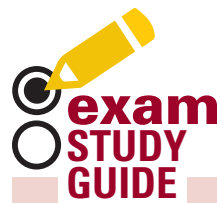
### Solution

The city installed **Vaughan chopper pumps**, which are suitable for use in pump and lift stations as conditioning pumps when fitted with a nozzle to provide high-velocity mixing. They were placed in the problem wet well on a portable stand to recirculate and chop the contents. The company selected an 8-inch submersible chopper pump with a 25 hp, 1,200 rpm motor with mixing nozzle and portable stand.



### RESULT:

In 18 months of use, the wet well has not required cleaning. The pump paid for itself in 2 1/2 months. **888-249-2467; www.chopperpumps.com tpo**



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## WASTEWATER

By Rick Lallish

**What type of pond is often used to treat strong industrial wastes?**

- A. Aerobic
- B. Anaerobic
- C. Facultative
- D. Mechanically aerated

**ANSWER:** B. Anaerobic ponds are most often used to treat strong industrial and agricultural wastes. Some are used for pretreatment as well. They are used to reduce wastewater strength and do not provide complete treatment. They are normally followed by a more conventional treatment method. Anaerobic ponds are devoid of any oxygen sources, including nitrate or nitrite. More information can be found in the Water Environment Federation training manual, *Wastewater Treatment Fundamentals 1 – Liquid Treatment*, Chapter 6.

## DRINKING WATER

By Drew Hoelscher

**What is the brake horsepower (BHp) of a 75% efficient pump that is pumping water 300 gpm against 150 feet of total dynamic head (TDH)?**

- A. 5 BHp
- B. 10 BHp
- C. 15 BHp
- D. 20 BHp

**ANSWER:** C. Water weighs 8.34 pounds per gallon, so moving it requires a lot of energy and work. Work is expressed in foot-pounds. One hp is equal to 33,000 ft-lbs per minute, so multiplying the weight of the water (300 gpm x 8.34 pounds = 2,502 pounds) by the distance (150 TDH) and dividing by 33,000 ft-lbs per minute will calculate the water horsepower (WHP). The WHP is the horsepower transferred to the water from the pump. To determine the BHp, divide the WHP by the percent efficiency of the pump (0.75). The BHp is the output horsepower from the motor to the shaft. Motors are not 100% efficient, and you can determine the required electrical horsepower (EHP) by dividing the BHp by the percent efficiency of the motor.

### ABOUT THE AUTHORS

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

## product spotlight

### wastewater

## Grinder helps keep systems running smoothly

By Craig Mandli

Twin-shafted grinders can offer unparalleled solids reduction capabilities for wastewater treatment facilities. The units, which are often installed to keep biosolids pumps from clogging or to keep centrifuges from being switched offline, help precondition biosolids and prevent unplanned maintenance on expensive effluent pumps and dewatering systems. More importantly, they eliminate the safety risks that operators face from removing debris by hand. The **Taskmaster TM8500** from **Franklin Miller** has long been a solid fit for this task.

The TM8500 is a high-performance, twin-shaft grinder that provides powerful size reduction capabilities, easy maintenance and exceptional durability. The unit features cutter cartridge technology that increases unit strength completely and eliminates the need for cutter stack retightening. Because they are constructed using one-twelfth the parts of a traditional grinder, overall durability is increased.

With the Taskmaster TM8500, banks of individual cutters and spacers are replaced by one-piece cutter cartridges. By eliminating these multiple parts, maintenance is also dramatically simplified. These cutting elements are machined from solid alloy steel or stainless steel using a unique manufacturing process. Each cutter cross-section increases from approximately 5/16 inch to more than 3 3/4 inches, all but eliminating cracking and misalignment. The result is a high-strength grinder that has a remarkable resistance to cutter and spacer cracking, as there are no gaps between cutters to get contaminated and loosen.

Taskmaster TM8500  
from Franklin Miller

The cutters are installed on two counter-rotating shafts, intermeshing one with another at close clearance to shear and shred solids into fine bits. One shaft feeds solids to the center of the unit while the other shreds them. The output achieved is easily processed by downstream equipment such as pumps, centrifuges and belt filter presses.

The Taskmaster can be successfully installed in sewage treatment plants, sludge lines, pumping stations, roadside or runway sanitary facilities, institutional waste, or small solid waste applications. These versatile processors reduce rags, plastics, wood, tampons and sanitary napkins to a size small enough to flow through most common drain openings. They can be installed in gravity or pressurized, vertical or horizontal pipe systems on the suction or positive side of a pump.

Standard features include mechanical shaft seals, heavy-duty bearings, automatic control system and a direct gear drive. This heavy, direct-coupled gear drive generates high-torque, low-speed rotation for powerful performance with low noise or vibration. In-feed or discharge conveyor systems are available as an optional add-on.

800-932-0599; [www.franklinmiller.com](http://www.franklinmiller.com)



### Teledyne ISCO LaserFlow Ex flow measurement sensor

The LaserFlow Ex noncontact velocity sensor from Teledyne ISCO is designed for intrinsically safe locations. The subsurface flow measurement sensor is certified for hazardous areas classified as Class 1, Div. 1, Zone 0 and ATEX category 1G. The LaserFlow Ex can remotely measure flow in open channels with noncontact Laser Doppler Velocity technology and noncontact Ultrasonic Level technology. The sensor measures velocity with a laser beam pointed below the surface of the water or wastewater stream. It offers built-in diagnostic tools, simple installation and minimal maintenance, which reduces the number of site visits. With a variety of communication options, programming and data retrieval can be performed from a remote location.

800-228-4383;  
[www.teledyneisco.com](http://www.teledyneisco.com)



### Wastecorp Pumps Super Duty TVP vacuum pumps

The Super Duty line of vacuum pumps from Wastecorp Pumps is

available in vacuum trailer, slide-in units or all-terrain vehicle tow packages in capacities ranging from 40 gallons up to 2,500 gallons. Super Duty TVP Series vacuum pumps are focused on the municipal and industrial pump markets. The pumps are completely customizable by the end user with vacuum power ranges from 127 to 520 cfm. Gas, diesel and electric models are available. Model options include Department of Transportation-compliant vacuum trailers or stationary slide-in vacuum pumps.

888-829-2783;  
[www.wastecorp.com](http://www.wastecorp.com)



### Blue-White Industries Digi-Meter F-2000 Series

The F-2000 Series electronic, digital paddle wheel flowmeters from Blue-White Industries monitor flow in a wide variety of applications. The units measure water ranges from 0.4 to 8,000 gpm and feature an easily visible, eight-digit LCD readout with up to four decimal positions. The

meter is field programmable via the front panel touchpad, and the panel is equipped with a security lockout. It is designed to accommodate pipe or wall mount installations. The insertion-style F-2000 displays flow rate, total flow and includes an NPN open-collector output for communication with data loggers, SCADA systems and other external devices. Additional features include 4-20mA/0-10 volts DC, batch processing, a high/low flow-rate alarm output and front panel security lockout. It comes factory programmed with a calibration certificate.

714-893-8529; [www.blue-white.co](http://www.blue-white.co)

## product spotlight

### water

## Versatile pumps fit rough environments

By Craig Mandli

Water and wastewater treatment is rough on hardware. The pumps used in these facilities are often constantly in use; and wet, humid conditions can quickly lower the life span of equipment not designed to handle those conditions. Fortunately the **LRP 700-1000 VSD+ range of vacuum pumps** from **Atlas Copco Compressors** was developed specifically for wet, humid and dirty applications. A departure from classic liquid ring pumps, the LRP 700-1000 VSD+ is a compact, high-performance, energy-efficient system enclosed in a rugged noise-attenuating canopy.

Ensuring efficiency, the dual variable-speed drive system operates in harmony within the pump. The primary VSD accurately maintains required vacuum levels by controlling the operating speed of the pump, matching pump performance to process demand and saving energy. The second VSD regulates the water circulation pump in response to the operating conditions. Optimizing water flow within the pump element provides maximum performance and stability at all vacuum levels and operating speeds. Unique algorithms help balance the operation of the water pump with the speed of the main motor.

“When it comes to pump technology, we believe in taking what has been the standard for years and driving it to the next level,” says Gerry Bergeron, Atlas Copco’s product marketing manager for liquid ring pumps in the U.S. “People who have looked at liquid ring pumps in the past and moved on to other solutions should take a look at this new innovation.”

The intelligent aspect of the pump comes through the MkV Elektronikon controller, providing a comprehensive built-in management system. Key information on performance and maintenance is readily available and visual. Multiple pumps can be monitored, controlled and optimized simultaneously, giving customers the most suitable product performance at all times.



LRP 700-1000 VSD+ from Atlas Copco Compressors

The pump can also be remotely monitored via Atlas Copco’s SMART-LINK program.

With the application being at or close to the point of use, noise and size are two essential considerations. The compact, integrated design, which includes many features usually only seen on the outside of the cubicle is still up to 70% smaller than comparable models — this also makes it a true plug-and-play design. An operating noise level in the range of 65 dBA makes it an extremely quiet vacuum pump. Service can be performed while the pump is horizontal. No oil means no regular filter exchange, and all areas needed for service are easily accessible. The vessel can be easily cleaned via the dedicated access port.

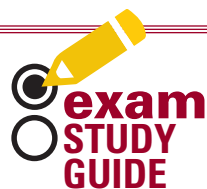
866-546-3588; [www.atlascopco.us](http://www.atlascopco.us)



### Watts Water Technologies QuadRail fastener system

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## people/awards

**Larry Polfiet**, assistant superintendent for the wastewater treatment collections system in Marshall, Minnesota, was named 2018 Employee of the Year.

The **Hollister Water Reclamation Facility**, operated and maintained by Veolia Water Technologies North America, received the Safety Plant of the Year award from the Monterey Bay Section of the California Water Environment Association.

The **City of Vacaville Easterly Wastewater Treatment Plant** received the 2018 Wastewater Plant of the Year award from the California Water Environment Association's Redwood Empire Section.

**Dave Wilke**, Enterprise Wastewater Treatment operator, was named 2018 Wastewater Operator of the Year by the Oregon Association of Wastewater Utilities.

**Dale Lucas**, Columbiana director of environmental services, was named 2019 Wastewater Operator of the Year by the Alabama Rural Water Association.

**Lori Stenzel**, senior water quality and environmental compliance specialist for Illinois American Water, received the 2019 Illinois Section of the American Water Works Association Women in Water Outstanding Woman Award.

**Strand Associates** earned a National Recognition Award for exemplary engineering achievement from the American Council of Engineering Companies for its work on Meister Cheese's wastewater plant in Muscoda, Wisconsin.

**John Myzell**, operations manager for the Orangeburg County (South Carolina) Water and Sewer Authority was recognized by the county's Community of Character initiative for his dependability.

**Bradley Walsh** was named chief executive officer and board member by Silver Bullet Water Treatment in Colorado.

The Niagara Falls (New York) Water Board named **Patrick Fama** its new executive director.

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



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## events

### July 14-17

Georgia Section AWWA Annual Conference, Westin Savannah Harbor Golf Resort and Spa. Visit [www.awwa.org](http://www.awwa.org).

### July 23-25

Nutrient Removal and Recovery Symposium 2019, Renaissance Minneapolis Hotel, The Depot. Visit [www.wef.org](http://www.wef.org).

### July 28-31

Alabama-Mississippi WaterJAM, presented by the Alabama Water Environment Association, the Mississippi Water Environment Association and the AWWA Alabama-Mississippi Section, The Battle House Renaissance Mobile, Alabama. Visit [www.almswaterjam.com](http://www.almswaterjam.com).

### July 29-30

Virginia Water Environment Association Lab Practices Conference, Omni Charlottesville Hotel, Charlottesville, Virginia. Visit [vwea.site-ym.com](http://vwea.site-ym.com).

### July 29-31

WEF-EESS (Water Environment Federation-Environmental Engineering Society of Singapore) Conference on Advancement in Water and Wastewater Treatment and Reuse, University Town – National University of Singapore. Visit [www.awwtr2019singapore.com](http://www.awwtr2019singapore.com).

### July 31-Aug. 1

Water Environment Association of Texas Biosolids and Odor and Corrosion Conference and Expo, Embassy Suites San Marcos Hotel, Spa and Conference Center. Visit [www.weat.org](http://www.weat.org).

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