# **TREATMENT PLANT OPERATOR**

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DEDICATED TO WASTEWATER & WATER TREATMENT PROFESS

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Energy

THE HAYWARD WATER POLLUTION CONTROL FACILITY BENEFITS FROM BIOGAS-FUELED COGENERATION AND SOLAR POWER

PAGE 28

Jeff Carson Operations/Maintenance Manager Hayward, Calif.

> TECHNOLOGY DEEP DIVE: DNA for microbe analysis PAGE 56

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4 TREATMENT PLANT OPERATOR

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# tents November 2016





### on the cover

The Hayward (California) Water Pollution Control Facility once consumed 60 percent of the city's electricity. Today, it produces its own and exports power for other city functions. Jeff Carson, operations and maintenance manager, leads a team that

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oversees a biogas-fueled cogeneration system. The plant also benefits from a solar energy array. (Photography by Lezlie Sterling)

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The country's fixation on spending restraint and low taxes is chipping away at necessities. What are the impacts of short-changing water infrastructure? By Ted J. Rulseh, Editor

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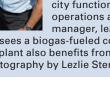
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- Wastewater Plant: Engineering excellence in Ohio City, Ohio
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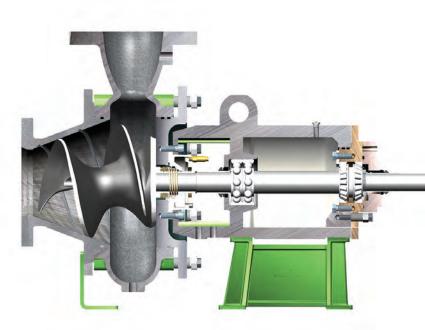
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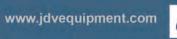


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# **The Austerity Trap**

THE COUNTRY'S FIXATION ON SPENDING RESTRAINT AND LOW TAXES IS CHIPPING AWAY AT NECESSITIES. WHAT ARE THE IMPACTS OF SHORT-CHANGING WATER INFRASTRUCTURE?

### By Ted J. Rulseh, Editor

got my first full-time newspaper job when I was 23, and it paid next to nothing. In fact, if I broke it down by the hour, I made less than in the stopgap post-college job I'd held previously, setting up banquet tables in a hotel.



My car was a beat-up 1964 Rambler. The rear tires were getting bald, but I "couldn't afford" new ones. That is, until the day I was driving to the county seat on a state highway in heavy rain, and those tires hydroplaned.

In a flash, water spray obscured the windshield, and I was in a spin, my clipboard flying across the car. I braced for a crash with an oncoming truck or for a rollover into the ditch. Instead, the rear end thumped into a soft embankment, the car swung around and stopped on the highway shoulder, facing in the wrong direction.

I was unhurt, and I just turned around and drove away. But I might have been killed and could have taken another driver with me. Guess what I

bought that very day, before driving home from the county seat. Right — two new rear tires.

### WHAT WE CAN AFFORD

What has that to do with water and wastewater? Actually, a lot. The lesson is that it's risky to forestall spending money on necessities. In these times, when the word "austerity" is in vogue, we hear a lot about things our nation can "no longer afford."

Those things apparently include sound water and wastewater infrastructure. At the federal level and in many states, getting funds approved for almost any purpose is a struggle. This isn't true only of what some might call luxuries. It's also true of basic facilities like roads, schools and underground piping — not just money to build them but to keep up what already exists.

Let's leave aside all the politics of taxation and spending and look at the stark reality. Infrastructure has to be maintained. If we neglect it, it is not going to improve with age, no more than my Rambler's tires were going to grow new tread if I waited.

Postponing maintenance almost always ends up costing more. We know this, in many cases from personal experi-

ence. One more year with the aging shingles can mean a water-soaked ceiling and a big puddle on the living room carpet. A neglected fall furnace inspection can mean loss of heat on a subzero night and a very expensive emergency service call. And so it goes.

# A BILL IN DISGUISE?

What's the result of neglected maintenance on water and wastewater treatment plants and water and sewer piping? Higher costs to handle I&I water at the treatment plant. Permit violations. Equipment breakdowns, inefficiency and wasted energy. Sanitary sewer overflows. Drinking water leaking from pipes into the ground. Main breaks and sinkholes. Compromised water purity.

And after that, and all it entails, the infrastructure still needs to be repaired and updated, at much greater cost than if it had simply been cared for properly. We all know this, and our elected officials should, too.

So, what is this "can't afford" mentality getting us? A sign on the wall at my first newspaper workplace said: "If you can't find time to do it right, how will you find time to do it over?" A corollary for these times might be: "If we can't afford to maintain it, how will we afford to fix it when it breaks?"

It's a supreme irony: There is a very good chance that persistent cuts in funding — sold to the public as savings may actually represent a huge bill for all sorts of problems. All but the most aware citizens may never notice, unless and until a sinkhole eats half of their city's downtown.

When it comes to water and wastewater infrastructure, the simple truth is: We built it, we have to maintain it. The word "afford" should not even be in the conversation. The "afford" should be, must be, built right into the water rates, sewer rates, and taxes we pay — end of discussion.

# IT'S NOT OPTIONAL

When it comes to water and wastewater infrastructure, the simple truth is: We built it, we have to maintain it. The word "afford" should not even be in the conversation. The "afford" should be, must be, built right into the water rates, sewer rates and taxes we pay — end of discussion. The alternative is to endure service disruptions, environmental degradation and greater expense.

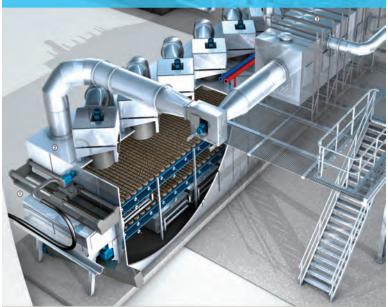
And finally, on basic principle, as a participant in the water and wastewater industry, and as a plain old citizen, I am sick and bloody tired of politicians telling me what this generally incredible and extremely wealthy country "can't afford." **tpo** 



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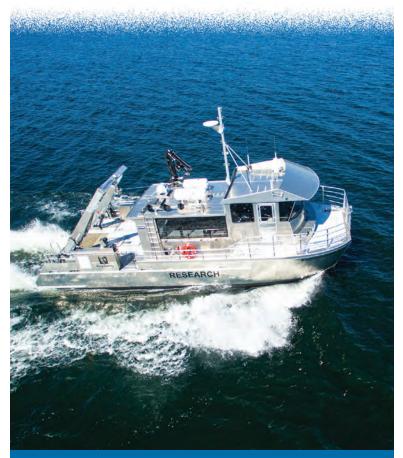
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Named after a Seattle band, the SoundGuardian is tackling environmental issues in Washington's Puget Sound. In this online exclusive, learn how a boat is making life easier for wastewater operators in the region, and read about monitoring programs at King County Wastewater Treatment. tpomag.com/featured

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*Trying to Reduce Stormwater Runoff? In Philly, There's an App for That* tpomag.com/featured



# MATH FACTOR Top 3 Equations for Activated Sludge Process Control

Experiencing a plant upset? Take a look at these three go-to equations that can help you pinpoint major activated sludge issues. See

if you agree with the provided equations in what has become one of the most highly discussed articles on TPOmag.com from the past month. **tpomag.com/featured** 

# WHAT A BEER! Brewing Contest Showcases Water Reuse

What do you get when you combine more than 100 homebrewers, certified beer tasters and a lot of purified wastewater? That would be the New Water Brew Contest, held Sept. 10 and 11 in Tampa, Florida. Find out how the WateReuse Association is showcasing recycled water with this highpublicity brewing contest. **tpomag.com/featured** 



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# It Takes a Watershed

AN AWARD-WINNING ILLINOIS WATER TREATMENT PLANT SUCCEEDS WITH SOURCE WATER PROTECTION THROUGH PUBLIC EDUCATION AND OUTREACH TO THE FARM COMMUNITY

#### STORY: Trude Witham PHOTOGRAPHY: Suzanne Tennant

### THE TEAM AT THE JOSEPH DONOVAN REGIONAL

Water Treatment Plant is serious about source water protection. Their efforts have helped make the Kankakee River one of the cleanest rivers in the Midwest.

Along with the plant's owner, Aqua Illinois, the team in Kankakee works to maintain and enhance the river water quality through education and outreach. They have formed and maintained alliances with local groups, organizations and government agencies to protect the river as a water source and a natural resource for the entire region.

For the team's continuous efforts, the plant won the AWWA Illinois Section 2015 Source Water Protection Award in the large system category.

#### FIRST FILTRATION PLANT

The 22 mgd (design) Joseph Donovan plant was built in 1886 as part of the Kankakee Water Company and was the first filtration plant in Illinois (1932). Today, the plant uses lime softening to treat an average of 11 to 13 mgd. Major equipment includes:

- Raw clarifier, primary clarifier and two secondary clarifiers (Evoqua)
- Lime slakers (Chemco)
- High- and low-service pumps from Peerless Pump (Grundfos Pumps)
- Chemical pumps (Lutz-JESCO; LMI Pumps)
- Wallace & Tiernan chlorinators (Evoqua)
- Chlorine scrubber (Purafil)



Andrew Stanek, facility operator, performs maintenance on an air compressor (Ingersoll Rand) in the shop at the plant.

Nitrates aren't found in the raw river water at levels that require treatment because we've been successful in reducing them at the source through our work with the farm community."

LTAND

T30

# Joseph Donovan Regional Water Treatment Plant, Kankakee, Illinois

BUILT:   1886 (filtration plant built in 1932)	
POPULATION SERVED:   27,000	$\sim$
SERVICE AREA:   Kankakee and surrounding cities and towns	7.5
SOURCE WATER:   Kankakee River	
TREATMENT PROCESS:   Conventional lime softening	
DAILY FLOWS:   22 mgd design, 11-13 mgd average	
DISTRIBUTION:   400 miles of water mains	
SYSTEM STORAGE   16 million gallons	
KEY CHALLENGE:   Replacing retiring staff, training new staff	
WEBSITE:   www.aquaamerica.com	
GPS COORDINATES:   Latitude: 41° 6'13.90"N; longitude: 87°51'14	4.84″W

- 17 conventional sand filters
- Sludge pumps (Crane Pumps & Systems)
- SCADA system with Modicon (Schneider Electric) and Allen-Bradley (Rockwell Automation) PLCs

Sludge from the plant is pumped into a 13-acre lime storage lagoon and applied to farm fields. The plant has upgraded pumps and motors over the years, but there has not been a major expansion since 1932. The lime slakers and carbon dioxide feeder will be upgraded in 2016.

## MAINTAINING THE RIVER

Plant staff members are active in making sure the Kankakee River remains exceptionally clean. Although agricultural runoff can contain nitrates, that has not been an issue. "Nitrates aren't found in the raw river water at levels that require treatment because we've been successful in reducing them at the source through our work with the farm community," says Kevin Culver, a regional environmental compliance manager with Aqua Illinois.



Farmer Jeff O'Connor conducted a recent study on the benefits of a cover crop to reduce nitrate in the river. O'Connor is chairman of the Kankakee County Soil & Water Conservation District and a director on the Kankakee County Farm Bureau. Aqua Illinois' Culver and plant lead operator Don Denault helped with the study by gathering and testing samples of the runoff water.

"The study compared the level of nitrates discharged from field drainage tiles into a receiving stream from the same farm field, a portion of which was seeded with a cover crop," says Melissa Kahoun, area manager with Aqua Illinois, Kankakee and Will counties.

When Denault tested the water, the data showed 56 to 74 percent less nitrate in the tile from the portion of the field with the cover crop. Says Culver, "Continued research and public education are planned, with a focus on efficient use of farm chemicals, both from an economic and environmental standpoint."

Culver volunteers with an organization called River Watch, collecting data once a year on aquatic insects and other macroinvertebrates in the river that are indicators of water quality. The program trains citizen scientists to collect the data that determines water quality trends. Water level, temperature and weather can affect the macroinvertebrate population, so Culver samples in May or June at four sites in the Kankakee watershed. He has been doing this since 2001 and has involved his whole family.

Aqua Illinois staff members also help with an annual Kankakee River cleanup every fall. The cleanup is part of the Northern Illinois Anglers Association's Adopt-A-River program, in which Aqua has been involved for 13 years.

#### **USING INGENUITY**

The plant has also faced its share of technical challenges. A reconfiguration (straightening) of the Kankakee River in Indiana caused faster flow and the migration of sand in the riverbed throughout Kankakee County and areas downstream.

# **REACHING OUT**

At the Joseph Donovan Regional Water Treatment Plant, community outreach and education is a big priority. Plant owner Aqua Illinois encourages outreach as a way to teach the community about issues like watershed protection.

The plant team conducts tours for small groups and officials. Water treatment plant area manager Melissa Kahoun and Aqua Illinois regional environmental compliance manager Kevin Culver take part in various career days with schools and give classroom presentations on request.

In 2015, Aqua Illinois won the Youth Outreach Award from AWWA Illinois Section. Says Kahoun, "We are an active participant in the Coalition for Hope and Excellence in Education (CHEE), and we set up source water protection booths at community events and outdoor shows." The company also judges the Envirothon high school environmental education competition.

"For more than 100 years, Kankakee families and employers have received high-quality filtered, softened water from the Kankakee River," says Kahoun. "Community outreach and education have been essential to preserving the river. After all, that's the only way we can protect our watershed and our source water for the next 100 years."

Outreach also raises awareness of career opportunities in the water treatment industry. "It takes a dedicated individual to ensure safe drinking water for tens of thousands of people every day," says Kahoun. "Aqua is meeting that demand by continually investing in our staff and maintaining and improving our facilities."



Even with new water quality regulations over the years, we've met all the requirements for more than 30 years. The only violation we have had is for missing one sample."

"For years, our staff and environmental advocates witnessed the sand encroachment and the impacts to drinking water operations and the environment," says Kahoun. "Throughout the mid-2000s, Aqua dredged the areas around its deep-water intake in the Kankakee, only to have major flooding wash even more sand into the intake."

The plant operations, led by Denault and Culver, came up with a plan to raise the intake structure above the sand bed. They worked with a contractor to remove the structure from the river, extend it 5 feet and reinstall it without interrupting service to customers.

It wasn't easy. The structure's base, which had not been exposed for generations because of sand infill, was much different than the plans had indicated. This required field revisions and other changes. The river froze in early December 2008, slowing down the project. The job was finally completed nearly a year later.

"Because of the ingenuity and dedication of our employees, the total investment in the project was limited to about \$180,000, which is dramatically less than a new intake structure would have cost," says Kahoun.

# AMPLE EXPERIENCE

This dedication sets the group apart and is a key to their success. Eight operators and a laborer operate and maintain the plant. Besides Kahoun, who has been with Aqua for six years, and Denault (Class A water treatment certification, 39 years), this highly experienced team includes:

- Mike Stone, production manager, five months
- Water treatment technicians Sean Culver (three years), Ulysses Hudson (35 years), Gary Huggins (31 years), Bruce McCue (31 years), Donald Rapier (39 years), Michael Scarcliff (11 years) and Andrew Stanek (six years)
  Laborer Chris Quillman (two years)

All water treatment technicians are certified, and most hold a Class A (highest) water treatment license. Stanek, who also holds a Class 4 sewer



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Ulysses Hudson, water treatment technician, records data from the SCADA system.

license, operates both the water and wastewater treatment plants in Kanka-kee County.

The team is especially proud of its 2016 Best Tasting Water in the South Suburbs award from the South Suburban Water Works Association. "This award is one of their greatest successes," says Kahoun. "They take a lot of pride in the water quality."

Says Denault, "Even with new water quality regulations over the years, we've met all the requirements for more than 30 years. The only violation we have had is for missing one sample."

To help meet the demand for treatment operators as current ones retire, Aqua has launched an employee development plan to identify those interested in learning about treatment. "Supervisory staff meet annually with each employee and identify and plan for the training needed to eventually fill a role in the treatment



process," says Kahoun. "We also emphasize cross-training, and one distribution employee is currently being cross-trained at the water plant."

### FUTURE IMPROVEMENTS

Looking ahead, a pharmaceutical company's plant expansion will affect the treatment plant. "By the end of 2017, CSL Behring will have completed a major expansion of its Kankakee plant," says Kahoun. "They currently process 4 million liters of plasma a year, and will be able to process 16 million liters a year. Water demand could increase by 1.2 mgd, for a total maximum demand of 1.8 mgd."

To meet that need and serve the expanding population of Kankakee County, the plant will undergo a \$15 million upgrade over the next year.



The team at the Joseph Donovan Regional Water Treatment Plant includes, from left, Bruce McCue, water treatment technician; Melissa Kahoun, area manager; Don Denault, water treatment technician; Andrew Stanek, facility operator; Sean Culver, Don Rapier, Ulysses Hudson and Gary Huggins, water treatment technicians; Chris Quillman, laborer; and Mike Stone, production manager.

Improvements will increase plant reliability and add redundancy to key treatment processes. Upgrades include:

- 12 mgd ClariCone system (CB&I)
- Improvements to the carbon dioxide feed system and a new carbonic acid feed system (Tomco2 Systems, 50-ton tanks)
- Two new 2,000-pound-per-day lime slakers (RDP Technologies)
- Filter valve and actuator replacement
- Anionic polymer feed system

In 2017, the treatment plant will add the city of University Park to its system. A 15-mile pipeline from Grant Park to University Park will be built at a cost of up to \$18 million. University Park's water demand from the Silurian Dolomite Aquifer is about 1.2 mgd, with a peak of 3.4 mgd. Its residents have complained about water hardness and iron. By tying into the Kankakee plant, they will enjoy softened, filtered water.

"University Park was talking about building a new treatment plant, but the cost was prohibitive. We have an unlimited water source with the Kankakee River, so it makes sense to bring the pipeline to them," says Kahoun.

Treating and distributing drinking water is a significant responsibility that takes dedication, training and skill." MELISSA KAHOUN These changes will no doubt affect the Kankakee water plant team, but Denault isn't concerned. "I've been picking other operators' brains about the operation and challenges of the ClariCones, but as far as training goes, it's still lime softening," he says. "Also, we upgraded our SCADA system two years ago and we're very happy with it. We can remotely monitor our plant, and we'll also be able to see the University Park system." Kahoun says her team is eager

for the new technology included in the Joseph Donovan plant expansion: "The operators are thrilled to get the ClariCone clarifiers, and they're excited about learning how to use the new system to provide even better service to our customers. Treating and distributing drinking water is a significant responsibility that takes dedication, training and skill. Our operators welcome the challenges our plant expansion will bring, and I know they'll continue to excel." **tpo** 

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The Ohio Division of Wildlife provided an indigenous fish aquarium and touch tank.

# **Beach Party With a Purpose**

A WATER UTILITY'S ANNUAL LAKEFRONT FESTIVAL ENCOURAGES PARTICIPANTS OF ALL AGES TO FIND THEIR CONNECTION TO LAKE ERIE

#### By Craig Mandli

hen you think of a beach party, you picture toes in the water and a tropical drink. While learning opportunities aren't typically part of the fantasy, they're a big part of a yearly event on the shores of Lake Erie.

WaterFest, held every August in Avon Lake, Ohio, showcases the beauty of Lake Erie and the importance of its conservation. It was the brainchild of Elana West, community outreach specialist for Avon Lake Regional Water, who saw a similar celebration near where she has family in Stuart, Florida.

I know the shores of Lake Erie don't have the same reputation as Florida's beaches, but that doesn't mean we love them any less."

#### **ELANA WEST**

"I saw this terrific beach party atmosphere with hundreds of people having fun and learning about their water system at the same time," she says. "I know the shores of Lake Erie don't have the same reputation as Florida's beaches, but that doesn't mean we love them any less."

#### COLLABORATIVE EFFORT

The event is presented by the utility in partnership with the city

of Avon Lake and Friends of the Parks. It aims to make conservation fun by offering ways to interact with the lake, including recreational adventures, children's activities, art and food.

Among dozens of organizations offering family-friendly activities are Ohio Sea Grant, The Ohio State University's Stone Lab, the U.S. Coast Guard, the Ohio Department of Natural Resources, and Lorain County Metro Parks. West says the festival provides a broad overview of the importance of water. "I would say WaterFest is a 5,000- or 10,000-foot view of what we do," she says. "It's certainly an

opportunity to help ratepayers learn their impact on water."

WaterFest includes events for kids of all ages. In the past, master sandcastle builder Carl Jara has

created one-of-a-kind masterpieces. Kids displayed their own sandcastle skills in a nearby play area.

Eco-recreation experts LoCo Yaks, West River Paddle Sports, Hooks for Hunger and Firelands Fly Fishing provided clinics to help families prepare to explore Ohio's waters.

Follow the Fish, an art and conservation organization, displays nature-themed projects and an art shop, showcasing artists from around the region and artwork from Eastview Elementary School students.





Master sandcastle builder Carl Jara created one-of-a-kind masterpieces.

Various organizations provide family-friendly activities and child-themed events.

A highlight of the event is the Raingutter Regatta, in which Cub Scout packs give kids ages 6 to 11 a free boat kit. After building their boats, kids sail them via lung power down a water-filled rain gutter. "The event is a lot like a Pinewood Derby where kids race cars against each other," says West. "It's a lot of fun to see the way the kids embellish their boats. It draws a huge crowd."

### SAFETY AND EDUCATION

Other fun-themed competitions include U.S. Coast Guard Auxiliary-sponsored life jacket races, and a U.S. Navy Sea Cadets knottying activity. Educational offerings include tours of the historic Peter Miller House on the lakefront, and rain barrel and compost-

ing demonstrations. The DNR conducts free boat inspections, and the Lorain County Metro Parks Department presents a Predators of the Sky raptor experience.

Because West felt it was important to focus on Lake Erie's fish, she worked with the state Division of Wildlife to secure a grant for a mobile indigenous fish aquarium and touch tank for children. Older kids can tour the division's electrofishing boat, while the U.S. Army Corps of Engineers highlights its Seamore the Sea Dragon interactive watercraft.

The parks department offers an on-land kayak clinic, while the Avon Lake Fire Department has its water rescue truck on site decked out with gear and performs a watercraft and safety demonstration.

Last but not least, there is an all-ages triathlon/duathlon and a Kids' Junior Splash & Dash for ages 7 to 14 that includes a Lake Erie swim and run around Miller Road Park.

#### **GROWING SUCCESS**

The free event has drawn about 1,000 people per year, and attendance grows each year. The focus on children reflects the festival's mission: to inspire children to connect with Lake Erie on some level, even if only asso-



An all-ages triathlon/duathlon and a Kids' Junior Splash & Dash are big parts of WaterFest.

ciating it with fun, so they care about it in the future.

"Whether that means going into research, rescue, law enforcement or politics, or simply making planet-friendly choices, it's good," says West. "If the parents connect with or learn a little more about Lake Erie, too, that's a bonus."

WaterFest is held every August in Avon Lake with a focus on inspiring children to connect with Lake Erie.

Though the lake is the drinking water source for many Ohioans, its health is sometimes put at risk. A growing population, mass water removal, microbead pollution and fertilizer runoff are among the threats WaterFest highlights. "We've found the best ratepayer is an educated ratepayer," West says. "Educating them helps them realize how complicated and fragile the water system actually is."

Primarily, WaterFest is a chance for families to enjoy themselves. West believes that light nature is the key to the event and is what other utilities should focus on if they want to do something similar.

"The results of your outreach efforts aren't always immediate," she cautions. "You'll see it down the line when those young kids take better care of the lakes because they'll understand where we're coming from. They'll remember the great time they had racing toy sailboats years ago and put it together. That's when you know you have more than just a beach party." **tpo**  PLANT

# Step by Careful Step

MARSHALLTOWN WATER WORKS OPTIMIZES TREATMENT PLANT WATER QUALITY AND DISTRIBUTION SYSTEM PERFORMANCE AND RECEIVES DIRECTORS AWARDS FOR BOTH

STORY: Trude Witham | PHOTOGRAPHY: Scott Morgan

Jared Wall, utility maintenance mechanic, runs a turbidity test at the Marshalltown Water Works treatment plant.

# FOR MANY YEARS, EMPLOYEES AT MARSHALLTOWN (Iowa) Water Works were used to doing things a certain way. The Partnership for Safe Water Program changed all that.

Three years ago, the utility went through the Partnership's self-assessment process to optimize its distribution system. The next year, it took part in a groundwater treatment assessment and optimization pilot program for the conventional lime softening process.

The team identified performance-limiting factors, developed system optimization action plans and submitted two peer-reviewed reports, one each for the distribution system and treatment plant. "We are already a very efficient operation, but there were things we identified during self-assessment that showed we could do better," says Tim Wilson, director of water production. Those included better data collection and better-documented standard operating procedures.

Treatment plant operators focused on the lime softening system parameters, while distribution staff analyzed the hydrant flushing process and chlorine residual testing. "We asked ourselves how consistently we were able to produce the same quality of water through our lime softening process," says Wilson. "We also asked what we could do to reduce the turbidity of the water coming off our softening basins. That reduces the turbidity going to our filters and increases our filter runtimes."

The hard work paid off. In 2016, the utility received the Partnership Directors Award for both water treatment and water distribution system assessment/optimization. Marshalltown became the second utility in Iowa to receive the Directors Award for treatment and the first for distribution.

### **REDUCING HARDNESS**

The utility celebrates its 140th anniversary this year, and some of its distribution piping is nearing the replacement stage. "Our trustees and staff regularly monitor the equipment condition through our five-year capital improvement plan," says Steve Sincox, general manager and CEO. "We'll be starting to replace those old pipes soon."

The water treatment plant, built in 1977, went through a major upgrade in 1997, from 10 mgd to 12 mgd. The upgrade included rapid sand filter rehabilitation, aerator replacement, sandblasting and painting of the solids contact units, SCADA improvements, and an additional lime-settling pond for softening residuals storage.

Marshalltown (Iowa) Water Works	
BUILT:   1977 (treatment plant)	
POPULATION SERVED:   29,000	
SERVICE AREA:   City of Marshalltown	
SOURCE WATER:   9 deep wells (Mississippian and Pleistocene aquifers)	
TREATMENT PROCESS:   Conventional lime softening	
DAILY FLOWS:   12 mgd design, 4.3 mgd average	
DISTRIBUTION:   162 miles of water mains	
SYSTEM STORAGE:   6 million gallons	
KEY CHALLENGE:   Replacing retiring staff; upgrading water mains	
WEBSITE:   www.marshalltownwater.com	
GPS COORDINATES:   Latitude: 42° 3'1.37"N; longitude: 92°54'31.99"W	

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ABOVE: Steve Sincox, left, Marshalltown Water Works CEO and general manager, and Tim Wilson, director of water production, in the clarifier room. INSET: A pressure gauge brought from the original 1876 Marshalltown water treatment plant to the new facility.

centrated on the more challenging areas, like the pipe gallery. "A limitation in the pipe gallery for our filters does not allow us to control flow as consistently as we would like as water passes through the filter gallery," says Wilson. "While the quality of our effluent is still very good, better flow control would provide a much more consistent product and allow us to more consistently meet the Partnership goals. This is something we will continue to plan for and work toward in the future."

Today, the plant serves about 29,000 people in Marshalltown and sells 30 percent of the treated water to the Central Iowa Water Association, a rural water provider. Source water comes from nine deep wells that provide a stable, high-quality supply.

"It's clear coming out of the ground, but hardness is around 450 to 500 ppm," says Wilson. "We use aeration to drive off the dissolved gases." The water is softened to less than 130 ppm; average finished hardness is 110 to 115 ppm. Lack of turbidity can be a challenge. "There are not a lot of solids to start with, and without that it can be a little more difficult to generate the floc needed to facilitate the softening and clarification process," Wilson says.

The final product won the Best Tasting Drinking Water competition in 2008 and 2009 from the AWWA Iowa Section. "While we do a lot to improve the raw water at the treatment plant, the minerals that we leave behind contribute to the taste, along with the exceptional work our outside crew does in the distribution system," says Wilson.

### OPTIMIZING FOR QUALITY

A team of 20 worked together to improve distribution system and treatment plant operations. Says Sincox, "When we started with the selfassessment process, we went through piles of data, which showed us what we are really good at and what we

We are already a very efficient operation, but there were things we identified during self-assessment that showed we could do better." TIM WILSON

> needed to improve. We asked ourselves what we could fix right away and what was more capital-intensive that we could plan for down the road."

> The staff fixed the simple, inexpensive things first and then con

The most valuable part is the self-assessment. Although it can seem daunting, if you systematically check off each area that needs to be improved and then implement that change, it gets easier."

In April 2016, the plant began a \$6.7 million upgrade. "When Alliant Energy asked to purchase water from us for their new Marshalltown power plant, we hired Fox Engineering to evaluate our water system and determine if we had enough capacity," says Sincox. Although the treatment plant does have enough capacity, the staff decided to repair, rehabilitate and upgrade some of the older equipment to help accommodate the new demand. The upgrade, to be completed in March 2017, includes:

- Replacing 1 1/2-million-gallon in-ground reservoir with 2-million-gallon reservoir
- New high-service pump building
- Two 3 mgd horizontal split case pumps (Flowserve)
- New lime slakers (MERRICK Industries)
- New SCADA system, Allen-Bradley Control-Logix hardware, Rockwell FactoryTalk View software (Rockwell Automation)
- New 1 1/2 MW standby emergency generator (Caterpillar)
- New switchgear and outdoor transformer
- Sandblasting and painting of existing solids contact units

"Replacing the lime slakers will improve the consistency of the lime feed, thereby improving water quality," says Wilson. "The SCADA system replacement will allow better monitoring of chemical feed systems, and the new reservoir will improve circulation of the finished water."

# HIGHLY EXPERIENCED

Many Marshalltown staff members have spent most or all of their careers with the utility. Sincox holds Grade IV Water Distribution certification and has been with the water works for 21 years. Wilson holds Grade IV Water Treatment and Water Distribution certifications, and has been at the treatment plant for nine years. Reporting to him are:

- Treatment plant operators Bruce Frisk (24 years), Jon Reuter (17 years), Ryan McFarland (one year) and apprentice Pat Bell
- Ed Phillips, operator and maintenance employee (17 years)
- Dana Pope, director of distribution (eight years)
- Utility workers Ronald McWilliams (15 years), David Rebik (15 years), Brian Kreimeyer (14 years) and Jordan Dolash (two years)
- Jared Wall, utility maintenance mechanic (five years)
- Meter service employees Mike Ellis (10 years), Jennifer Hulin (nine years) and Doug Knoll (16 years)

Operators work two 12-hour shifts and two eighthour shifts (four days on and three days off) each week. Phillips fills in when operators are on vacation. The staff gives back by giving plant tours and presentations to the general public and student groups.

"They give tours to third-graders, high schoolers and sometimes students from Marshalltown Community College as part of their science classes," says Wilson. "Sometimes we have two to three groups a day. Different operators take different groups to give the students fresh perspectives, and also to save our voices."

## PREPARED FOR FLOODS

The treatment plant and wellfield sit in the Iowa River floodplain. "We are continually adding and improving infrastructure to make sure our equipment is above the 100- and 500-year flood projections," says Sincox. The plant saw record flooding in 2008, although the infrastructure and equipment were not affected.

(continued)



# WATER WAGON

The water distribution team at Marshalltown Water Works came up with a unique way to teach the community about the benefits of tap water over bottled water.

"The staff was tasked with building a watering station to promote our tap water and educate people about the exorbitant cost and waste associated with bottled water," says Steve Sincox, general manager and CEO. "Rather than create a freestanding device that would need to be loaded on pickup or trailer, they recommended repurposing an old portable air compressor that hadn't been used in over a decade."

All four distribution employees dismantled, sandblasted and painted the compressor and developed the concept for the watering station plumbing and the layout. "They really took ownership of the project, and it would not have been the same without their ingenuity and expertise," says Sincox.

The result is a watering station that's easy to move and allowed the utility to recycle an old piece of equipment. Introduced in April 2015, the water wagon travels to community events around town. Team members connect the wagon to a water source and chill the water before serving it to the public. "One year, we included a water meter so we could measure how much water we put through it," says Sincox.

The utility's nine wells average 600 to 4,200 gpm. The larger wells are equipped with variable-frequency drives for greater flexibility in dialing in the flow needed on a given day. Since 2008, all wellheads except one have been raised above the 100year flood level. The exception is a 700 gpm well that is on the lower end of the flow range but on the high end of the raw water ammonia range.

Savs Sincox, "Our operations staff suggested that we add a variable-frequency drive to this well, which will essentially make it into



Operator Jon Reuter tests a water sample.

The Marshalltown Water Works water treatment plant and wellfield sit in the Iowa River floodplain.

a chemical feed well." The plant uses chloramine as its primary disinfectant, and the ammonia needed to generate the chloramine is already present in the raw water.

"Being a lower-capacity well, it is not very efficient to run it with any combination of the other wells, since the raw-water ammonia is too high," Sincox says. "By adding a variable-frequency drive, we can dial back the flow, which will help us to better meet demand and maintain quality."

#### **FUTURE CHALLENGES**

One challenge facing the utility in recent years is staff turnover. "This is a great place to work and historically we've not had a lot of turnover," says Wilson. "But, we've had some people retire or move on the last two years, and they are hard to replace. It takes a lot of training and time, and those who are still here have to juggle their hours. So it affects everyone."

Three years ago, the plant started an apprentice program, in which experienced operators train new ones. "We got someone trained and certified in 12 months by job shadowing with an existing operator," Wilson says. "It worked out well."

On the distribution side, the main challenge will be replacing water

mains. "We inventoried all our mains and looked at the breakage point," says Wilson. "We have experienced higher breakage in pipes from the 1920s, and we've targeted these for replacement in 2017."

In the meantime, the plant will continue with the Partnership program. "It's all about continuous improvement," Sincox says. "Some areas that need work are capital-intensive, but it's a goal we're shooting for. The most valuable part is the self-assessment. Although it can seem daunting, if you systematically check off each area that needs to be improved and then implement that change, it gets easier. The payback in terms of what you learn makes it all worthwhile." tpo

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# SUSTAINABLE OPERATIONS



Shutting down one aeration basin helped the Wilako Wastewater Treatment Plant save \$70,000 a year on energy. Using two old lagoons to store inflow during heavy rains helped the plant deal with I&I issues.

# **Smarter Aeration**

AN ALABAMA TREATMENT PLANT MAKES ADJUSTMENTS THAT REDUCE ELECTRICITY BILLS SIGNIFICANTLY WITHOUT ANY CAPITAL EQUIPMENT COST

### By Doug Day

t was an invitation too good to turn down. Two regulatory bodies wanted to help the Wetumpka Water Works & Sewer Board save energy at its wastewater treatment plant. The resulting aeration changes have saved significant energy.

The Wilako Wastewater Treatment Plant was among those invited to participate in the Energy Management Initiative (EMI) through Region 4 of the U.S. EPA and the Alabama Department of Environmental Management (ADEM) in spring 2014. "They looked at our processes, suggested some changes and gave us some ideas," says Ronnie Windham, general manager.

The plant (4.5 mgd design, 1.8 mgd average) had been using two aeration basins, each with six 75 hp high-speed vertical turbine aerators operated



Missy Rhoades, lab manager, and Tyler Perdue test for TSS in effluent. Despite shutting down one aeration basin and reducing energy use for aeration in the other basin, the plant achieves 99 percent TSS reduction and easily meets its permit. about six hours apiece per day, and a pair of 40 hp mixers operating 11 hours per day. To save energy needs, the EMI suggested shutting down one basin and operating the other anoxically for about six hours per day.

### TACTICAL CHANGES

Chris Bowar, water works superintendent, says one basin had been shut down several years ago when a textile plant closed, reducing plant flow by 2 mgd. That didn't work because of I&I problems. "This time our chief operator, Don McIlhargey, changed some operations, started tweaking runtimes, watching dissolved oxygen levels, and keeping flows and solids under control."



Don McIlhargey, chief operator, checks SCADA system readings and makes adjustments. While the plant is manually operated, the SCADA system tracks dissolved oxygen in the aeration basin, helping operators maintain proper levels.

McIlhargey put the aerators and mixers in the remaining

basin on a rotating schedule, further reducing power demand. "We maximize DO by bringing it up to 1 to 1.5 ppm, and then turn off the aerators and let it get down to 0.5 ppm," he says. "It hasn't harmed us at all. Our TSS removal rate is still around 98 or 99 percent. Changing operational procedures has been a big benefit. We needed to do it, and the EMI gave us areas to concentrate on first."

Russ Barber, plant operator, says the savings will help with a plant that is 20 years old. "It's showing its age, and we do have some adverse effects of the textile plant because the waste stream they sent here for a number of years was quite corrosive," he says. "We have a number of improvements to look at and we needed to find all the ways we could to save on operating costs and put money into replacing worn-out equipment."

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# NO CAPITAL COST

The changes reduced power use by 460,000 kWh (24 percent), saving \$70,000 from March 2014 through March 2015. "This was about mindset and being motivated to work smarter," says Bowar. The changes required no new equipment and no purchases.

Bowar doesn't expect such reductions all the time: "We'll have savings, but we're not sure what they will be. We have heating systems to run in winter, and rainfall adds more runtime."

The aeration changes also reduced effluent nitrogen by 62 percent (12 tons per year) and  $CO_2$  emissions by more than 390 tons per year. Effluent remains well below permit levels and is consistent with results achieved before switching to one basin:

• CBOD<sub>5</sub> – less than 2 mg/L (permit level 25)

- TSS 3 mg/L (permit level 30)
- NH4-N less than 0.04 mg/L (permit level 10)

We have a number of improvements to look at and we needed to find all the ways we could to save on operating costs and put money into replacing worn-out equipment."

#### DEMAND ON OPERATORS

The Wilako plant is operated manually, so the new procedures mean operators have to pay closer attention. "Our SCADA has a really nice graphing system, so we're able to keep good track of our DO," says McIlhargey. "It's manual input, but the time it takes out of the day is worth it for saving power."

There is no plan to automate the process: "I believe our money is better spent replacing worn-out equipment and making bigger upgrades. Automation can be done in the future sometime, but right now we have much bigger priorities." Among those is reducing I&I. The plant uses two old treatment lagoons to store influent during storm rain events. "We can make manual adjustments in the collections system and divert some of the excessive flow to the lagoons," says McIlhargey. "We bleed it back in after the flows drop back down. So far, that has worked very well." It does require turning up the aerators.

# What's Your Story?

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McIlhargey adds that the sewer board is allocating funds annually for I&I upgrades such as replacing sewer lines and lining old brick manholes and clay pipe. With more focus on energy efficiency, lighting upgrades are planned, the digester blowers are being upgraded with variable-frequency

drives (VFDs), and aeration basin diffusers will be changed out.

"The ones we've had are open diffusers, and we're going to disc membrane diffusers," McIlhargey says. "We're also looking at VFDs for the aerators and mixers. We're playing with a lot of ideas along the way." **tpo** 



# **PLAN1**

# Energy Galore

Jeff Carson, operations and maintenance manager, takes readings inside the cogeneration building, which supplies a surplus of power to the water pollution control facility.

A CALIFORNIA CLEAN-WATER PLANT USES BIOGAS-FUELED COGENERATION, SOLAR ENERGY AND EFFICIENT PROCESSES IN PRODUCING SOME 38 PERCENT MORE ELECTRIC POWER THAN IT NEEDS

STORY: Jim Force PHOTOGRAPHY: Lezlie Sterling

# THE HAYWARD WATER POLLUTION CONTROL

Facility used to consume up to 60 percent of the city's electricity. Today, it produces its own and exports enough energy to supply a significant share of the power for the water and sewer pumping stations, and for City Hall.

The facility is unplugged, according to Jeff Carson, operations and maintenance manager.

It fulfills 100 percent of its power needs through cogeneration using digester gas while generating a 38 percent surplus available for other city facilities. A 1 MW photovoltaic solar array generates even more electricity, which is exported to the local power grid.

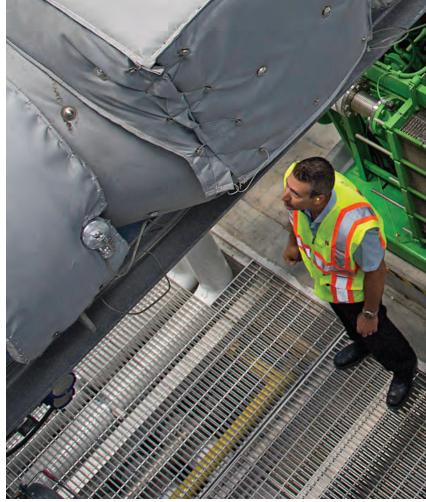
The city, sixth largest in the San Francisco Bay Area of California, plans to add more cogeneration and solar capacity within the next two years, doubling the plant's power output. "We currently supply power to 22 external accounts," says Carson. "As we refine the process and increase our green power production, we will be able to export to more accounts."

And Carson's "unplugged" reference? "I remember old MTV videos of vocal groups that used no electric instrument. The music was called 'unplugged,' and I thought that was an appropriate description of our plant. The average person may not understand our processes but can picture us unplugged from the power grid."

### **EFFICIENT PROCESS**

The Hayward Water Pollution Control Facility was started up in 1952 and occupies 300 acres on the city's southwest side. It serves the city of Hayward and its 150,000 residents. Average daily flow is 11.3 mgd; design capacity is 18.5 mgd.

The facility uses trickling filters at the head end to remove the majority of CBOD. This is followed by the headworks and primary clarifiers. Low-



L remember old MTV videos of vocal groups that used no electric instrument. The music was called 'unplugged,' and I thought that was an appropriate description of our plant."

CULU .

Dente

load suspended growth treatment is provided by a solids contact process before the secondary clarifiers.

Using actuators from REXA and instruments from YSI, a Xylem brand, the plant staff controlled the airflow and reduced aeration blowers from 2 1/2 operating at 200 hp to just one operating at 200 hp. It's one of many measures taken to increase energy efficiency.

"On average, we had 2 1/2 out of three blowers running all the time," says Carson. "We grouped all the ideas together, selected the best and took that concept to our electricians. Our instrumentation wasn't tight enough for the process. We refined the PLC mode of operation, and in the end we have one blower running in steady-state operation. We've experienced a significant savings in electricity."

Clarified effluent is disinfected with sodium hypochlorite and then sent to a regional dechlorination facility before released to San Francisco Bay. The plant has not had a permit violation in more than 10 years and averages more than 97 percent CBOD and TSS removal.

# Hayward (California) Water Pollution Control Facility

BUILT: | **1952** 

POPULATION SERVED: | 150,000

SERVICE AREA: | City of Hayward

FLOWS: | 18.5 mgd design, 11.3 mgd average

EMPLOYEES: | 29

TREATMENT LEVEL: | Secondary

TREATMENT PROCESS: | Low-load suspended growth treatment

RECEIVING WATER: | San Francisco Bay

BIOSOLIDS: | Used for landfill cover

The plant also sends up to 4.5 mgd of treated effluent to the Calpine-Russell City Energy Center, a 619 MW natural-gas-fired power facility next to the plant. The effluent reduces the center's potable water requirements, and the Hayward facility saves about 20 percent on effluent pumping costs.

Biosolids are thickened to 5.5 percent solids on a pair of gravity belt thickeners (BDP Industries) and then fed to three 3.48 mgd anaerobic digesters on a digester feed sched"The second cogeneration pad is already in place. That will facilitate tie-in. The city's goal is to be at zero energy consumption by 2020."

ule. The solids are mixed with fats, oil and grease, and scum from the clarifiers in what Carson calls "our secret recipe for success."

The mixing occurs in the feed pipeline, and solids are switched back and forth between digesters 1 and 2 before being sent to digester 3. Digester overflow, averaging 90,000 gpd, is sent to solar drying beds. The biosolids are used for landfill cover, although expected regulations in California may prevent that practice in the future. "We are looking at options," says Carson.

#### PUMPING OUT POWER

Biogas from the digesters process fuels the cogeneration system, which was designed by Carollo Engineers and commissioned in 2014, replacing two older units. The gas is scrubbed in a treatment process and then routed to a Jenbacher JGS416 engine. The engine is linked to a 70 percent efficient generator. Waste heat provides up to 3.4 million Btu/hour to the hot-water loop.

The biogas can be blended on the fly with natural gas as needed. The



The team at the Hayward Water Pollution Control Facility includes, from left, Epheriam Taylor, utility maintenance mechanic; David Donovan, operations supervisor; Suzan England, senior utilities engineer; Dan Magalhaes, maintenance supervisor; Lin Dan, chemist; Alex Ameri, utilities and environmental services director; Megan Bucci, senior secretary; Ray Busch, plant manager; and Jeff Carson, operations and maintenance manager. *(continued)* 

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blend rate is below 7 percent natural gas, and occasionally the cogeneration unit runs on only biogas for several weeks with outstanding results.

In addition to FOG from restaurants and other establishments, Hayward accepts milk waste from Berkeley Farms and spent product from a biodiesel process. The quality of feed to the digesters is key. "The material can be inconsistent," Carson says. "We sample all along, trying to determine what's good and what's not. We try to find the happy medium and the most consistent vendors of the material." A FOG storage tank helps smooth out the feed quality.

Close monitoring of the cogeneration process is also critical. "We typically run on blended mode at maximum engine output," says Carson. "During commissioning, we ran in plant demand mode to minimize natural gas usage. The cogeneration unit also shuts off if power export rises above a cer-

tain level, due to current tariff setpoints." On average, cogeneration produces 750,000 to 800,000 kWh per month, topping total plant usage of 700,000 kWh and producing the excess that can be exported.

The solar field, added in 2010, generates additional power for export directly to the Pacific Gas & Electric (PG&E) utility grid, tying in directly to the plant's bus bar main breaker. The panels are from REC Solar, which also maintains the installation and uses its global clock so that the array follows the sun.

While the generation system ranks 21st on U.S. EPA's list of the top 30 installations generating green power, the plant team is shooting for more. "We're making adjustments to supercharge the digestion process and significantly increase the production of gas," Carson says.

The improvements include adding automated valves, doubling the size of the FOG blending tank, updating the biogas burner to handle more gas production, and upgrading all



# **EXEMPLARY FACILITY**

As its green power production goes up, honors keep coming in for the Hayward Water Pollution Control Facility. It was named 2015 Plant of the Year by the San Francisco Bay Section of the California Water Environment Association (CWEA).

The U.S. EPA bestowed its Green Power Leadership Award for generating up to and over 130 percent of the plant's energy needs. Hayward was also one of four California cities honored with the 2015 League of Cities Silver Beacon Award in 2015 for reducing greenhouse gas emissions, saving energy and adopting policies and programs that promote sustainability.

Jeff Carson, operations and maintenance manager, was named an emerging leader by CWEA. "He's the project coordinator for process optimization," CWEA board member Gayle Tupper wrote in the nomination form. "He solicits staff input, researches the project, and collaborates with managers and engineers for ongoing improvements. As a coach, he focuses on learning and improvement of plant processes and performance."

The plant is a destination for professionals eager to learn more about the waste-to-power process. "Many people visit and are interested in our combination of cogeneration and solar processes," says Carson. "Our engineering staff, along with operations and maintenance, are at the top of their game and contributing exceptional improvements."

Carson has found enough interest to form a cogeneration user group in the Bay Area to discuss such topics as operations, maintenance and air quality.

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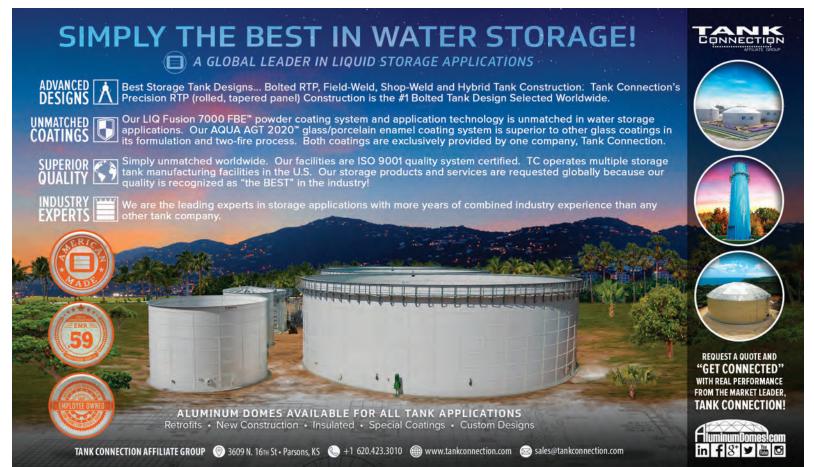


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Frank Schultz (left) and Jeff Carson check the solar panels, which contribute substantially to the plant's energy production.

Consistent of the second secon

sibilities and safety instructions. They outline the restart procedure in several succinct sentences, accompanied by control panel photos.

Training is high on the list of recommendations Carson makes for wastewater facilities contemplating

feed lines for more clarity. If these efforts are successful, Carson says plans will move ahead to add a second cogeneration unit.

"The second cogeneration pad is already in place," says Carson. "That will facilitate tie-in. The city's goal is to be at zero energy consumption by 2020." A second solar array identical to the first is being financed, and land is being prepared for panel structures.

#### **EXCELLENCE THROUGH**

Cogeneration is no slam dunk. Carson says the tie-in of the generation system with the rest of the plant was complex: "You're dealing with switchgear and boiler loops, as well as power engineers, PG&E, and your own internal staff. In addition, the state air quality board has stringent requirements. You need to train your wastewater experts to become energy experts. They need to know how to run the system after-hours, to bring the system back online."

Carson and the entire Hayward team met with vendors to learn about the equipment. Maintenance personnel were first sent off to training in Wisconsin, after which they refined the control setpoints, reviewed all the equipment, and monitored what they needed to know to maintain the desired cogeneration system performance. Facility staff conducted process area training, using multimedia standard operating procedures, videos and online monitoring. Critical event training focused on wet-weather power restoration. Training was provided for operators, mechanics, electricians and laboratory staff.

The simplified SOPs helped. "We developed easy-to-follow SOPs on how to use the cogeneration system and how to restart it if it got knocked offline," says Carson. The documents include a clear list of definitions, personnel respongreen power generation. "Staff is your main resource," he says. "They're critical. You have to think of staff in order to be successful."

Beyond that, he suggests going back to the original facilities plan: "Start with digestion and biosolids handling. Do an energy audit and monitor your electrical usage. Find out when it's intensive and when it's not. Get the design right, involve your operators and maintenance personnel, and look for available grants in your area."

Under the leadership of Alex Ameri, director of utilities and Public Works, Hayward has replaced its original cogeneration unit and installed

the first solar array to shave demand in the face of an ever-increasing energy bill. "He got the grants," says Carson. "He had the vision."

Today, the city has an aggressive Climate Action Plan and has been awarded the 2015 California League of Cities Silver Beacon Award for reducing greenhouse gases. "Global leaders have crafted plans to reduce our carbon footprint," says Carson. "Energy-efficient wastewater treatment plants can help make a better planet. Imagine if all 14,700 wastewater plants in the United States were unplugged." **tpo** 

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# A Look Down the Road

NEW TECHNOLOGIES IN NUTRIENT REMOVAL AND RECOVERY ARE AMONG MAJOR ADVANCES THAT CAN IMPROVE EFFICIENCY AND SAVE ENERGY IN WASTEWATER TREATMENT

#### By Ted J. Rulseh

lean-water plants and their operating teams face increasingly strict regulations and ever-greater expectations for efficiency and resource recovery. Emerging technologies can help them meet both. Ralph "Rusty" Schroedel, P.E., BCEE, a wastewater engineering man-

ager with AECOM's engineering office in Milwaukee, Wisconsin, has observed a variety of advanced nutrient removal processes either being researched or applied commercially that can help treat-



Ralph "Rusty" Schroedel

means treatment must optimize energy use and production, water use and reuse, and carbon utilization through nutrient removal, energy production and benefi-

industry.

cial use of biosolids. In an interview with *Treatment Plant Operator*, Schroedel talked about the changes he sees coming for the wastewater treatment

ment plants fulfill their obligations.

The processes he describes deal with

both the liquid and solids sides of treat-

ment. Among his basic premises is that,

"The future of wastewater treatment will

be based on carbon management." That

Now, work has been done on what is called nitritation/denitritation, where you skip the step of converting fully to nitrate. Instead, the process converts ammonia to nitrite and from there directly to nitrogen gas. That process can yield a 25 percent reduction in oxygen demand, a 40 percent reduction in carbon demand, and a 40 percent reduction in biomass production.

#### **tpo**: Is this the latest in nitrogen removal methods?

**Schroedel:** No, the newest approach is deammonification, which uses anaerobic ammonium oxidation (ANAMMOX) autotrophic bacteria. In this process, a portion of the ammonia is converted straight to nitrogen gas and the balance is first converted to nitrite and then nitrogen gas. This provides an even greater reduction in oxygen demand — up to 60 percent. You also get a 50 percent reduction in demand for alkalinity and eliminate the demand for supplemental carbon. That carbon can then be directed to energy recovery.

This two-step process first uses the conventional organisms to nitrify about half of the ammonia to nitrite, and then the ANAMMOX organism oxidizes the rest of the ammonia, using the nitrite as its electron donor. The result is that almost all the nitrogen is released as nitrogen gas directly, without using any of the organic carbon in the wastewater.

The regulations are never going to get less stringent, and as they get more stringent, it's important for operators, engineers and academics to keep abreast of what's going on and be willing to implement new technologies as necessary to meet their permit requirements."

**tpo:** In the most basic sense, what has changed as it relates to nutrient removal in wastewater treatment facilities?

Schroedel: In the past, nutrient removal wasn't much of an issue. In the early 1970s in the Great Lakes region, a reduction in phosphorus to 1 mg/L was implemented and was fairly readily achievable. The current trend is toward much lower limits of 0.5 mg/L and substantially lower. Some facilities are looking at even less than 0.1 mg/L.

Nitrogen removal is becoming stricter as well. In the past, for ammonia, the only requirement was for nitrification — conversion to nitrate. Now denitrification or total nitrogen removal is often being required, with limits on total effluent nitrogen sometimes less than 5 mg/L. These changes have impacts to treatment plants in requiring more energy, more chemical demand and more space at the plant.

#### **tpo**: How do emerging nitrogen reduction methods compare to traditional methods?

**Schroedel:** In the fundamental way things have been done and still are done commonly, plants go through full nitrification, converting ammonia to nitrite, then to nitrate, and then denitrification, converting nitrate to nitrogen gas, which is released and removes the nitrogen from the process.

# **CPO**: Where do the ANAMMOX bacteria come from, and how are they introduced to and sustained in a process?

**Schroedel:** That is one of the major challenges. The ANAMMOX bacteria is a granular material and is red in color, so you can see it when you have a concentrated amount of it. But it is extremely slow-growing, and it is extremely important to have a process than can retain the organisms and allow an adequate mass of them to perform the desired treatment.

# **LPD**: How is the deammonification process deployed in actual applications?

**Schroedel:** It has been applied primarily on sidestreams. The Water Environment and Reuse Foundation has several projects ongoing to evaluate sidestream applications and potential mainstream implementation of the process.

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**tpo:** What would be an example of applying this process to a sidestream? **Schroedel:** If you have an anaerobic digester, the process breaking down sludge solids creates a highly concentrated ammonia stream. Then, depending on the type of dewatering or solids separation used, you have a readily treatable and much smaller-flow sidestream that is high in ammonia and is very suitable for application of the ANAMMOX bacteria. By removing the nitrogen in the sidestream before it is returned to the headworks, you significantly reduce the mainstream nitrogen loading.

#### **LPO**: Turning to phosphorus, what is the state of research on biological removal?

**Schroedel:** Biological phosphorus removal does require a carbon source. So that's in this mix when we're thinking about carbon management. There are a wide range of biological removal processes, and they are being implemented at hundreds of facilities. But there is continuous research and refinement of the processes. The process basics are fairly mature and relatively well understood, but there are more sophisticated approaches to design and control. There are also a variety of phosphorus-accumulating organisms, and work is being done to discover how to provide the environment to optimally grow the most efficient of those organisms.

#### **tpo**: What else is happening in the area of phosphorus management?

**Schroedel:** Another process that is being applied in several places is the recovery of phosphorus as struvite. Here again, the removal is typically from a sidestream after anaerobic digestion that has a high concentration of phosphorus. The interesting thing about recovering phosphorus as struvite is that it has multiple benefits. You make a product that can be used as a fertilizer. You minimize the potential for struvite precipitation on piping, pumps and other equipment. And you produce phosphorus at a time when the readily mineable supply of that nutrient is projected to be exhausted somewhere in the next 20 to 100 years.

By removing the nitrogen in the sidestream before it is returned to the headworks, you significantly reduce the mainstream nitrogen loading."

#### **LPD**: Why do you say that carbon management is so important as a basis for wastewater treatment decisions?

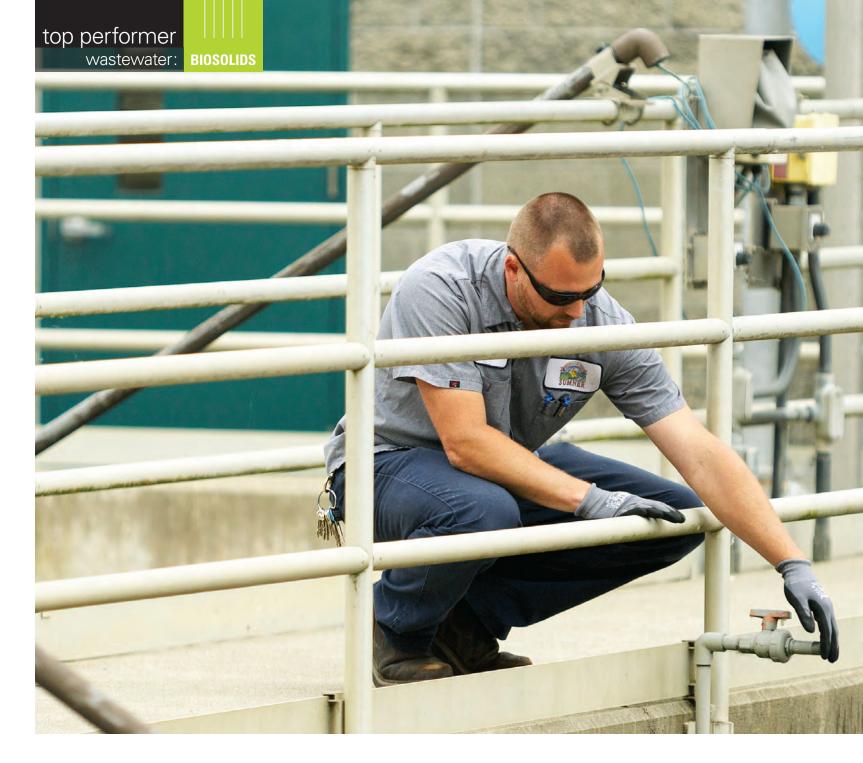
**Schroedel:** The primary objectives going forward will be efficiency and cost. The optimum use of carbon is going to drive the economics and efficiency of the treatment process, whether that involves making energy through biosolids and methane gas production, or providing the carbon necessary for biological treatment or nutrient removal processes.

#### **LPD**: To what extent can these new processes be implemented in existing facilities, versus being deployed in new facilities or upgrades?

**Schroedel:** In some cases the processes can be retrofitted very readily. Many plants have some excess aeration tank capacity, and those tanks can be subdivided and reoriented for the new processes. The sidestream treatment processes should be readily implementable because those are much smaller flows and so require smaller tankage.

#### **LPD**: What do progressive utilities need to do in light of these new technologies?

**Schroedel:** The regulations are never going to get less stringent, and as they get more stringent, it's important for operators, engineers and academics to keep abreast of what's going on and be willing to implement new technologies as necessary to meet their permit requirements. Keep an eye on the firms and research organizations and the technologies being developed, and plan for them. **tpn** 



# Eye of the Beholder

EFFECTIVE BRAND-TO-CONSUMER CONNECTIONS THAT LEVERAGE KEY POSITIVE TRIGGERS HELP A WASHINGTON COMMUNITY MAKE THE MOST OF BIOSOLIDS

STORY: Scottie Dayton PHOTOGRAPHY: Young Kwak



FEW WOULD THINK OF BIOSOLIDS AS ATTRACTIVE, but that was the goal Gregory Kongslie set for Sumner Grow, the Class A exceptional-quality biosolids product from the Sumner (Washington) Wastewater Treatment Facility.

"While planning the 2005 upgrade, we knew homeowners would comprise half our target market for biosolids," says Kongslie, plant superintendent. "Unless our product exhibited acceptable form and desirability, no one would take it even though it was free."

Furthermore, Pierce County has three Class A biosolids facilities. Sumner Grow granules would compete with SoundGRO, a pelletized biosolids from Chambers Creek Regional Wastewater Treatment Plant, and TAGRO biosolids mulch, mix and potting soil from the city of Tacoma.

"We installed two fine screens at the headworks, and they are as responsible for the success of our product as the biosolids dryer," says Kongslie. "The screens remove all the distinguishable materials, enabling us to create a debris-free, popular product." That wasn't always the case. Ryan Vonderau, journeyman operator, blows condensation from an air distributor manifold on an aeration basin at the Sumner Wastewater Treatment Facility.

#### EARLY DAYS

Sumner's biosolids beneficial reuse program began in 1987 when the city built two 400,000-gallon aerobic digesters. "With no dewatering capabilities and not much control on the pre-thickening side because of the open tanks, we generated up to 17,500 gallons of liquid biosolids per day," says Kongslie.

Local farmers accepted the liquid, and many fields had conditions that allowed land application throughout winter. When the U.S. EPA 503 biosolids regulations became law in 1993, some sites were restricted to summeronly application due to setbacks and other limitations. Because of the time-consuming, labor-intensive effort involved in permitting new sites, the staff considered only those with 20 acres or more.

"We ended up with 60 permitted sites in the county that were gradually lost mainly due to housing developments," says Kongslie. Eventually, only

Managing Class B biosolids was laborintensive and difficult because every site had problems. What we're doing today has dramatically improved our lives." two large pastures remained; the city paid a contractor to cut and remove the grass. As those landowners insisted on more services, the situation became untenable.

The city then went to transporting biosolids 50 miles to Edmonds for dewatering and incineration. Three full-time employees each drove a 3,500-gallon tank truck. Hauling three to five days per week cost \$25,000 to \$30,000 per month.

#### **BIGGER AND BETTER**

To reduce trips, the city contracted with a private hauler for two 9,000-gallon tankers, but there was

another problem. "Edmonds fed cake to the incinerator at 25 percent solids, but our material at 1.5 percent solids was more difficult to dewater," says Kongslie. "It was messing up their program."

A new plan was in order. The city acquired a belt filter press and bought 10- and 12-cubic-yard dump trucks to transport cake 60 miles to a compost facility twice a day. Transportation and tipping fees averaged \$7,000 per month. "While we saved money, the plant now needed a full-time belt press operator and occasionally a third truck when dewatering longer hours," says

The city only considered

switching to Class A production

Kongslie.



A sample of Class A Bonney Good Sumner Grow biosolids.

late in the planning stage for the next plant upgrade. In 2004, Kongslie accompanied consulting engineers from Gray & Osborne and municipal officials to wastewater treatment plants in western Washington to see their composting and incineration operations.

"Our plant is near residential communities, which ruled out composting because of odors," says Kongslie. "That left biosolids drying, and the nearest units were in Arkansas, Arizona and Virginia. After seeing them, we knew drying would be a good fit for our limitations."

TREATMENT PLANT OPERATOR

40

#### **FLOOD MANAGEMENT**

Situated 200 feet from the confluence of the White and Puyallup rivers, the Sumner Wastewater Treatment Facility remained at risk of flooding even though it is surrounded by a perimeter wall designed to protect it from a 100-year flood.

"We've increased the wall's elevation three times since 1978," says Gregory Kongslie, plant superintendent. "Sediment from previous floods and silt from mountain runoff continue to accumulate in the river beds. Between 2006 and 2009, three floods came within 12 inches of cresting the wall, and river levels were predicted to go even higher."

In 2012, the city raised the wall 3.5 feet and built a removable 60-foot steel bulkhead across the plant's access road. J-bolts anchor the metal to concrete slabs on both sides of the road, creating a watertight seal across it.

The wall is actually three materials. Besides the steel bulkhead, a third of the length around the perimeter is interlocking plastic sheet pile-driven 8 feet into the ground. The remaining two-thirds of the wall, along the lowest points of the property, is 12-inch-thick concrete.

"We're probably closer to the 500-year floodplain now," says Kongslie. "Much of Sumner would be flooded before water breached this wall, which is 4.5 feet higher than previously recorded flood levels." The team at the Sumner Wastewater Treatment Facility includes, from left, Danielle Lee, operator; Ron Basinger, lab technician; Clay Watkins, journeyman operator; Matt Ellingson, operator; Greg Kongslie, superintendent; Twyla Proctor, administrative assistant; Anthony Vendetti, chief operator; Ryan Vonderau, journeyman operator; and Fred Miller, maintenance technician I.

#### Sumner (Washington) Wastewater Treatment Facility



COMMISSIONED: | 1955; upgraded 2005, 2015

SERVICE AREA: | Cities of Sumner and Bonney Lake, portion of Pierce County POPULATION SERVED: | 30,000

FLOWS: | 6.1 mgd design; 4.27 mgd average

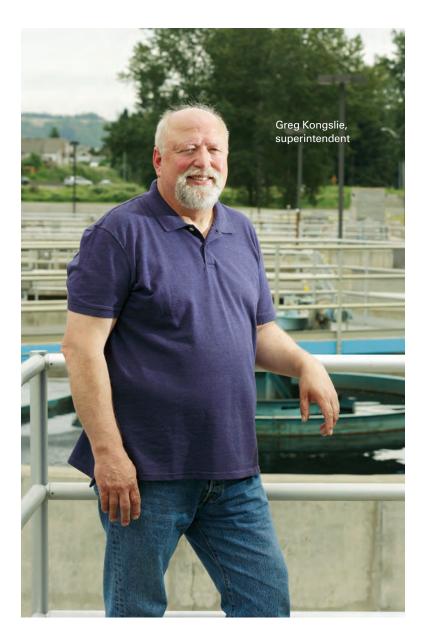
TREATMENT LEVEL: | Secondary

- BIOSOLIDS PROCESS: | Dewatered, thermal drying
- BIOSOLIDS VOLUME: | 400 dry tons per year
- BIOSOLIDS USE: | Residential and municipal fertilizer

WEBSITE: | www.ci.sumner.wa.us

GPS COORDINATES: | Latitude: 47°11′59.29″N; longitude: 122°15′17.33″W

The team recommended the SludgeMASTER Model RK72 continuousmix Fenton sludge dryer (RDP Technologies). The unit, twice as large as Fenton's other models, was only the second of its size. "We basically had a prototype," says Kongslie.



#### TREATMENT TRAIN

The 6.1 mgd (design) plant treats 4.27 mgd on average from 30,000 residents. Inflow passes through two 1/4-inch perforated-plate fine screens (Kusters Water, division of Kusters Zima Corp.) each rated for 6 mgd. The aeration process in two tanks includes biological selectors using anoxic zones followed by aerobic zones. An internal recycle pump in the latter portion of the aeration basins discharges to the anoxic zones for denitrification. After UV disinfection, effluent enters the White River.

The 2005 upgrade converted the aerobic digesters to mesophilic anaerobic digesters. Half the 25,000 cubic feet per day of biogas they produce fires a boiler (Burnham Commercial) that heats the digesters. Waste gas is flared off. Liquid biosolids from the digesters is thickened in a D-Series centrifuge (Andritz Separation). An auger conveys the 20 percent cake to a 50-cubicyard hopper that feeds the dryer. The Fenton system includes the hopper, boiler, scrubber, centrifugal blower and two biofilters.

The dryer uses conduction to dehydrate 2 wet tons of cake per hour in batches of 9.5 cubic yards. Inside the drying chamber, a hollow-stem flight auger homogenizes the cake as heated paraffin-based oil in a thermal loop circulates through the flighting, stem, and the chamber's outer jacket. A slight vacuum in the chamber controls heat and prevents degradation of the biosolids.

A natural-gas-fired 7.5 million Btu/hour boiler (Fulton) maintains temperatures in the chamber at 320 to 340 degrees F for four hours, killing all pathogens and producing Class A biosolids. The dried granules are 90 to 92

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ABOVE: Matt Ellingson (right) and Danielle Lee reattach a sample controller (Manning Environmental) to a replacement refrigerator used as a composite sampler. BELOW: Clay Watkins checks dewatered cake from a centrifuge in a Fenton biosolids dryer (RDP Technologies).



percent solids. A 15 hp blower pulls captured steam from the chamber through a duct as a spray of cool water condenses the steam. This water returns to the plant for treatment.

#### **BRIGHT OUTLOOK**

To control odors, an 8,300 cfm Series 41 centrifugal blower (Hartzell Air Movement) draws the cooled air through two 4,150 cfm shredded wood media biofilters in parallel. Treated air is discharged to the atmosphere. "We also collect air above the dryer and over the hopper to reduce odors in the building," says Kongslie.

Once a batch is finished, the chamber discharge door opens. An auger with a perforated plate separates oversized particles that return to the hopper. Screened biosolids continue to the surge bin to cool. Then two in-series water-jacketed conveyors move the granules to a chute where another auger distributes them to one of three truck boxes.

Five batches fill a box. Operators then replace the full truck with an empty one. The process yields 400 dry tons annually. After verifying that the granules meet the pathogen reduction requirement, the truck is weighed and sent to a farm or off-loaded at the plant's 2,700-square-foot concrete storage building. Maintenance technician Fred Miller uses a skid-steer loader tractor or compact tractor (both John Deere) to transport biosolids from the building to the 10-cubic-yard public distribution kiosk.

The city realized a return on its investment in seven years. "We were spending \$150 per dry ton on tipping fees and \$1,200 per truckload on hauling," says Kongslie. "Now we spend \$160 per dry ton on natural gas. Figuring

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After 11 years of use, we found practically no measurable deterioration, which alters our original assumption of a 20-year life span for the dryer." GREGORY KONGSLIE Grow available around the clock. People using the recycling center at the treatment plant saw the distribution kiosk and tried the product. "We had a 'free' sign on the kiosk

in maintenance, our total production cost is probably \$300 per dry ton. Managing Class B biosolids was labor-intensive and difficult because every site had problems. What we're doing today has dramatically improved our lives."

#### PERFORMANCE IMPROVEMENTS

The upgrade included a SCADA system that automated the plant and reduced the staff to 9.5 full-time equivalents. Besides Kongslie and Anthony Vendetti, chief operator, the team includes Matt Ellingson and Danielle Lee, operators; Mike Moe, Clay Watkins and Ryan Vonderau, journeyman operators; Ronald Basinger, laboratory technician; Miller; and Twyla Proctor, Kongslie's part-time administrative assistant. "We run one 10-hour shift five days a week and part-time shifts on weekends," says Kongslie.

The dryer equipment was more complicated than what the operators were accustomed to, and they consulted with Fenton engineers during discovery and startup. Many fixes involved changes to the programmable logic controller. Today, the dryer runs for 10 hours two to three days per week. Because cake concentrations and drying times are fairly consistent, the system needs only occasional monitoring. "It's very reliable," says Kongslie.

In February 2016, operators shut down the dryer for eight days, the longest time it has been idle. As they replaced the substantial but worn auger bearing, they measured wear on all the components. "After 11 years of use, we found practically no measurable deterioration, which alters our original expectation of a 20-year life span for the dryer," says Kongslie.

#### PUBLIC ACCEPTANCE

With reliable production and quality ensured, the city made Sumner

and a picture of a giant pumpkin we'd raised on biosolids," says Kongslie. "We also have fertilized and unfertilized lawns and landscaped areas to illustrate the product at work."

City dump trucks deliver 65 percent of biosolids production to farms 15 to 20 miles from the plant. Homeowner usage remains stable, although a March newspaper article about Sumner Grow increased demand. "We achieved our objective of making Sumner Grow attractive," says Kongslie. "We don't need marketing strategies because we have such good results doing nothing — 100 percent of our product goes away." **tpo** 

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Doug Chapman, liquids support specialist, checks dissolved oxygen readings in the H.L. Mooney Advanced Water Reclamation Facility aeration basins.

## **A Launchpad for Careers**

A TRAINING PROGRAM AT PRINCE WILLIAM COUNTY'S WATER RECLAMATION FACILITY LETS STUDENTS AND CAREER-CHANGERS IN ON THE GROUND FLOOR OF THE PROFESSION

#### **By Sandra Buettner**

B aby boomers are retiring from the clean-water industry in record numbers, and there is strong competition in the trades for the kinds of workers needed to replace outgoing operators.

In response, the Prince William County (Virginia) Service Authority launched an initiative to attract and retain workers for its operator and mechanical maintenance positions. The Career Path program was started in 2011 with help from a sister utility, the Upper Occoquan Sanitation Authority. PWCSA then honed the program and tailored it to its own needs.

Trainees are hired for plant operator and mechanical maintenance positions and begin a structured five-step process that can lead directly to careers. Trainees receive plant-specific training and take outside study classes, such as short schools in preparation for Virginia wastewater operator licenses. As they progress, they take on increasing responsibility and receive pay increases.

#### TROUBLE WITH TURNOVER

PWCSA, serving a population of 153,000, has a 69-square-mile service area and employs 60 people who support its water reclamation facility. The H.L. Mooney Advanced Water Reclamation Facility, built in 1981, has an \$8 million annual operations budget, an average flow of 14 mgd, and a 24 mgd design capacity.

Theresa O'Quinn, human resources director, notes that a high rate of retirement is by no means limited to Prince William County: "It is a trend in the wastewater industry all over the United States. It is getting harder and harder to replace the experience and skills of retirees, especially when it comes to the trades. About half of the turnover at our plant is due to retirements, and we don't see this trend changing anytime soon."

One staff member, Mike Failor, WRF operator 1, who is preparing to retire after more than 30 years with the authority, is working with plant staff

to make improvements and suggestions to the training program with the aim of making it better suited to the needs of the future.

"The original program was put in place to help the authority retain the knowledge of our experienced operations staff before their retirements," says Failor. "It has been modified from its original conception to one of operator education, training and development."

The career path program looks for applicants with mechanical experience and aptitude who don't mind working irregular shifts. It attracts people who might not have considered wastewater treatment but who see appeal in on-the-job training and opportunity for advancement in a stable industry with well-paid jobs that can't be sent overseas. Many applicants stay and launch careers.

#### **GETTING STARTED**

After applicants are interviewed and pass a series of aptitude tests, they start as trainees and must obtain a Class 4 operator's license within two years. After that, their destiny is up to them. If they choose, they can progress on their own timetable to Class 3, 2 or 1 licensing. Along the way, they must meet proficiency standards. Each time they fully complete a given step in the career path, they earn a promotion to a higher pay level. The promotions are noncompetitive — other workers do not have to retire or leave to create vacancies for trainees to move up.

The career path program is promoted during employee recruitment, during employee onboarding, and throughout the year by the trainees' supervisors and managers. Trainees can monitor their progress against program requirements online.

The program is open to various backgrounds, including high school and college graduates and people with manual labor or office and administrative

work histories. The average age of employees who have advanced in the career path is 46 and their average length of service with the service authority is six years. At present, there are five trainees in the program, all of whom came from outside PWCSA.

After trainees are hired, they work with the shifts for one to two months to learn all aspects of the job. After that, they are placed on a regular rotating shift. Training is standardized so that the expectations are the same for everyone. All have to pass a checklist of critical knowledge items. For instance, in the lab area, trainees need to know what samples must be collected and how to run various tests.

#### STEP BY STEP

The career path program entails five steps:

**Step 1.** Starting trainees have 24 months to complete the Wastewater Class 4 license and a set of skill level tests. Once those are completed, they are promoted to Operator Class 4. This portion of the career path is mandatory and a condition of employment.

**Step 2.** Upon attaining Operator Class 4, trainees can voluntarily take an additional skill level test and get a Wastewater Class 3 license. After a one-year waiting period, they can receive a promotion to an Operator Class 3.

**Step 3.** Upon attaining Operator Class 3, they can take an additional skill level test and obtain a Wastewater Class 2 License. After a two-year waiting period they can be promoted to Operator Class 2.

**Step 4.** An Operator Class 2 who possesses a Class 1 license and has passed two skill level tests is eligible for an in-grade promotion while waiting to complete the program's final step.

**Step 5.** An Operator Class 2 takes the last skill level test to receive a Wastewater Class 1 License. After a three-year waiting period, the person can be promoted to Operator Class 1.

#### **TRACKING PROGRESS**

Trainees collaborate with others during shift changes and discuss different ways of doing things and lessons learned. They also shadow lead operators to learn the different areas of the plant. The program constantly evolves, and training materials are routinely updated.

Trainees like the straight line the program creates for advancement. They meet monthly with their supervisors to chart their progress. The authority pays the training costs for employees who want to take offsite training at the local community college or other locations, helping them get their state licenses and move up through the program faster.

"We were having a challenge attracting operators who were already certified," says Rachel Carlson, water reclamation operations manager, who oversees the program and the trainees. "This program has solved that problem and simultaneously enabled us to attract a whole new pool of operators. It is a win-win." **tpo** 



Plant operator trainee Michael LoPorto cleans algae from filters as part of standard twice-daily preventive maintenance practice.





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## **Compost by Design**

A PILOT PROJECT INVOLVING FIVE COMPOST BATCHES GIVES AN OREGON CITY VALUABLE INSIGHTS TO THE COMPOSTING PROCESS AND VERIFIES CAPABILITY TO PRODUCE CLASS A MATERIAL

#### **By Brian Fuchs**

he Oregon city of Albany is assessing ways to improve solids treatment and handling at the Albany-Millersburg Water Reclamation Facility (WRF). The city, in the early stages of exploring composting, implemented a compost demonstration project.

The project objectives included:

- Evaluate the optimal mix ratio by weight and by volume of biosolids to bulking material
- Confirm that the finished product will qualify as Class A Exceptional Quality biosolids compost
- Assess the effectiveness of odor and emissions control from the compost process
- Identify the design, operational and environmental considerations for the process
- Confirm treatment time for system sizing, construction and design for a full-scale operation

The project gave the city valuable information to use in formulating its product and specifying the equipment and process parameters for full-scale compost production. Composting will enable the city to return to beneficial use of biosolids after landfilling most of the material for several years.

#### BACKGROUND

Before 2009, the wastewater treatment plant consisted

of primary clarification, complete-mix activated sludge treatment, secondary clarification and anaerobic digestion of biosolids. The biosolids were thickened on belt filter presses and stored before land application. The Class B material was successfully land-applied for many years.

The current water reclamation facility, in operation since September 2009, is designed to treat an average flow of 12.4 mgd and a peak wet weather flow of 68 mgd. The liquid treatment stream is processed via headworks screening, a vertical-loop reactor activated sludge system, secondary clarification and chlorine disinfection. Depending on flow conditions and the time of year, all or some effluent is discharged to the Talking Water Gardens wetland for heat load reduction before final discharge to the Willamette River.

The solids are processed in open-air tanks that can operate as interchange reactors (IR) or aerobic digesters, which are fed with waste activated sludge. Since 2009, when the new plant came online, only a small amount of biosolids could be stabilized to meet Class B criteria. The material is dewatered on belt filter presses, temporarily stored on site in covered bins, and then hauled to the Coffin Butte Landfill. The city landfills 180 cubic yards (22 dry tons) of biosolids per week, but intends to return to beneficial use.



Kristen Preston, city of Albany wastewater superintendent, leads an odor panel as part of the city's project to design a marketable biosolids compost product.

#### TEAM AND TECHNOLOGY

The project team included water reclamation facility staff, Sustainable Generation, W.L. Gore & Associates and Kennedy/Jenks Consultants.

The city selected covered aerated static pile (CASP) composting for the demonstration project. CASP, a forced aeration system for treating blended piles of organic residuals, uses aerobic biological degradation to reduce pathogens and organic solids. Process airflow pushed through the piles provides oxygen to support microbial activity while controlling the pile temperature. The method uses a cover over the pile to control moisture and odor, reduce temperature variation, protect the material from the elements and reduce impacts to stormwater.

The city partnered with Sustainable Generation, a provider of waste conversion products and services to the food waste and biosolids composting markets, to trial the SG Mobile System using the GORE Cover based on pos-

The city had a successful Class B biosolids land application program for many years and we were looking for an opportunity to return to a beneficial reuse program with the possibility of producing a Class A material that could be more widely used."
KRISTEN PRESTON, WASTEWATER SUPERINTENDENT, CITY OF ALBANY

itive aeration. The technology is designed to adapt to naturally occurring batch-by-batch variations in feedstock material. The system's oxygen-controlled aeration adjusts its intensity to batch conditions and to changing oxygen demand during the composting cycle.

The microporous GORE Cover is waterproof and windproof and has semipermeable properties that produce a constant microclimate in the heap. Being permeable to water vapor, it influences the extraction of moisture during composting and allows carbon dioxide produced during the process to escape.

A resultant insulating layer of air guarantees an even distribution of temperature in the body of the heap and helps contain odor-causing compounds. The cover is weighted (sealed), creating a complete in-vessel enclosure so that the entire pile can be pressurized, ensuring an even distribution of air throughout the pile.

#### ODOR EVALUATION

Composted biosolids should not produce significant odors if the compost pile is kept in an aerobic condition. The city conducted a qualitative odor evaluation to test the ability of the CASP process in limiting odors.



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Personnel documented the intensity (from not noticeable to overwhelming), and character (pleasant, earthy, offensive, fishy, sewage) of the odor for the feedstocks and at varying distances from the pile during different stages of composting (heap construction, active composting, turnover, maturation and finishing).

The results indicated that while the early stage had higher-intensity odors up close, odors were minimal at a distance. The raw sludge elicited the most negative responses, followed by the heap construction stages and the first turnover of the pile. These results were expected since the compost in the early stages had not been fully stabilized. During an open house with local policy

Batch 1 Batch 2 Batch 3 Batch 4 Batch 5 **Parameters** Duration (Days) 56 56 55 50 56 Sludge Type RAS RAS RAS IR RAS **Bulking Agent** Parks/Lane **Overs/Lane Hog Overs/Lane Hog** Lane Hog Fuel Lane Hog Fuel Hog Fuel Fuel Fuel (Wood Waste) Carbon: Sludge 1:2 1:2 1:2 1:2 1:2 Mix Ratio By Weight **Total Weight** 203 202 195 191 212 (Wet Tons)

**Table 1: Comparison of Batch Composition and Process Duration** 

Abbreviations: RAS = Return Activated Sludge IR = Internal Recycle

leaders, the final compost products received favorable odor impressions.

#### COMPOST DEMONSTRATION

The composting demonstration project used a series of five batches to test different durations, sludges and bulking agents (Table 1). Sustainable Generation and city staff jointly set up the technology and startup of Batches 1 and 2. As the city staff members gained experience, they took over responsibility to run Batches 3, 4 and 5. Kennedy/Jenks provided oversight and collected the data to be summarized in a final report.

On Nov. 5, 2014, Batch 1 underwent Phase I active composting for about four weeks, during which the heap reduced in size from compaction and solids decom-

position. On Dec. 3, the cover was removed and the heap was flipped by moving it to the side with a front-end loader and reassembling it in the same location; the goal was to achieve ample mixing and incorporation of the toes of the heap.

The heap was then re-covered and underwent Phase II, maturation (curing) composting, for two weeks. On Dec. 15, the pile transitioned from Phase II to Phase III (finishing), during which the cover was removed and set aside. Phase III normally lasts 14 days, but in this case it was 20 days to accommodate the Christmas holiday. When Phase III was complete, the compost was set aside and stored unscreened for at least four weeks.

Batches 2 through 5 underwent similar processing from January 2015 through August 2015. *(continued)* 

Batches 1 and 2 were screened using rented equipment to 1/2-inch minus; the screened-out "overs" were used as part of the bulking material in Batches 4 and 5.

The same sludge (waste activated sludge) was used in each batch except for Batch 4, where solids directly from the interchange reactors were used. The demonstration was extended through the summer to check for differences in composting due to varying environmental conditions.

The initial mix is targeted to meet:

- A beginning carbon to nitrogen ratio (C:N) of 25-30:1
- A moisture content of 55-65 percent
- Adequate bulking agent to optimize the mixed material porosity: approximately 3-inch minus shredded wood waste, hog fuel or wood chips

The final compost product is targeted to meet:

- An ending carbon to nitrogen ratio (C:N) of 20-15:1
- A moisture content of below 50 percent
- Carbon dioxide respiration below 1 mg CO<sub>2</sub>-C per gram of organic material per day

As the demonstration project moved from Batch 1 to Batch 5, the early batches were used to help:

- Train the operations team to run the technology
- Understand the feedstock components and identify the optimal mix ratio of dewatered sludge to bulking materials
- Understand how the mix ratio would influence the system control settings
- Monitor and record time and temperature requirements to meet Class A requirements

#### CONCLUSIONS

The biosolids compost demonstration study gave the city of Albany important information about the operational experience of a pilotlevel compost system, the equipment required, and the laboratory methods and regulatory requirements of a biosolids compost program. The project documented that sludge from the water reclamation facility can be composted to meet Class A EQ compost regulatory requirements and can be sold as a marketable product. **tpo** 

Parameters	Ва	tch 1	Ва	atch 2	Batch 3		Batch 4		Batch 5	
Time of Sampling	Initial Mix	Screened								
Bulk Density (lb/yd <sup>3</sup> )	970	0	1,115	*	873	*	914	*	1,166	*
Moisture Content (%)	57	58	63	58	66.4	43	59.9	33	65.7	40
рН	6.4	5.8	6.4	6.5	6.2	6.5	7	6	7.4	6.1
Organic Matter (%)	28.3	30.7	31.2	30.7	27.7	47.9	32.3	43	28.4	42.1
C:N Ratio	24	25	30	25	19	29	36	17	26	16
Respiration (mg/CO <sub>2</sub> /g/day)	*	0.6	7.1	0.6	*	0.8	4.9	1	3.5	0.5
Total N (dry) (%)	1.44	1.56	1.44	1.56	2.17	1.57	1.12	1.85	1.57	2.2
Phosphorus (%)	*	0.51	*	0.45	*	0.69	*	0.50	*	0.58
Potassium (%)	*	0.51	*	0.48	*	0.55	*	0.45	*	0.47
Notes/Abbreviations:										

Table 2: Summary of Compost Characteristics in Batches 1 Through 5

Notes/Abbreviations:

\* = Not reported

 $lbs/yd^3$  = Pounds per cubic yard

 $mg/CO_2/g = Milligrams of carbon dioxide per gram$ 

C = Carbon N = Nitrogen

#### Table 3: Summary of Compliance with 40 CFR Part 503 Regulations

	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
EPA 503 PFRP Requirements Met <sup>(a)</sup>	YES	YES	YES	YES	YES
EPA 503 VAR Requirements Met <sup>(b)</sup>	YES	YES	YES	YES	YES
EPA 503 Pathogens <sup>(c)</sup>	PASS	PASS	PASS	PASS	PASS
EPA 503 Metals	PASS	PASS	PASS	PASS	PASS
Natas					

Notes:

(a) Requires the sewage sludge is maintained at 131°F or higher for 3 days

(b) Requires biosolids to be kept under aerobic conditions at temperatures over 104°F for at least 14 days with an average temperature greater than 113°F

(c) Passed for Salmonella Spp.



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## **Smooth Transition**

A PLANT TEAM AND CONSULTANTS IN NASHVILLE KEEP TWO SURFACE WATER TREATMENT PLANTS RUNNING DURING CHEMICAL FEED SYSTEM UPGRADES

#### By Ted J. Rulseh

he Omohundro and K. R. Harrington conventional surface water treatment plants that provide drinking water to metropolitan Nashville recently received new chemical feed systems. Both systems were installed without interrupting either plant's operations and have enhanced energy efficiency and chemical feed accuracy, accord-

ing to Gilbert Nave, assistant director for water operations with Metro Water Services in Nashville.

The feed systems at both plants were designed with a single brand of peristaltic feed pumps, helping to simplify maintenance, reduce parts inventories, and make it easy for staff to move between plants without requiring additional training on the chemical feed equipment.

#### **RICH HISTORY**

The Omohundro facility along the Cumberland River is on the National Register of Historic Places. Its George Reyer Pump Station, which moves raw and finished water, was built in 1889, and the original chemical feed, sedimentation and filtration portions of the treatment plant were built in 1929. The pump station and treatment plant were expanded and upgraded several times over the years, and the plant is now rated at 90 mgd.

The Harrington facility lies east of Nashville, also on the Cumberland River, and draws water above the confluence with the Stones River. Built in 1974 with a 60 mgd capacity, it was expanded to a 90 mgd in 1992. A major flood that hit the Nashville area in May 2010 affected all portions of the plant.

The chemical feed systems had not been upgraded since 1992 at Harrington, and since 2001 at Omohundro. Because repair kits and replacement parts were becoming obsolete and expensive to obtain, Metro Water Services contracted with Gresham, Smith and Partners (GS&P) to design upgrades for both systems. The upgrades covered alum, carbon, fluoride, lime, polyphosphate, polymer and permanganate.

#### **TEAM EFFORT**

The engineering team worked with plant management, operations and maintenance staff members to select the key feed system components. "We held a series of workshops to get everybody's buy-in for layouts and system sizing," says Kristi Schnell, senior engineer with GS&P. "We sized the systems based on plant history, by analyzing eight years of monthly operating report data to determine trends in historical flows and chemical dosages. We also reviewed future plant flow projections."

The team established goals for the project that included energy efficiency, reliability, maintainability and operational flexibility. Dale Mosley, GS&P principal, observes, "As with all changes in treatment plants, there were challenges in hitting the goals, but the biggest was keeping the existing chemi-



The Omohundro plant fluoride feed system, showing the feed pumps, carrier water system, isolation valves, and pressure relief valves. The system also includes a day tank with scale for accurate chemical dosing. Secondary containment was provided around the feed system.



The Omohundro plant alum feed system, showing the feed pumps, pulsation dampeners, flowmeters, carrier water system, isolation valves, and pressure relief valves. Secondary containment was provided.

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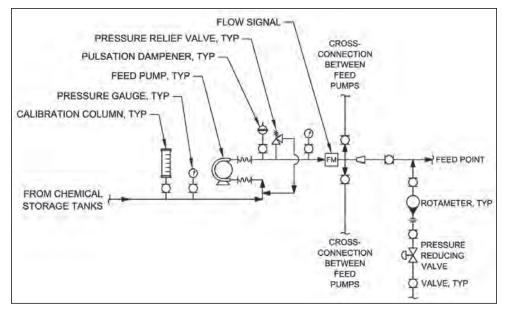
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The general arrangement of each feed pump system is shown schematically above. Each feed system varies slightly from this, but the major components are the same. Calibration columns are used for checking pump flow rates; pulsation dampeners are used to calm the pressure waves; pressure relief valves are used to prevent catastrophic failures; and flow signals are used to assure positive flows in the system.

cal feed systems in operation while constructing and switching over to the new systems.

"Shutting down either plant during construction was just not an option. After the flooding, we found that operating with one plant shut down puts unacceptable stress on the water system." An additional component of the project was to elevate both plants' chemical feed systems above the 500-year plus 2 feet flood elevation for critical facilities, as recommended by the Federal Emergency Management Agency.

Early in the design process, computational fluid dynamic modeling demonstrated that some changes in the chemical dosing processes would enhance treatment and optimize chemical use. As replacements for the existing diaphragm-type chemical feed pumps, the team evaluated diaphragm, progressive cavity and peristaltic pumps. They chose peristaltic pumps, and Watson-Marlow Fluid Technology Group was the successful bidder.

We now can fine-tune chemical dosage rates better. Previously, the operators manually changed the chemical feed pump rates whenever the plant flow rate changed. Now they are much more comfortable, to the point where they let the treatment flow pace the chemical feed pumps." GILBERT NAVE

The new systems include four sizes of peristaltic pumps, all with variable-frequency drives. "The pump outputs are easily changeable based on treatment plant flows," says Mosley. "If the plant has an increase or decrease in flow, the peristaltic pumps slow down or speed up to deliver the chemical dosage required to meet the flow condition."

#### **OPERATING SIMPLICITY**

In addition to pumps, the feed system valves and instruments were standardized to provide operational flexibility between plants.

"We desired a consistency between the two facilities for the benefit of the maintenance and operations staffs," says Nave. "We can now train very easily between the facilities. If an operator has an opportunity to be promoted, or if a management staff member needs to be reassigned from one



The Omohundro plant powdered activated carbon feed system delivers a slurry of 1 pound of carbon to 1 gallon of water. Each pumping system is designed while running to flush on a timed cycle to prevent sedimentation and blockage in the feed piping.

facility to the other, there is consistency in what they see. So the learning curve is small in how they operate the equipment."

The process of installing and switching to the new chemical feed systems took a great deal of coordination and timing. "We used the existing bulk storage tanks and as much of the existing systems as possible," says Mosley. "All the transfer and feed equipment is new. It was like assembling a complicated jigsaw puzzle to keep each chemical feed system operational while replacing equipment.

"At Harrington, one of the key objectives was to get all the chemical feed equipment at a higher elevation so they didn't risk flooding again. To do that we had to move the equipment from the lower floor level to the ground floor level. We were able to phase construction to make it work."

Another key aspect of the new chemical feed systems is a switch from dry powder chemicals to liquid chemicals to increase safety for the opera-

> tors and limit materials handling. The only material now delivered as powder is carbon, which is mixed with water in a bulk tank to form a slurry.

#### **RUNNING SMOOTHLY**

To date, the chemical feed systems at both plants have been functioning as designed and have required only minimal maintenance. "We're very satisfied," says Nave. "The hoses for the peristaltic pumps are the weak link in the system and will require replacement on a regular basis. We're in a learning curve on how long each

hose lasts with each chemical. Once that is established, we will get that information set up in our computerized maintenance management system so we can be proactive in replacing the hoses.

"We now can fine-tune chemical dosage rates better. Previously, the operators manually changed the chemical feed pump rates whenever the plant flow rate changed. Now they are much more comfortable, to the point where they let the treatment flow pace the chemical feed pumps. Operators' buy-in during design was key to this. They choose the feed settings and the system maintains them, right on the nose. The operators make the rounds to review each system but few if any adjustments are needed." **tpp** 



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#### A DECORATIVE LIVING FENCE AT A MARYLAND WATER TREATMENT PLANT HAD TO BE BUILT EXTRA STURDY TO RESIST POWERFUL PREVAILING WINDS

#### By Jeff Smith

n downtown Havre de Grace, a 17-foot-tall living fence graces the front and one side of the highly visible water treatment plant.

Hundreds of newly planted perennials such as bugleweed and lily turf climb the fence along with coral and trumpet honeysuckles. Ornamentals such as switchgrass and deciduous shrubs like St. John's wort provide ground cover along the nearly 200 feet of specially constructed metal fencing.

"The plants will bud during different seasons, so when they mature, we will have flowers of various colors on the fence all year long," says Bill Reeder, deputy director of construction and program management for the city.

#### **CHALLENGING WINDS**

The fence was not easy to build. Started in 2012 as part of the city's initiative toward earning Maryland certification as a sustainable city, con-

The plants will bud during different seasons, so when they mature, we will have flowers of various colors on the fence all year long." BILL REEDER

struction proceeded for nearly a year before anyone considered the effects of strong winds. That's when Reeder's department got involved and essentially redesigned the project.

Havre de Grace sits at the mouth of the Susquehanna River and at the head of the Chesapeake Bay, 40 miles northeast of Baltimore. The prevailing southerly wind comes up the bay unobstructed, and the 4 mgd treatment facility along the river can experience high winds even during times of relative calm.

The initial fence design would not have withstood the winds. "It would have been blown down quicker than we could put it up," Reeder says. After rebidding the

entire project, the city chose a welded wire-mesh ornamental fence, called the Patriot, made by Jerith Manufacturing Corp. of Philadelphia. The fence is a strong alternative to aluminum chain-link fence, but with a more subtle visual appearance that blends with the environment.

#### HEAVY REINFORCEMENT

Installed in an uneven zigzag format with section spacing of 2 to 8 feet, the fence is supported on a rebar-reinforced monolith concrete foundation that extends 30 inches below grade. Each of

27 vertical posts is mounted on a 1-foot-thick outrigger. The 3,000 psi highstrength concrete is air-entrained for freeze protection. A 3-inch pipe forms the fence's center rail.

"This fence is designed for high winds and is not going anywhere," says Jim Newby, deputy director of administration. He says that once the perennials are fully grown, the dense screen of flora will block the view of some

Share Your Ideas

**TPO** welcomes news about interesting features of your facility's grounds, signage or buildings for future articles in the PlantScapes column. Send your ideas to editor @tpomag.com or call 877/953-3301.

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The completed 17-foot fence shows the concrete foundation and early plantings of perennials that will cover the entire surface of the fence.

plant equipment, such as a large generator. Even though the fence does deter access to the plant, its purpose is to create a green, aesthetic appearance and add a beautiful natural feature to the city.

Seventy percent of the funding for the \$120,000 project was through a community legacy grant from the Maryland Department of Housing. Reeder says that because of the special structural features needed to handle the high winds, the fence is not typical of what many other water plants would build.

Says Newby, "We worked hard to control the costs, yet make it a sustainable and beautiful addition to the plant." **tpo** 



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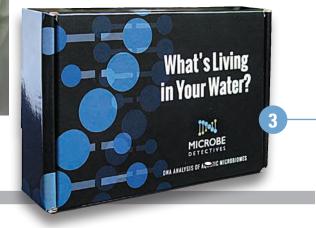
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- 2. The Microbe Detectives technique uses DNA sequencing to identify and quantify bacteria present in water samples.
- 3. A standard kit to be used for creating a microbial profile of wastewater.



## What's in Your Water?

DNA SEQUENCING CAN GIVE WATER AND WASTEWATER OPERATORS A MUCH CLEARER PICTURE OF THE MICROBIAL SIDE OF THEIR PLANT PROCESSES

#### By Ted J. Rulseh

astewater treatment plants depend on multiple microbes for their performance, and yet operators typically lack deep information about the different bacteria at work.

Drinking water plants, meanwhile, need to battle microbes that could cause problems in their distribution systems or at customers' taps.

Now, DNA sequencing technology holds promise to give water and wastewater operators more complete information about the bacteria in their systems. One company offering the technology is Microbe Detectives, formed in 2012. From a sample of mixed liquor (from a wastewater plant) or a sample of well water, tap water or raw water (from a water utility), the company promises a complete microbial profile.

Trevor Ghylin, Ph.D., P.E., founder and chief technology officer, says more complete knowledge of the microbes in their processes can help operators more effectively diagnose problems and make better process control decisions. Ghylin, a former wastewater process engineer and a licensed wastewater operator in Wisconsin, talked about the technology and its promise in an interview with *Treatment Plant Operator*.

## **CPO:** Please describe in simple terms what your technology does for water and wastewater operations and why it's better than existing methods.

**Ghylin:** With DNA sequencing technology we use, we can essentially identify and quantify almost every single microbe that's in a water sample.

#### With DNA sequencing technology we use, we can essentially identify and quantify almost every single microbe that's in a water sample." TREVOR GHYLIN

Other tools like culturing and microscopy typically are limited to identifying a handful or maybe even just one type of bacteria, depending on the method being used. So those are pretty crude instruments.

#### **GPO:** What is an example of where this technology can be useful on the wastewater side?

**Ghylin:** In wastewater, it allows us to detect things like nitrifying bacteria, phosphorus-removing bacteria, and all the filaments — the foaming bacteria. We can even identify methanogens in digesters. It's a very powerful tool.

#### **LPD:** And where might the technology come into play for a drinking water utility?

**Ghylin:** In drinking water, coliform is a good example. The total coliform test is the most common test in drinking water, but it is also a very crude tool. It's supposed to indicate potential fecal contamination, but in reality it

I had firsthand experience trying to do bio-P with absolutely no information. We finally did DNA sequencing and we found we didn't have any bio-P bacteria in the system. So obviously we weren't creating the proper conditions for those bacteria."
TREVOR GHYLIN

picks up various environmental bacteria that are not harmful at all, and doesn't end up revealing a whole lot about anything. With DNA sequencing, we identify by name everything that is in the sample and how much is there, so there is no ambiguity on whether there is fecal contamination or not.

#### **CPO**: Why is it important to know everything that is in a sample? Isn't it enough to know the main constituents?

**Ghylin:** It's true that there are really a dozen or less bacteria that are important in wastewater. But take for example phosphorus-removing bacteria. There are at least three types of bacteria that can remove phosphorus in wastewater plants. If you design a test to target just one of those, that specific microbe might be present, and yet the process still might be removing phosphorus because one of the others is present.

Because we can see everything, you don't need to start out knowing what is in there or knowing what you're looking for. The same goes for ammoniaremoving bacteria. There are probably a dozen different genera of such bacteria. We don't have to know which one we're looking for. We see them all.

#### **tpo:** In simple terms, what is DNA sequencing and how does it work?

**Ghylin:** If you remember from high school biology, DNA is made up of four chemical bases: adenine, thymine, guanine and cytosine, abbreviated by the letters A, T, G and C. An organism's genetic code consists of arrangements of those letters that make up different genes.

We now have technology that can read the DNA.

So we receive a sample of activated sludge from a wastewater plant and extract the DNA from it. Once we have the pure DNA, we put that into the DNA sequencing machine, which reads the letters from the sample. In a given sample we usually read about 10,000 strings, representing 10,000 bacterial cells. Once we have the strings of letters, we compare them to our database of bacteria to figure out what bacteria and how many are in the sample.

#### **tpo:** Can you give an example of how this technology has helped solve an actual problem for a wastewater treatment plant?

**Ghylin:** One of the clearest examples is biological P removal. Bio-P can be frustrating because you have no information about what is going on in your system other than measuring effluent phosphorus and crossing your fingers. You don't know if you have got phosphorus-removing bacteria or not.

I had firsthand experience trying to do bio-P with absolutely no information. We finally did DNA sequencing and we found we didn't have any bio-P bacteria in the system. So obviously we weren't creating the proper conditions for those bacteria. Once you know that, you can look at adding volatile fatty acids (VFAs) to the system and creating conditions so those bacteria have what they need to grow.

#### **CPO**: What is a specific case where this technology is helpful in the drinking water side?

**Ghylin:** A good example is with nitrification in distribution systems. Many utilities use chloramine as a residual disinfectant. Sometimes they get nitrifying bacteria growing in their pipes and consuming the disinfectant. Again, this is a case where existing tools can't tell you if you have nitrifying bacteria or not, but DNA sequencing can. We worked with a utility in California on this type of problem. It was very helpful to them to identify that they had nitrifying bacteria, so they could look at remedies.



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**CPO:** In its essence, what makes this method a better way to help monitor and control a treatment operation?

**Ghylin:** Right now, treatment plants are operated with almost no information about the biology in the system. Typically they have a dissolved oxygen concentration, an MLSS concentration, an effluent BOD level and some other effluent parameters, but that's about it. It's pretty limited information, especially if you're trying to do more sophisticated treatment like nitrification/denitrification or bio-P, or if you have a problem with filaments or foaming. Our method brings information that can be much more powerful.

#### **tpo**: Is that true even for plants that make extensive use of microscopy?

**Ghylin:** Microscopy is great. If you're trained and you're willing to do it, it can give you some really fast information. Some bacteria, like *Microthrix* and a couple of others, are fairly easy to recognize. But it's pretty limited. A lot of filaments are hard to classify with a microscope. You can't identify ammonia-removing bacteria or bio-P bacteria.

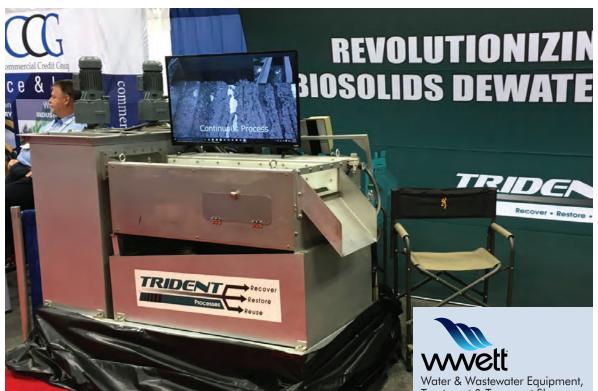
The other limitation is that it's difficult to quantify bacteria. Outside of sitting there counting, it's a pretty subjective measure of how many *Micro-thrix* and how many other filaments you have. On the other hand, the DNA data is extremely quantitative.

#### **LPD:** How would a water or wastewater operator start working with you on an analysis?

**Ghylin:** We have online ordering through our website. We ship out a sampling kit with detailed instructions. It's a simple process, similar to what they would do for any other lab analysis. We provide prepaid return shipping. **tpo** 



The KDS Separator from Trident Processes, on display at the WWETT Show in Indianapolis, provides an alternative to conventional solid/liquid separation. The 2016 show was Trident's first as an exhibitor.



Treatment & Transport Show www.wwettshow.com Education Day: Feb. 22, 2017 Exhibits: Feb. 23-25, 2017

Indiana Convention Center, Indianapolis

## **Versatile Separation**

SPACE-SAVING DEWATERING UNIT HAS APPLICATIONS ACROSS MULTIPLE INDUSTRIES

#### **By Jennifer West**

Sometimes, simple is better. That is one main selling point behind the latest innovation of Trident Processes: the Trident KDS Separator showcased at the 2016 Water & Wastewater Equipment, Treatment & Transport Show.

Along with simple engineering and efficient use of space come significant energy savings. The device is an alternative to conventional solid/liquid separation. It is used in industries including wastewater treatment, food processing and metal processing. Kerry Doyle, company president, says the potential applications are endless.

"We see a lot of opportunity anywhere there's solid/liquid separation required," he says. "Wherever belt presses are used, there is a very valid use

The power savings alone would pay for the equipment. It has a very high capacity in a very small footprint, and it has a very low horsepower requirement."

for this product. We're finding new applications every day." The 36-inch tabletop screen design uses rotating discs to slowly move a mixture from one end of the unit to the other. As the oval discs rotate and arc, liquids pass through the spaces and the solids remain on top.

#### FULLY ADJUSTABLE

"Because the disc is oval in shape, when it turns, it has a low initial entry through the screen," Doyle says. "As it rotates, it gets higher and higher in the

screen. Every time a column moves that material forward, it gets drier and drier."

The separator is completely adjustable by application. For instance, a wastewater treatment plant might start with a waste stream of 1.5 percent solids coming out of a clarifier and need to thicken it to 6 to 8 percent before it enters the digester. However, another application might require 10 percent solids.

"You can actually tune the machine so it can be at 7 percent or 10 percent and it won't ever change," Doyle says. The unit's maximum capacity is 10 to 12 percent solids. Because the process requires no grinding, pressing or screening, the stainless steel separator experiences little wear. It also solves problems related to clogging or plugged screens and offers immediate energy savings.

"The power savings alone would pay for the equipment," Doyle says. "It has a very high capacity in a very small footprint, and it has a very low horsepower requirement."

This makes it well suited for mobile applications: "You can put it on a trailer and move it from site to site."

#### HIGH CURIOSITY

The separator garnered substantial interest at the WWETT Show. "I had so many customers that I asked distributors to stay in the booth and answer questions because we were overrun," Doyle says. "Even when the lights went down and people were breaking down booths, we still had people in our booth talking to us."

Like many exhibitors, Doyle was surprised at the variety of attendees. He spoke to representatives of pumpers, corporations, a big appliance company, people from wastewater treatment plants and more: "The show experience was fabulous. It seemed to be a good mix."

800/799-3740; www.tridentprocesses.com. tpo

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- Wastewater Microbiology (session TH26)
- GIS Based Asset Management for Public Utilities (session FR23)

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## **Treatment and Filtration**

By Craig Mandli

#### **Aeration Equipment**

#### AIRMASTER AERATOR TURBO X-TREME IAT

The 25 hp Turbo X-Treme IAT from Airmaster Aerator is a high-efficiency, floating/surface aerator that can pump 5 mgd. The stainless steel unit incorporates a turbo blower and a double-sided



Turbo X-Treme IAT from Airmaster Aerator

impeller to achieve high-capacity water movement with maximum aeration and mixing. In operation, it disrupts the molecular structure of the wastewater and infuses air. The air-infused wastewater is then discharged from both the right and left side of the aerator and mixed from the top of the basin to the bottom. This creates a complete mix of airinfused wastewater in the basin without increasing the temperature of the wastewater. It can consistently raise the dissolved oxygen levels in the water while providing high-capacity water movement. **888/813-3680; www.airmasteraerator.com.** 



Floating aerators from Environmental Equipment Engineering

#### ENVIRONMENTAL EQUIPMENT ENGINEERING FLOATING AERATORS

Thanks to computer-aided design and unitized fiberglass construction, floating aerators from Environmental Equipment Engineering have a smooth, curved intake, volute and discharge passage. From the volute, the throat curves gracefully into

an ever-widening opening. This intake bellto-volute-to-discharge passage is one of smooth continuity that reduces exit losses to virtually

nothing while increasing efficiency. 804/730-1280; www.eeeusa.net.

#### MASS TRANSFER SYSTEMS JET AERATION SYSTEM

The jet aeration system from Mass Transfer Systems has a nozzle designed to transfer oxygen without using a blower. In low-oxygendemand cases, the aspirating system is cost-competitive with blower systems in depths up to 14 feet. Consider that in addition to the blower

cost, there are installation, switchgear, cabling, operating and maintenance costs. At liquid depths below 10 feet, the horsepower demand is similar for both blower and aspirating systems. With increasing depth, the blower system will have a horsepower advantage. Using a variable-speed pump can swing the aspi-

rating horsepower lower, particularly in situations where oxygen is not continu-



Jet aeration system from Mass Transfer Systems

ously needed. Variable speed also extends the range of oxygen transfer considerably. When air is not required, the system is effective for mixing only. Future requirements for more air can be met by simply connecting a blower to the air pipe. **508/404-1025; www.mtsjets.com**.



Model R OXIGEST treatment system from Smith & Loveless

#### SMITH & LOVELESS MODEL R OXIGEST

The Model R OXIGEST treatment system from Smith & Loveless provides stable operation and flexible process options for high-strength wastewater or larger flows up to 5 mgd. The field-erected design encompasses

complete aeration, clarification and advanced treatment processes, while allowing these units to be individually separated and controlled. The system achieves advanced nutrient removal and produces effluent quality suitable for water reuse and direct or indirect discharge. Its concentric tankage maximizes space efficiency in its footprint, preserving facility land for other key plant operations. It offers advanced process control and automation throughout the plant's operation. Multiple aeration zones can be employed to provide specific activated sludge processes for desired treatment levels, including multistage aeration, complete mixed, plugflow and nitrification/denitrification. Integral treatment process steps can include grit removal, flow equalization, re-aeration, tertiary filtration, chlorination, dechlorination and biosolids storage. **800/898-9122; www.smithandloveless.com.** 

#### **Blowers**

#### **AERZEN BIOGAS BLOWER**

Aerzen Biogas Blowers are designed for digester gas applications, ensuring process safety and reliability. Operators can choose from a variety of sizes with intake volume flows of 50 to 1,500 inlet cfm and positive pressure up to 15 psig. **610/380-0244; www.aerzenusa.com.** 



Biogas Blowers from Aerzen



#### APG-NEUROS TURBO BLOWER

The APG-Neuros Turbo Blower is a single-stage high-efficiency product that can attain flow rates of up to 8,500 scfm and a discharge pressure up to 15 psig with a horse-

power range from 30 to 300. For greater flow range, Dual Core and Quad Core models from NX400 (400 hp) to NX1400

**Turbo Blower from APG-Neuros** 

(1,400 hp) that combine multiple cores within the same enclosure can reach between 3,000 and 25,000 scfm. The units have easy and low-cost installation, and can reduce noise levels to between 80 and 85 dBA. They have a small footprint, and are low maintenance with an oil-free, non-contact air bearing and permanent-magnet synchronous motor and no heat rejection to the blower room. **866/592-9482; www.apg-neuros.com.** 

#### EURUS BLOWER ZG

ZG trilobe aeration blowers for MBBR, biosolids and/or equalization tanks from Eurus Blower are rated to 15 psig and flows to 3,950 cfm. They have integral-shaft ductile iron impellers, dual splash lubrication, oversized roller bearings, piston ring air seals, Viton lip seals, plus low vibration and noise characteristics. Packages have an integrated intake filter/ silencer with washable filter media, heavyduty base/integrated discharge silencer,



ZG trilobe aeration blowers from Eurus Blower

vibration dampers, OSHA guard and a V-belt drive with auto belt tensioner. Options include motors, check valves, safety valves, flexible connectors and sound enclosures. 630/221-8282; www.eurusblower.com.



#### FPZ SCL K10-MS

The SCL K10-MS blower from FPZ incorporates regenerative/side-channel technology to provide up to 556 scfm with continuous pressure up to 7.6 psig. It is available in 7.5, 10, 15, 20 or 25 hp versions, depending upon pressure requirements. Standard motors are suitable for use with variable-

SCL K10-MS blower from FPZ

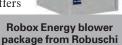
frequency drives, so the blower can operate at slower speeds to minimize power

consumption. It has an integral, direct-drive TEFC motor (no belts/ transmissions) and is oil-less, requiring virtually no maintenance. Optional intake/exhaust ports maximize installation flexibility. It weighs less than 300 pounds and has a noise level under 82 dBA. 262/268-0180; www.fpz.com.

#### **ROBUSCHI ROBOX ENERGY**

The Robox Energy blower package from Robuschi and Gardner Denver is the first rotary screw blower package to be powered by an efficient permanent-magnet motor. Pairing the permanent-magnet motor with a rotary screw blower, the unit offers

high-efficiency operation and wide turndown capability. Robuschi's Smart Process Control program offers further cost reduc-



tion by pairing the integral VFD with a PLC controller, delivering only the air you need, when you need it. It offers pressure operation to 15 psi, and flow rates to 1,450 cfm. 866/428-5253; www.robuschiusa.com.



**Universal Blower Pac** 

#### UNIVERSAL BLOWER PAC 3C-PAC

The 3C-PAC from Universal Blower Pac is a compact, plug-and-play, fully enclosed blower system engineered for various sizes to fit any sideby-side indoor or outdoor installation. A range of sizes is available from 35 up to 3,000 scfm to fit airflow and pressure range requirements, **3C-PAC blower system from** 

as well as desired design (two- or trilobe) and performance needs. Whether the sys-

tem requires high or low pressure, steady flow, drastic turndown capability, or engineering for energy efficiency, it can meet specific design goals. With UBPstandardFLEX, the standard 3C-PAC can be easily modified for various applications to achieve a customized design that still meets delivery time frames. Numerous modification options are available, such as enclosure material or paint finish, explosion-proof environment design, or three-phase transformer for instrumentation. 317/773-7256; www.universalblowerpac.com.

#### **Filtration Systems**

#### ADEDGE WATER **TECHNOLOGIES BIOTTTA**

The biottta biological filtration system from AdEdge Water Technologies leverages nature to offer a sustainable solution for wellhead treatment of inorganic and organic



**Biottta biological filtration system** from AdEdge Water Technologies

contaminants. Its fixed-bed, dual-stage biotreatment cultivates an environment for microbiological organisms to destroy contaminants or reduce elements to simple unharmful forms. The fixed-bed treatment process consistently addresses contaminants at low levels, intermittent or fixed operation, and the dual bed assimilates a complete packaged biotreatment plant. It has regulatory approval for the reduction of nitrate and perchlorate and demonstrates hexavalent chromium, VOCs, iron, manganese and sulfide elimination in a single process. The low-volume discharge is easily managed as a nonhazardous waste stream. 866/823-3343; www.adedgetech.com.

#### EVOQUA WATER TECHNOLOGIES WHISPER BIOFILTER

The WHISPER Biofilter from Evoqua Water Technologies is designed for quiet operation and effective odor treatment, removing 99 percent of incoming hydrogen sulfide. The rotating irrigation system

provides uniform water and distribution - optimal biological conditions. The nondegradable Bioglas



WHISPER Biofilter from **Evoqua Water Technologies** 

media, made from acid-resistant recycled glass, provides a long-lasting surface for biomass growth. The unit can treat airflows up to 1,100 cfm and hydrogen sulfide concentrations above 100 ppm. The units have skid-mounted controls for easy installation and operation. Regional service centers can provide turnkey full-service programs including on-site evaluation, installation, operation, service and performance reporting. Units are available on a monthly rental basis to reduce capital investment. www.evoqua.com.



#### **GRAVER TECHNOLOGIES HIGH FLOW SERIES FILTERS**

Graver Technologies High Flow Series Filters have a larger geometry to handle higher flows with fewer filter elements. This results in faster, fewer and easier filter change-outs,

meaning less downtime, reduced change-

out labor and less waste disposal. The inside-

to-outside flow allows for a large dirt-holding

Graver Technologies **High Flow Series Filters** 

capacity, extending the time between filter change-outs. A single 60-inch high-flow element can replace up to 32 standard 10-inch filter cartridges based on surface area, which translates to smaller systems, reducing up-front capital acquisition costs. 888/353-0303; www.gravertech.com.

#### GROUND PENETRATING CARBON GPC FILTER PROCESS

The GPC Filter Process from Ground Penetrating Carbon consists of a specially stratified sand filter modeled after coastal outwash plains and sandy alluvial soils. The final denitrified effluent from a treatment plant is mixed with a carbon source and then peri-



**Ground Penetrating Carbon** 

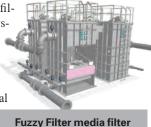
odically dosed onto the filter, creating the proper microbial environment for the soil bacteria within the sands of the filter to metabolize differing compounds. By establishing the correct carbon-to-nitrogen ratio within the dosed mixture, the soil bacteria within the sands will metabolize differing contaminants. The process can be installed as an inline system and dosed to an existing leaching field, or it can

#### product focus Treatment and Filtration

be built as a bottomless filter and continue to enlist the surrounding soils to attenuate certain contaminants. It has been shown to reduce the dissolved total nitrogen of denitrified effluent by over 50 percent, and reduce BOD and TSS to levels near or below detection. **508/548-3564;** www.groundpenetratingcarbon.com.

#### SCHREIBER FUZZY FILTER

The Fuzzy Filter compressible media filter for water and wastewater treatment systems from Schreiber is very high-rate, compact and modular, and is applicable to a wide variety of water and wastewater applications. Operating in an upflow design, it achieves a high rate of solids removal through the use of synthetic fiber spheres. It offers loading rates of 40-plus gpm per square foot. During the wash cycle,



from Schreiber

influent continues to enter the filter while an external blower supplies air in the bottom of the chamber to agitate the media. The media, which is retained between two perforated plates, is subjected to vigorous air scouring to free captured solids. Freed solids exit the filter by wash water passing up through the vessel. After the washing cycle, media is returned to its compressed state and filtration is resumed. **205/655-7466; www. schreiberwater.com.** 



STAAR trickling filter systems from SeptiTech

#### SEPTITECH STAAR

ETV-EPA verified and NSF/ANSI Standard 40/245 certified, SeptiTech STAAR (Smart Trickling Anaerobic Aerobic Recirculating) trickling filter systems are available in 500 to more than 100,000 gpd flows. They screen and remove nondegradable particles from raw biosolids. The simple, automatic and reliable equalization and clarification process maintains low levels of Nitrate-N with all below-grade com-

ponents that fit in readily available concrete, plastic or fiberglass tanks. With an easy, continuous, automatic operation, they allow for fast recovery after power outages. Low-maintenance designs and low energy input makes them affordable and robust with low biosolids production with accommodation of peak flow periods. They can be used to treat wastewater high in organic matter, BOD, COD and other pollutants. Modular designs benefit both the environment and communities, and are easily upgradable to meet growing capacity loads and location-specific demands. **800/318-7967; www.septitech.com.** 

#### Lagoons

#### BLUE FROG SYSTEMS CONTINUOUSLY STIRRED TANK REACTOR

Continuously Stirred Tank Reactors, engineered bacteria selector tanks from Blue Frog Systems, are placed over the influent in facultative and stabilization lagoon systems to enhance the facultative bacteria's productivity. They can remove 90 percent of car-



Continuously Stirred Tank Reactors from Blue Frog Systems

bon and 50 percent of ammonia. The selector tank selects for indigenous biosolids-digesting bacteria that form gas-producing biofilms. The biofilms create a natural, mineral-based granular sludge bed reactor over the entire lagoon bottom. Biosolids are accumulated in winter months and digested each spring, eliminating odors and accumulation. Stabilization lagoons aerobically convert settled solids into ash, which leaves the system continuously with a small spike during seasonal turnovers. **308/325-5463; www.bluefrogsystem.com.** 

#### MARKLAND SPECIALTY ENGINEERING SLUDGE GUN

The Sludge Gun hand-held biosolids blanket level detector from Markland Specialty Engineering measures silt/biosolids interface levels in clarifiers, tanks and lagoons, and helps provide valuable biosolids level profiles. It allows users to monitor sludge bed depth for regulatory compliance and prevention of carryover, and to eliminate



Sludge Gun blanket level detector from Markland Specialty Engineering

unnecessary pumping/dredging. It uses high-intensity infrared light to locate both the biosolids blanket and overlying cloudy layer, in concentrations ranging from light flocs to thick blankets. For example, Model 10-LP detects clear liquid surfaces; high-power Model 10-HP excels at finding the level of biosolids in murky lagoons. The unit is compact, weatherproof and convenient for boats/catwalks, with no calibration required. **855/873-7791; www.sludgecontrols.com**.



#### MBRs

#### **BIO-MICROBICS BIOBARRIER**

BioBarrier MBR system from Bio-Microbics The BioBarrier MBR system from Bio-Microbics simplifies settling, screening, direct aeration and ultrafiltration to remove 99.9 percent of contaminants. Certified to NSF/ANSI 40 Class 1, NSF/ANSI 245 (nitrogen reduction), and NSF/

ANSI 350 standards, the system can be installed above or below grade using locally sourced tanks. It can be used for 500 to more than 100,000 gpd flows, meeting water quality requirements for the reduction of chemical and microbiological contaminants for non-potable water use. Treated effluent can be used for restricted indoor water use and/or unrestricted outdoor water use. It is a packaged, pre-engineered, scalable, efficient solution that enables property owners, regardless of their size, to gain a rapid return on investment. **800/753-3278; www.biomicrobics.com.** 

#### GEOMEMBRANE TECHNOLOGIES STRUCTURALLY SUPPORTED COVERS

Structurally supported covers from Geomembrane Technologies can help municipalities pursue water reuse opportunities. They can be used for chlorine contact basins and MBRs. They consist of a retractable sheet of coated fabric tensioned across a lowprofile cluminum exclude frame.

profile aluminum arched frame spanning the tank opening. The customizable covers retract easily



Structurally supported covers from Geomembrane Technologies

so that plant operators can access tanks for routine inspections and maintenance. They also control odors and algae, and prevent rainwater and debris from entering tanks. **855/484-4630; www.gticovers.com.** 

#### OVIVO USA OV960

The OV960 membrane unit from Ovivo USA was designed for deep tanks and for retrofit projects. Equipped with 10,330 square feet of membrane area, each unit can treat peak flows in excess of 300,000 gpd. The flexible sheets are highly resistant to damaging debris and clogging. **512/834-6000; www.mbrcentral.com.** 



OV960 membrane unit from Ovivo USA

#### **MBBRs**

#### PREMIER TECH AQUA MBBR PACKAGE

The MBBR Package system from Premier Tech Aqua is preengineered, which reduces wait time for professionals and the initial investment for clients. Suitable for commercial and community applications, new installations or retrofits, the one-stop-shop approach offers a variety of treatment options that can be mixed and matched to form a host of treatment combinations. Integrating Ecoprocess MBBR and Ecoflo Biofilter for final polishing, the treatment chains are delivered to sites and into rotomolded polyethyl-



ene tanks. They are suitable for both domestic and high-strength wastewater and

ideal for projects between 1,000 and 20,000 gpd. Easily scalable, the system is appropriate for effluent

discharge criteria that must meet at least 20/20 levels in BOD5 and TSS or require nitrogen removal. Integrating the Coco Filter Polishing Unit allows it to reach stringent discharge criteria of below 10/10. **604/346-8199; www.premiertechaqua.com**.

#### **Membrane/Media Filters**

#### WESTECH ENGINEERING TRIDENT HS

The Trident HS package water treatment plant from Westech Engineering provides multi-barrier pro-

Trident HS package water treatment plant from Westech Engineering

tection for difficult-to-treat surface water, groundwater, industrial process water and tertiary wastewater. The system consists of packaged high-rate settling, adsorption clarification, mixed-media filtration and optional UV disinfection. It can handle very high raw-water turbidity and solids loading, and achieve TOC reductions of up to 70 percent, with a nearly 50 percent reduction in waste production. **801/265-1000; www.westech-inc.com**.

#### **Mixers**

#### FLYGT - A XYLEM BRAND 4320

The 4320 high-efficiency, low-speed submersible mixer from Flygt - a Xylem brand couples a high-efficiency mixer and motor efficiency

with an integrated variable-frequency drive to deliver mixing with adjust-



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#### product focus Treatment and Filtration

ability and simplicity. High product efficiency and adjustable speed makes it possible to change mixing to actual and changing conditions. Coupling an integrated drive with a synchronous motor, it eliminates the need for an external VFD. Speed controls are easily adjusted with a small operator panel or controlled remotely from central control systems via Modbus protocol. Two- or three-bladed propeller models are available in 4.6, 6.6 and 8.2 feet. It has soft start and stop, and a high power factor up to 0.94, and high cos phi up to 0.999. It includes status information and alarms, such as propeller speed, power and running time. **855/995-4261; www.xylem.com/treatment.** 



#### JDV EQUIPMENT CORPORATION NOZZLE MIX SYSTEM

The Nozzle Mix System from JDV Equipment Corporation is a dual-zone mixing system that provides uniform mixing patterns, producing even distribution and a stable environment. The system is designed with

Nozzle Mix System from JDV Equipment Corporation ronment. The system is designed with pumps installed outside the tanks to facilitate maintenance. The pumps are typi-

cally chopper pumps or pumps incorporating inline grinders that prevent fibrous materials from accumulating and causing plugging problems. The application dictates which type(s) of the many varied pump options can be used. High-velocity nozzles are mounted inside the tank and oriented to discharge in a flow pattern that completely mixes the tank contents. **973/366-6556; www.jdvequipment.com.** 

#### PARK PROCESS VORTAFLO

The VortaFlo static mixer from Park Process combines two mixing nozzles of different sizes to create turbulence and induce mixing. The addition of the injection quill allows chemicals or polymer to be injected in the mixing zone past the turbulence-creat-



ing nozzle, prior to passing through the mixing nozzle. In the case of polymer-flocculating biosolids, the turbulence nozzle causes the biosolids to roll in the mixing chamber so the polymer has maximum contact with biosolids particles prior to passing through the mixing nozzle, where flocculation is promoted. It is available in sizes ranging from a 1-inch inlet/outlet and 2-inch mixing chamber to a 12-inch inlet/outlet and 20-inch mixing chamber. **855/511-7275; www.parkprocess.com.** 



Advanced Chemical Oxidation Process from ACOS

#### **Nutrient Removal**

#### ACOS ADVANCED CHEMICAL OXIDATION PROCESS

The Advanced Chemical Oxidation Process from ACOS can help destroy hazardous organic contaminants in wastewater. Designed to meet individual needs

and degradation goals, the process generates and applies hydroxyl radicals in a precisely controlled, precisely designed environment. With its co-current plug flow geometry and parameters, the process focuses the highest concentration of hydroxyl radicals on the wastewater with the highest concentration of contaminants. Hazardous contaminants are destroyed rapidly, efficiently and cost-effectively. **267/614-8478; www.acos-technologies.com.** 

#### **IN-PIPE TECHNOLOGY BIO25-C**

Bio25-C from In-Pipe Technology is a bacterial blend used for the treatment of sewage and wastewater. It consists of all-natural, nonpathogenic *Bacillus* bacteria and is introduced into the wastewater system at strategic points via G2.5 dosing stations. As the blend is added over time, bacteria begin to dominate the sewer microcosm and control fats, oils and grease that often lead to odor problems and the excess growth



Bio25-C bacterial blend from In-Pipe Technology

of unwanted filamentous bacteria. Because the bacteria are all facultative, they are effective with or without dissolved oxygen, allowing organic materials and nutrients in the wastewater to be converted into gas or additional bacterial biomass and creating a 40 percent overall reduction in biosolids. By pretreating the collections system, this increases the readily biodegradable chemical oxygen demand and thus decreases the amount of organic biosolids that reach the plant, reducing costs for treatment, chemicals and power. **888/325-5033; www.in-pipe.com.** 



#### KUSTERS WATER PROTECHTOR CENTERFLOW BAND SCREEN

The Kusters Water ProTechtor CenterFlow Band Screen, with its vertical orientation, is ideal for headworks applications with limited footprint and headspace. Influent enters the middle of the screen, then passes through the trav-

eling perforated plate filter belt out the side

ProTechtor CenterFlow Band Screen from Kusters Water

and bottom, eliminating all bypass, and resulting in improved effluent quality and high capture rates. **864/576-0660; www.kusterswater.com.** 

#### LAKESIDE EQUIPMENT CORPORATION CLOSED LOOP REACTOR

The Closed Loop Reactor process, a modified form of the extended aeration complete mix process from Lakeside Equipment Corporation, provides biological nutrient removal using energy-efficient designs. It



Closed Loop Reactor process from Lakeside Equipment Corporation

produces removal efficiencies that exceed those of advanced tertiary treatment processes. BNR configurations are available with in-basin designs for nitrification and denitrification, as well as external selector configuration for Bio-P and total nitrogen removal. Process monitoring and control systems can be provided to continuously monitor and adjust the operation of the biological reactors to optimize process performance and reduce power costs. The Magna Rotor Aerator provides oxygen and mixing to the basin with reliable operation and high efficiency. **630/837-5640; www.lakeside-equipment.com.** 



EquaReact system from Parkson Corp.

#### PARKSON CORP. EQUAREACT

The EquaReact system from Parkson Corp. incorporates hydraulic flow equalization and first-stage biological treatment, concurrently in the same tank, to enhance nutrient removal capability. It reduces footprint, saves energy and reduces capital costs while improving the overall system

performance and treatment capability. The combined treatment can be applied to virtually any activated sludge biological process train, including two-stage MLE, multistage Bardenpho, MBR, MBBR or IFAS. It can be used in municipal, industrial and combined municipal/industrial flow applications for new plant installations or retrofit/rehab projects. **888/727-5766; www.parkson.com.** 

#### SCHWING BIOSET NUTRIENT REMOVAL SYSTEM

Schwing Bioset's nutrient removal system recovers orthophosphate and ammonia nitrogen from wastewater while offering benefits to the treatment plant. This controlled struvite formation significantly reduces phosphorus loads within the plant, and prevents unwanted scaling and accumulations while creating a valuable end



Nutrient removal system from Schwing Bioset

product. The phosphorus forms a stable struvite crystal that can be marketed and sold for beneficial reuse, keeping excess phosphorus out of the local waterways and helping close the phosphorus recycling loop. **715/247-3433; www.schwingbioset.com.** 



from NEFCO

#### **Oxidation Ditches**

#### NEFCO BAFFLE WALL SYSTEMS

Baffle Wall Systems from NEFCO are lightweight, high-strength engineered fiberglass panels used in many systems, including activated sludge clarifiers, aeration basins, oxidation ditches and contact chambers. They are available in multiple configurations that can be used to divert flow in a large tank, enclose equipment, or modified to be used as a cover panel to protect framing guides for slide gates or preventing airborne debris from entering the effluent of a clarifier. They are custom engineered to meet design parameters as specified while aiming for optimum performance and ease of installation. Panels require virtually no maintenance and have no parts to wear or replace. **561/775-9303; www.nefco.us**.

#### **Reverse Osmosis**

#### SCIENCO/FAST SCIRO

The SciRO reverse osmosis system from Scienco/FAST can treat a wide variety of water sources, including surface water, wells and brackish water, and deal with a wide

range of contaminants, including turbidity, salinity, arsenic and nitrates. Using advanced mem-



SciRO reverse osmosis system from Scienco/FAST

brane-based technology, the automated system removes dissolved materials from water and effluent with the flexibility to allow adjustments by operators. It was designed to be small, compact and adaptable to various power sources. Systems are easy to maintain with replacement parts available worldwide, and are portable for emergency situations. **866/652-4539; www.sciencofast.com. tpo** 

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- SeptiTech STAAR trickling filter systems

Lagoons

- □ Blue Frog Systems Continuously Stirred Tank Reactors
- Markland Specialty Engineering Sludge Gun blanket level detector

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- Schwing Bioset nutrient removal system

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## Injection system helps clear odor issues from pump station

#### Problem

Hydrogen sulfide at 1,000 ppm at the Forest Hills Pump Station in Pikeville, Kentucky, was creating a nuisance odor, corrosion issues and a possible health risk. The station was at a major intersection across the street

from the high school and football stadium. The city had tried chemicals and other odor controls, none of which worked.

#### Solution

The Mountain Water District chose a **Phantom Odor Control System** from **Anue Water Technologies.** The system continuously injects ozone and oxygen into the well to break up FOG and reduce hydrogen sulfide.



The hydrogen sulfide level dropped to 9 ppm after the first day and to zero the second day. The system also broke up the FOG, eliminated odors and resolved the corrosion issues. Chemical treatment costs were eliminated. **760/727-2683; www.anuewater.com.** 

#### Cloth media filter helps reduce power consumption

#### Problem

In December 2015, Talladega, Alabama, underwent an upgrade to its tertiary filtration to comply with an effluent TSS limit. The existing microscreen filters were no longer serviceable due to plugging and leaking of solids.

#### Solution

The city replaced the microscreens (12 mgd capacity) with two eight-disk **Aqua MegaDisk Filters** using an **OptiFiber PES-14 Pile Cloth Media** from **Aqua-Aerobic Systems.** The filters were easily retrofitted into existing tankage and hydraulic profile.



#### **RESULT:**

The filters increased capacity by 4 mgd in a smaller footprint, reducing power consumption. Better turbidity and TSS removal improved disinfection. The filters will accommodate growth of the city and will meet tighter permit requirements. **815/654-2501; www.aqua-aerobic.com.** 

## Efficient blowers provide air injection into aeration tanks

#### Problem

The Schlammersdorf-Vorbach sewage treatment plant processes household wastewater for 2,900 residents in two communities in Germany. In summer 2015, the plant's two blowers failed.

#### By Craig Mandli

#### Solution

The plant installed two **Tyr blowers** supplied by **Busch Vacuum Pumps and Systems.** The blowers deliver intermittent overpressure at 0.5 bar with constant volume flow. As the maximum pumping speed is required only in cases of extreme contaminant load,



the control system is programmed to operate both blowers at two speeds without frequency converters. This means the total pumping speed may be set to four levels, saving energy. The control system runs the blowers for up to 12 hours a day. Control of dissolved oxygen is automated.

#### **RESULT:**

Personnel costs have been reduced by the automation and the participation of the Grafenwoehr utility company, which receives plant alarm messages. After a year, the utility company expressed complete satisfaction. **757/463-7800; www.buschusa.com.** 

## Efficient mixing system helps community receive Green Project Reserve funding

#### Problem

The Mount Pleasant (South Carolina) Waterworks Center Street Wastewater Treatment Plant was upgraded to improve treatment and increase capacity. The upgrade included replacing inefficient positive displacement blowers and coarse-bubble aerated mixing in the flow equalization basin.

#### Solution

**BioMix Compressed Gas Mixing technology** from **EnviroMix** was installed to provide anoxic mixing in two biological nutrient removal selector basins.



#### **RESULT:**

The project was funded through South Carolina's State Revolving Fund program, and the work related to the design and installation qualified for Green Project Reserve (GPR) funding with a 1 percent interest rate loan versus the standard 1.8 percent. The solution reduced power demand by 70 percent. **843/573-7510; www.enviro-mix.com.** 

#### Lagoon system helps clean up discharge

#### Problem

The old three-cell 0.302 mgd aerated lagoon in Miner, Missouri, had high suspended solids and ammonia and nitrogen concentrations above targets. The discharge needed to be cleaned up to comply with state and U.S. EPA regulations.

#### Solution

**Environmental Dynamics International** proposed an **Intermittently Decanted Extended Aeration Lagoon (IDEAL)** to provide full nitrification while removing a majority of total nitrogen through denitrification. The process uses two ponds, the IDEAL for advanced treatment followed by a partial mix basin with a settling zone for sludge storage and solids separation, shrinking the plant while improving efficiency and effectiveness.

#### **RESULT:**

Ammonia has averaged 27 mg/L in influent and drops to less than

0.05 mg/L by discharge. No sample has come in above the method detection limit, even when the temperature in the unit dropped below 37 degrees F. BOD dropped from 230 to 4.5 mg/L and TSS from 104 to 5.3 mg/L. Total nitrogen dropped 66 percent from 32 to 11 mg/L. **573/474-9456; www.environmentaldynamics.com.** 

#### Automation helps treatment facility save costs

#### Problem

In 2015, a 30 mgd water pollution control facility in New England completed upgrades to meet the anticipated NPDES permit for nutrients. The new permit included discharge standards for nitrogen and phosphorus that were more stringent than the design basis for the upgraded biological nutrient removal system.

#### Solution

The facility retained **EOSi** to study denitrification with **MicroC 2000A**, a glycerin-based supplemental carbon, in one of the four treatment trains. EOSi provided inline analyzers, a chemical storage tank and pumping equipment for the evaluation study, as well as an automatic feeding system using a Nitrack Controller to optimize the supplemental carbon usage. The company's technical staff continuously monitored key process parameters, optimized setpoints, and modified the process control strategy.

#### **RESULT:**

The selected treatment train consistently achieved effluent total nitrogen concentrations lower than the permit requirement. Automation ensures that internal COD in the primary



effluent is used for denitrification when available, minimizing supplemental carbon costs. The facility staff expanded the supplemental carbon program to all four biological treatment trains. **866/642-7621;** www.microc.com.

#### Cloth media filters increase operational efficiency Problem

A wastewater treatment plant outside New Bern, North Carolina, had failing packaged sand filters, requiring extensive maintenance on the mechanisms. The plant had recently upgraded from chlorination to UV disinfection, but effluent showed inconsistent TSS and fluctuating turbidity.

#### Solution

The operating company, with local regulators and engineers, installed **Fluidyne Fixed Plate (FFP) cloth media packaged filters.** The system uses simple open-close pneumatic valves along with gravity to con-

trol filtering and backwash. No pumps are needed to create backwash flow, allowing media panels to remain in place at all times instead of being rotated past a stationary spray or suction manifold. This eliminates moving parts and wear items and allows the elements to be square or rectangular (versus circular), easing



manufacture, installation, removal and maintenance, while maximizing treatment area. Media elements can be independently isolated and removed without discontinuing flow to the entire filter or diverting flow during routine maintenance or inspections.

#### **RESULT:**

Plant personnel were satisfied with the treatment system for its ease of use and maintenance and low cost to purchase and operate. **319/266-9967; www.fluidynecorp.com.** 

## Combined processes provide reliable biosolids receiving

#### Problem

In 2010, Emerald Coast Utilities Authority (ECUA) in Pensacola, Florida, finished a rebuild after Hurricane Ivan and no longer had a biosolids receiving facility. This presented a problem in light of the authority's grease trap ordinance and the need to provide a site for off-loading of biosolids.

#### Solution

ECUA selected **Huber Technology** to provide a complete solution using the RoFAS centerfeed drum combined with rock trap, screenings wash press and grit trap as one integral unit.



#### **RESULT:**

The solution performed reliably, handling anything brought into the system. The large-capacity automated facility enabled haulers to quickly and efficiently off-load. Plant staff was pleased to provide an environmentally safe receiving station. **704/949-1010; www.huberforum.net.** 

#### Deammonification system helps city meet nitrogen limits

#### Problem

The South Durham (North Carolina) Water Reclamation Facility needed to meet a total nitrogen limit of 3 mg/L at design flow to comply with the total maximum daily load in the Jordan Lake Watershed. The facility uses anaerobic digesters followed by belt filter press dewatering. The liquid from dewatering accounted for about 20 percent of the nitrogen load in the plant's BNR process.

#### Solution

The city determined that **ANITA Mox sidestream deammonifi**cation technology from **Kruger USA** would cost three times less per pound of nitrogen removed in capital and operating costs. It uses about 60 percent less oxygen, requires no external carbon source, produces less bio-

#### case studies TREATMENT AND FILTRATION

solids and is based on the moving bed biofilm reactor platform. The system consists of engineered polyethylene carriers (AnoxKaldnes K5 media) to provide protected surface for biofilm growth.



#### **RESULT:**

The system was started up in 12 weeks. Now operating full scale, it achieves more than 80 percent ammonia removal and 70 percent total inorganic nitrogen removal, helping meet strict nitrogen limits. **919/677-8310; www.veoliawatertech.com.** 

#### Hydrolysis process helps city produce marketable fertilizer

#### Problem

With a capacity of 7.2 mgd, the Water Pollution Control Plant in St. Thomas, Ontario, discharges to the local waterway under strict Ministry of Environment requirements. City leaders were concerned with the general health and shape of the digesters, and wanted a more sustainable, year-round management solution.

#### Solution

City staff chose the **Lystek International Thermal Hydrolysis Process.** The technology uses a physical/chemical process to produce a fully marketable, federally registered, Class A biofertilizer called LysteGro. This system can also be used to create LysteCarb, an alternative source of carbon for use in BNR systems. "The technical criteria were proven through a peer review of existing installations," says Justin Lawrence, director of

environmental services and city engineer. "The environmental and social benefits are primarily the reuse of bionutrients and a greatly improved odor control system."



#### **RESULT:**

"The lower life cycle capital and operating costs create a

significant savings, and we can also improve our capacity in the biosolids system," says Lawrence. The \$10 million project enables the city to divert biosolids from landfill. **888/501-6508; www.lystek.com.** 

#### Injection system helps city meet effluent DO goal

#### Problem

The Hagerstown (Maryland) Wastewater Treatment Plant used ozone produced by an oxygen-fed ozone generator for disinfection. Effluent discharged to a creek contained dissolved oxygen levels that met regulatory standards. Once the plant converted to UV disinfection, the regulatory agency was concerned about the impact of discharging effluent with a lower level of DO.

#### Solution

Since the compressors and oxygen concentrators that were used in the old system still worked, the plant team used that equipment to feed oxygen to reach the effluent DO goal (as high as 8 mg/L during certain seasons). A pure oxygen injection system using gas-contacting equipment from **Mazzei Injector Company** was purchased to meet the DO requirement. A frac-

tion of the mainline flow is taken off the effluent pipeline and directed through a booster pump, and then through a 4-inch Mazzei stainless steel injector to aspirate pure oxygen. The oxygenated sidestream is mixed back into the 36-inch effluent pipeline through an inline **Pipeline Flash Reactor**, eliminating an additional tank/basin and reducing energy consumption and footprint.



#### **RESULT:**

Since startup, mainline flows have varied from 3.5 to 30 mgd (average 6.5 mgd). The system has increased the effluent DO levels, exceeding the discharge requirements under all conditions with minimal maintenance and low operator involvement. **661/363-6500; www.mazzei.net.** 

## Self-cleaning water filter helps reduce plant downtime

#### Problem

A county utility in eastern Washington operates a micro-hydroelectric plant that delivers power generated by a local river. The plant was seeing excessive downtime; efficiency was affected by the high TSS in the water source, which is subject to seasonal turbidity. The plant relied on 200-micron bags to filter the cooling water for the plant's two turbines. The bags filled to capacity at times, depending on river conditions, requiring employees to manually clean or replace them. Because clogged filters and bag replacement require plant shutdown, the plant had to keep employees on call 24 hours a day.

#### Solution

The plant installed a 50-micron **SWT Filter** from **Spiral Water Technologies** inline before the mechanical seal water delivery. The SWT is an automatic, self-cleaning water filter for ultrahigh and variable TSS of up to 25,000 ppm. With helical action, the system can filter up to 100 times dirtier water and provide continuous 10- to 100-micron filtration with 90 percent less energy than traditional filtration systems. It automatically collects, condenses and purges solids, eliminating filter bags.



#### **RESULT:**

After operating the system through the river's most variable seasonal conditions, the plant facilities manager declared it a successful upgrade that significantly improved plant efficiency. **844/277-4725;** www.spiralwater.com.

#### Submicron filtration system reduces maintenance costs, chemical use and pump wear for a paper manufacturer

#### Problem

Paper manufacturer Kimberly-Clark uses a nearby well as a source of process water. The filtration system had difficulty filtering water high in solids, iron, calcium and manganese. This put the filtering system under stress. Routine maintenance, product failures, increased downtime and rising chemical costs required a full review of the filtration system.

#### Solution

The company installed a Vortisand submicron filtration system from Neptune Benson, eliminating solids that were adversely affecting

the manufacturing process. The system included a delivery system capable of dispensing 1,000 gpm in a custom design to fit a restricted floor plan.



#### **RESULT:**

The maintenance-free system with submicron fil-

tration eliminated fouling, reduced chemical expenses, and eliminated filter bags and the attendant manual maintenance. Pump wear was significantly reduced, eliminating the need to send manifolds for remanufacturing every three months. Less maintenance led to less downtime and \$8,000 savings in its first two weeks of operation. 888/876-9655; www.vortisand.com.

#### Membranes enable plant to meet drinking water standards

#### Problem

As water use triples during the summer months in Cottage Grove, Oregon, city officials needed to identify a treatment method to meet drinking water standards and meet peak demand at the Row River Water Treatment Plant.

#### Solution

The plant installed an Aria FLEX membrane system from **Pall Corporation** that uses advanced pressurized filtration membranes. The system can provide excess capacity in addition to meeting drinking water standards and flow rate demands.

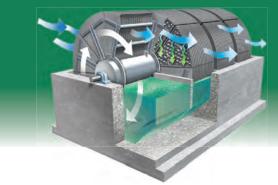


#### **RESULT:**

The flexible membrane unit enabled the plant to expand its capacity from 2 to 4 mgd; it will produce 8 mgd at full build-out. The operator-friendly system enables operators to manage, monitor and adjust water levels as needed. In the last eight years, the system has seen no fiber breakage. The system also removes Giardia, Cryptosporidium and bacteria. It enables clean-in-place to occur every 60 days versus 30 days. Efficiency has led to annual \$5,500 savings and reductions in use of chlorine and other chemicals. 607/758-1774; www.pall.com/water.

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#### Packing company solves waste screening problem

#### Problem

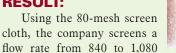
Wastewater officials in Toronto, Ontario, requested more efficient removal of gut trimmings, paunch waste, grease, solids and manure from wastes at a meat packing company. Waste included 1.4-inch fat particles, plus a large percentage of fat in manure.

#### Solution

The company installed three 48-inch-diameter SWECO Stainless Steel Vibrating Screen Separators. The units use 80-mesh, 0.007inch openings, plus two 8- by 8-inch table discharge spouts and one 8- by 8-inch frame discharge spout. Additional screen cloths of 40-mesh, 0.015-

inch openings and 94-mesh, 0.0071-inch openings are available when needed in the screening room. Waste from the killing floor is received by a surge tank.

#### **RESULT:**



gpm. Removal of undesirable solids has satisfied system requirements. The solids are delivered from the separators to a drag conveyor and then to railway pickup for fertilizer. 800/807-9326; www.sweco.com.

#### UV system protects hospital patients from chlorine-resistant pathogens

#### Problem

To protect patients from Legionella infection, a U.S. Veterans Administration medical center in Tallahassee, Florida, needed a point-of-entry UV disinfection system for additional treatment of a municipal water source.

#### Solution

The hospital installed 12 UV Pure Upstream systems to treat all incoming water and protect more than 15,000 visitors per year from Legionella and other waterborne pathogens. The systems are connected by a com-

pact stainless steel multiplex manifold for a total treatment capacity of 336 gpm. Each system uses Crossfire technology, a dual-lamp, reflective design that reuses lamp energy to provide 2.4 times the UV dose of conventional systems and enables the system to achieve the required UV dose even when UV transmittance is as low as 75 percent.



The systems can easily be taken offline for maintenance while the others remain in operation. Dual-smart UV sensors continually monitor parameters such as UV dose, UV lamp intensity and UV net transmittance. If any parameters are not within specifications, the affected system goes into alarm, shuts down and notifies the operator. A robust, automatic cleaning system prevents fouling of the quartz sleeves and ensures maximum UV dose. 888/407-9997; www.uvpure.com.

#### **City replaces lagoon surface** aeration, saving energy

#### Problem

The city of Yerington, Nevada, was frustrated by the poor treatment, high energy costs and unreliability in its lagoon system's surface aerators. The system has a 15-foot-deep treatment cell followed by a partially aerated polishing pond.

#### Solution

Yerington upgraded to MARS aerators from Triplepoint Water **Technologies.** The units combine coarse-bubble mixing and fine-bubble oxygen transfer in a single, portable unit. Because they are powered by an onshore blower, there are no moving parts in the water, ensuring reliability and saving on operation and maintenance costs. The team retrofitted the

system to an unused train and then discontinued flow to the existing train. Twelve aerators were installed in the primary cell to meet the daily oxygen demand of 495 pounds. Four units were installed in the polishing cell. Air is supplied by an onshore blower with a variable frequency drive.



#### **RESULT:**

Savings on energy and maintenance are expected to exceed \$400,000 over 10 years, and the facility upgrade is expected to pay for itself in less than three years. 800/654-9307; www.tpenv.com.

#### Process filter allows plant to reuse water

#### Problem

To operate more efficiently in drought-ravaged conditions, the Douglas (Arizona) Wastewater Treatment Plant sought to use internal secondary water. However, plant personnel had concerns about using the water for pump seals and other equipment, such as conveyor system nozzles.

#### Solution

VAF Filtration Systems, manufacturer of automatic self-cleaning filters, provided a **V-500 filter** with flexibility to interchange screens with

varying degrees of capability to meet the changing needs of the plant. Its Bi-Directional Hydrodynamic Drive (BHD) allows the cleaning scanner to move bidirectionally during each flushing cycle, allowing the filter to keep up with unexpected high TSS during system upsets.



#### **RESULT:**

The technology increases cleaning efficiency and simplifies the self-cleaning process so that pistons, electric motors, gears, limit switches and PLC controls are not required. The self-cleaning process produces flush waste that is less than 1 percent of flow. 303/425-4242; www.vafusa.com.

#### Aerator slashes costs and saves jobs

#### Problem

In 2012, the city of Evart, Michigan, needed to replace several aerators in its 300,000 gpd wastewater facility of two aerated lagoons, a storage/polishing lagoon, and a four-cell rapid infiltration basin. The aerated lagoons are 1.1 surface acres each and are about 10 feet deep. The storage/polishing pond is nearly 20 acres with a 12-foot depth. The city was faced with the possible need to eliminate two employees due to budget shortfalls.

#### Solution

The city purchased six **air turbine aerators** from **VaraCorp**, with a provision that 13 more units could be acquired if the original six met expectations. Precession creates a low-pressure zone in the midst of a cavity within the turbine. This zone is sated with air, which flows from surface holes above the waterline through a hollow, rotating airshaft. Atmospheric pressure

pushes air down to the turbine's cavity, at which point it is slung outward at high speed due to centrifugal force. The result is a cloud of dissolved oxygen that saturates the water.



#### **RESULT:**

Although the air turbines were powered by motors that were only one-seventh the size of the prop aerators being replaced (3 hp vs. 20 hp), the dissolved oxygen content of the water began to rise to new levels. Once all 19 air turbine aerators were in operation, the DO level rose from 4 to 5 ppm to 5 to 7 ppm. Patrick Muczynski, lead operator, reported that the electrical costs are barely 25 percent of the costs for the old aerators. The aerators have required virtually no maintenance. The low capital cost of the aerators and the lower electricity costs enabled the city to keep the two employees. **800/801-6685; www.varacorp.com. tpo** 



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I was attracted to wastewater because it offered steady work, a chance to use my background in science and the opportunity to improve the environment and make the community a better place to live."

Josh Willison An Original Environmentalist WASTEWATER TREATMENT OPERATOR Franklin County (Mo.) Water & Sewer District

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#### 1. HACH PEEL PLATE HETEROTROPHIC PLATE COUNT TEST

The Peel Plate heterotrophic plate count (HPC) test from Hach simply peels open the test, pipets the sample, seals the test and incubates. No media preparation is required. The heterotrophic plate count, formerly known as the standard plate count, is a procedure for estimating the number of live heterotrophic bacteria in water. This test can provide useful information about water quality and supporting data on the significance of coliform test results. High concentrations of the general bacteria population may hinder the recovery of coliforms. **800/227-4224; www.hach.com**.

#### 2. ACRISON DRY POLYMER PREPARATION SYSTEM

The Model 500 dry polymer preparation system from Acrison features a color touch-screen operator interface with graphic displays, automatic batch calculations, and extensive control and monitoring capabilities. Other features include additional sensors throughout the system to more closely monitor its operation in real time, and an upgraded air dryer for conveying polymer into the unit's cyclone wetting chamber. The new system layout improves user accessibility to all components while still maintaining a compact footprint. **201/440-8300; www.acrison.com**.

#### 3. FRANKLIN MILLER BULK WATER FILL STATION

The Haulermaster bulk water fill station from Franklin Miller is a complete engineered solution for municipalities and water districts who want better control and security in their water dispensing and the ability to accurately monitor and charge for the resource. The system can control, monitor, administer accounts and gain control of payments. The fill station includes all piping and equipment optionally housed in an attractive equipment enclosure. The station identifies haulers via a card swipe system, permits access, records transactions and prints transaction receipts. **800/932-0599; www.franklinmiller.com**.

#### 4. PREMIER TECH AQUA SEWAGE TREATMENT PLANT

The Conder ASP HDPE sewage treatment plant from Premier Tech Aqua features an integral final effluent discharge pump system, eliminating the need for a separate pumping station to be installed downstream of the drainage. The system is designed for both commercial and domestic application where mains drainage is unavailable. **800/632-6356; www.premiertechaqua.com.** 

#### 5. LARSON ELECTRONICS MOBILE LIGHT TOWER WITH GENERATOR

The towable, self-contained LED floodlight tower with an 8 kW Marathon generator from Larson Electronics features a water-cooled 11.7 hp Kubota engine that supplies current to four 500-watt LED lamps, producing 240,000 lumens of light. Each unit comes with 48 CREE highoutput LEDs producing 963 lumens each, arranged in rows and paired with high-purity optics, capable of producing a wide spot beam. Each light is securely fastened to the light boom and each lamp includes a support bracket to help maintain lamp stability. The IP67-rated lamps resist dust, dirt and humidity, as well as rapid temperature changes and rough environmental conditions. **800/369-6671; www.magnalight.com**.

#### 6. PCA DIFFERENTIAL PH SENSORS

Model 1100 differential pH sensors from Process Control Automation (PCA) are designed for accurate and reliable pH measurements. The sensors offer automatic temperature compensation, ground loop error elimination, cable runs of up to 900 meters, and a convertible design for versatile mounting options. Features include a double junction reference and gel-filled electrodes for longer life and dependability. Applications include any critical pH monitoring and control situation. **978/747-4300; www.aquasensor.net.** 

## product spotlight

#### Goulds high-capacity borehole pump enables sand and abrasives to pass easily

#### By Ed Wodalski

The e-GS 4-inch, high-capacity borehole pump from Goulds Water Technology, a Xylem brand, features a floating-stack hydraulic design that enables sand and abrasives to pass easily. Made for 4-inch and larger wells, the pump has a corrosion-resistant stainless steel casing and built-in check valve to prevent drain backflow and hold pressure.

"Sandy conditions can quickly cause wear and damage to pumps, but the e-GS 4-inch uses GWT's floating-stack hydraulic design to eliminate contact points. This gives the pump the ability to stand up to sand and other abrasives without damage," says Shukri Elmazi, product manager at Xylem. "The built-in check valve allows the system to stay pressurized and filled with water. While there is not necessarily a need to add another check valve, Goulds Water Technology recommends one for every 200 feet of vertical pipe."

Other pump features include polymer impeller material that protects the pump from abrasion and a dual-surface thrust washer that prevents rubbing of components during startup.

"Some municipal water treatment plants use a blend of groundwater and surface water as their source. The e-GS pump is ideal for extracting groundwater and is CSA NSF/ANSI 372-certified for drinking water systems," he says.

The e-GS Series consists of four hydraulic mod-

els (35GS, 45GS, 65GS, 85GS) and can be coupled to 4- or 6-inch NEMA-standard submersible motors for greater flexibility, deliv-

e-GS pump from Goulds Water Technology, a Xylem brand

GOULDS

45GS50

ering heads to 1,400 feet and flows to 120 gpm.

"The impeller and diffuser combination was redesigned for greater efficiency, meaning less horsepower is required per stage, allowing for more stages per model," Elmazi says. "More stages translate to higher pressure and deeper pump sets." **866/325-4210; www.goulds.com**.

#### 7. SCOTT SAFETY FLITE COV AIR RESPIRATOR

FLITE COV supplied air respirators (SAR) with breathing apparatus from Scott Safety feature an automatic changeover valve for an emergency air supply cylinder, available in different durations, and a locking hand wheel on the cylinder pressure-reducing valve to prevent inadvertent shut-off during use. It also features use of the compact Tempest Demand Valve, and is compatible with multiple approved Scott Safety facepiece options. **800/247-7257; www.scotthealthsafety.com**.

(continued)



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#### wastewater: product spotlight

#### **DeZURIK** high-performance combination air valves solve problems caused by pipeline grease

#### By Ed Wodalski

APCO single-body combination air valves (ASU) from DeZURIK are designed to operate effectively on pipes filled with fluids containing grit, solids and grease that coagulate and can render some air valves inoperable.

Features include an oversized float designed to be buoyant in grease and keep dirty fluid level low. The upper body shape includes a splash reduction ring and air compression chamber to further limit fluid levels and restrict solids interference. The valve has no linkages that can foul in dirty service applications.

"We have had tremendous success applying the ASU valve in difficult grease applications," says John Skalla, municipal sales manager for DeZURIK. "The longer a customer can keep their valve clear of grease and operating, the more money they save on maintenance and efficiency."

Made of 316 stainless steel, the combination air valve is available in 1- through 6-inch sizes and has an operating range of 2 to 150 psi, as well as a new extended range of 2 to 300 psi. It is available with flanged or threaded ends and meets requirements of AWWA C512.

Lighter than traditional cast iron valves, a 2-inch ASU combination valve weighs 40 pounds versus valves weighing up to 100 pounds. It is also shorter than traditional valves - 20 versus 30 or more inches tall.

"Combination air valves handle air in a pipe in two ways," Skalla says. "First, when filling or draining a pipe, air needs to be let out or in quickly, or damage such as pipe collapse can occur. Also, air forms naturally in flowing liquids and must be released so it doesn't collect at high points in the pipeline, reducing or preventing liquid flow, among other problems."

The inlet and outlet are the same size on the ASU, eliminating restrictions that occur in other valves. It ensures the ASU is protecting the pipe from vacuum collapse. Dual-range air release capacity and pipe pressure does not affect orifice sizing.

"The benefit is one valve size handles a wide range of capacities and pressures. Often, one valve size can be used in the entire pipeline," Skalla says.

"I hear stories where multiple valves of various sizes are removed from the pipe for cleaning and maintenance, but the customer forgot to record their location. Traditional air valves must have their orifice sizes selected specifically in each location. Installing them in the wrong location is a problem. With

our dual-range air release, we've elim- APCO air valves from DeZURIK inated that problem." 320/259-2000; www.dezurik.com.



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"Treating and distributing drinking water is a significant **responsibility** that takes dedication, training

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Melissa Kahoun, Aqua Illinois, Area Manager, Kankakee and Will Counties Joseph Donovan Regional Water Treatment Plant, Kankakee, III.

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#### Grundfos USA appoints general manager

Grundfos named Jonathan Hamp-Adams general manager of Grundfos USA. He will lead all Grundfos sales organizations in the U.S.



Jonathan Hamp-Adams

#### Sherwin-Williams launches water and wastewater LinkedIn group

Sherwin-Williams Protective & Marine Coatings launched a LinkedIn group (www.linkedin.com/groups/7053701) for water and wastewater professionals to discuss issues related to protective coatings and lining materials for their operations. The group welcomes water system operators, engineers, contractors, maintenance personnel and other professionals allied to the water and wastewater fields. Forum topics include case studies, best practices and industry news related to extending infrastructure life, combating corrosion, maintaining facilities, avoiding downtime, applying coatings and linings, and system designs.

#### Proco Products receives ANSI/NSF 61 certification

Proco Products received ANSI/NSF 61 certification on its Proco Series 230, Proco Series 233L/234L, Proco Series 271, Proco Series 231 RC/RE and Elastomer sizes 1-inch I.D. through 120 inches I.D. These standards were developed by the National Sanitation Foundation (NSF) and the American National Standards Institute (ANSI) and establish stringent requirements for the control of equipment that comes in contact with either potable water or products that support the production of potable water.

#### Anue Water Technologies moves to new facility

Anue Water Technologies, manufacturer of highefficiency ozone and oxygen generation systems in North America and Australia, relocated to a new manufacturing facility in Oceanside,



California, consolidating all manufacturing under one roof. The move was due to increased demand for Anue's municipal product line, together with the company's entry into the industrial wastewater market.

#### The Toro Company elects chief executive officer

The Toro Company's board of directors elected Richard M. Olson president and chief executive officer. A 30-year veteran of the company, Olson has served as Toro's president and chief operating officer since September 2015, and was elected to the company's board of directors in January 2016. Toro's current chairman and chief executive officer, Michael J. Hoffman, will continue to serve as chairman of the board.

#### Evoqua's Neptune Benson business acquires VAF Filtration Systems

Evoqua Water Technologies and its recently acquired Neptune Benson business acquired VAF Filtration Systems, a leading screen filtration manufacturer based in Arvada, Colorado. The acquisition pairs VAF's self-cleaning screen filtration systems with Neptune Benson's media-based filters.

#### Wastequip's Go To Parts division adds dealer network

Go To Parts, Wastequip's OEM parts division, added McNeilus Truck & Manufacturing as a Galbreath parts dealer in Texas, California, Arizona, Nevada, Colorado and Oregon.



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#### Enviro-Care hires regional sales manager

Enviro-Care Company named Kenny Oyler eastern regional sales manager. He spent 13 years with JWC and 20-plus years with IDI, FMC and Wheelabrator.

#### SKion and La Caisse acquire Ovivo

SKion GmbH and La Caisse de dépôt et placement du Québec partnered to acquire 100 percent of Ovivo shares. The company's management team, led by Marc Barbeau, president and CEO, will continue to operate the business from its headquarters in Montreal, Canada.

#### JWC Environmental names senior vice president

JWC Environmental promoted Greg Guard to senior vice president of global sales. He will be responsible for directing sales initiatives and strategies within the organization that includes over 100 distributors and representative firms. Guard joined JWC in 2012 to lead the newly created industrial business group and took on responsibility for JWC's municipal sales in North and South America in 2013.



Greg Guard

#### COLE Publishing editor Ed Wodalski passes away

Ed Wodalski, longtime contributor and editor with COLE Publishing, passed away suddenly on Sept. 21. He was 64. In addition to his writing contributions, Ed held many roles at COLE, including primary proofreading and coordinating national photo shoots and assignments. Most recently, he was the print and digital editor for *Plumber* magazine, and also oversaw the product and industry news for nine COLE publications. "Ed was not only a loyal contributor to the COLE team, but a mentor, family man and friend. He will be deeply missed," said Jeff Bruss, president of COLE Publishing. Ed is survived by his wife, Dawn; son, Michael; daughter, Nicole; and three grandchildren. **tpo** 

#### people/awards

The sanitation districts of Los Angeles County received Peak Performance Awards from the National Association of Clean Water Agencies. Platinum Awards went to the Los Coyotes and Saugus water reclamation plants, and the Joint Water Pollution Control Plant in Carson. The Lancaster, Palmdale and Pomona water reclamation plants received Gold Awards, and the La Canada, Long Beach, San Jose Creek, Valencia and Whittier Narrows water reclamation plants earned Silver Awards.

The city of **Litchfield (Illinois) Wastewater Treatment Facility** was honored by the city council for having no lost-time accidents in 20 years.

**Decatur Utilities' Dry Creek Wastewater Treatment Plant** received the 2016 Best Operated Plant award (greater than 10 mgd) at the Alabama Water Pollution Control Conference. **John Beard,** wastewater plant superintendent, received the 2016 Bolton-Crockett-Beck Award for service to the association and outstanding accomplishment.

**Cleveland T. Grimes** posthumously won the Golden Manhole Award from the Kentucky-Tennessee Water Environment Association. Grimes, who died in 2016, was executive director of the Hamilton County (Tennessee) Water and Wastewater Treatment Authority.

The sewer line crew members in the Wastewater Division within the city of Milford (Connecticut) Department of Public Works were named employees of the month for July 2016. The selection committee chose the team for their dedication and outstanding customer service. The crew includes **Craig George, Gary Brown, Dan Sennett** and **Nick Digioia**.

Adrian Martin, Ashley Dove, James Foust and Brandon Wilcox of the city of Columbia (South Carolina) Metro Wastewater Treatment Plant received the 2016 Water Heroes Award from the Water Environment Federation for their actions during a major flood in October 2015. More than 150 million gallons of sewage was surging into the treatment plant, and a nearby dike was threatening to break. The workers were told to shut down the plant and evacuate, but the four stayed to ensure that the wastewater would not contaminate the Congaree River and, ultimately, the city's drinking water.

The Conservation Foundation awarded the city of **Elmhurst (Illinois) Wastewater Plant** with the Clean Water Award.

The **Glenbard (Illinois) Wastewater Treatment Facility** received the George W. Burke Jr. Safety Award from the Central States Water Environment Association and the Clean Water Award from The Conservation Foundation.

**Richard Suvlu,** an operator at Barrow Utilities and Electric Coop, received a Meritorious Service Award from the AWWA Alaska Section.

**Stanley Keith Martin,** superintendent of the Mud Creek Water Pollution Control Plant in Valdosta, won the N.M. DeJarnette Award from the Georgia Association of Water Professionals for operations excellence, operator training and advancing the operations field.

**Pine Bluff (Arkansas) Wastewater Utility Boyd Point Treatment Plant** received a National Association of Clean Water Agencies (NACWA) Platinum Peak Performance Award after seven consecutive years of 100 percent permit compliance.

The **Emerald Coast Utilities Authority** in Florida received a Gold Excellence Award in the composting category for its biosolids composting facility from the Solid Waste Association of North America (SWANA).

#### events

#### Nov. 2-4

Nebraska Water Environment Association Fall Conference, Holiday Inn Hotel and Convention Center, Kearney. Visit www.ne-wea.org.

#### Nov. 3

Missouri Water Environment Association Fall Technical Conference, Columbia. Visit www.mwea.org.

#### Nov. 7-11

Mexico Section AWWA Annual Conference. Visit www.awwa.org.

#### **Nov. 9**

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

#### Nov. 13-16

AWWA-North Carolina Section, Raleigh Convention Center. Visit www.ncsafewater.org.

#### Nov. 13-16

Canadian Water and Wastewater Association National Water and Wastewater Conference, Marriott Eaton Centre, Toronto, Ontario. Visit www.weao.org.

#### Nov. 13-17

Water Quality Technology Conference and Exposition, Indiana Convention Center, Indianapolis. Visit www.awwa.org.

#### Nov. 14-15

Alabama Water Environment Association and American Water Works Association-Alabama and Mississippi Chapters' Water and Wastewater Technology Conference, The Hotel at Auburn University. Visit www.awea-al.com.

#### Nov. 14-15

Pennsylvania Water Environment Association Asset Management Specialty Conference, Penn Stater Conference Center, State College. Visit www.pwea.org.

#### Nov. 16

New York Water Environment Association Energy Specialty Conference, Desmond Hotel, Albany. Visit www.nywea.org.

#### Nov. 27-Dec. 1

Florida Section AWWA Annual Conference, Orlando. Visit www.fsawwa.org.

The **Hanover (New Jersey) Sewerage Authority** wastewater treatment plant received an NACWA Platinum Peak Performance Award and an Excellence in Management Silver Award for 2015.

**Corbin, Kentucky,** was honored for the best-tasting water at the Kentucky-Tennessee AWWA annual conference in Knoxville, Tennessee.

Water from the village of **Potsdam, New York,** was judged best in St. Lawrence County for 2016.

The **Connecticut Water Company** celebrated its founding 60 years ago. The company was created through a merger of the Guilford-Chester Water Company and the Naugatuck Water Company. Today, the company serves 56 towns and 92,000 customers.

**K. Charles Griffin** was named executive director of the Pittsburgh (Pennsylvania) Water and Sewer Authority, serving more than 300,000 customers in Pittsburgh and surroundings.

The Aquarion Water Company hired Stephen Olson as director of oper-

ations for Massachusetts. **Ronit Goldstein**, manager of community relations, expanded her role to include managing the portion of operations in the system that serves Hingham, Hull and North Cohasset.

President Barack Obama appointed DC Water CEO and general manager **George S. Hawkins** to the National Infrastructure Advisory Council.

**Rockdale Water Resources** and **ESG Operations** received two Platinum and four Gold Awards from the Georgia Association of Water Professionals. In Rockdale County, the awards were: Platinum Awards for the Big Haynes Water Treatment Plant and the Almand Branch Wastewater Plant, and Gold Awards for the Quigg Branch, Scott Creek, Snapping Shoals and Honey Creek wastewater treatment plants.

The **Erwin Utilities Wastewater Treatment Plant** received an Operational Excellence Award from the Water Environment Association, Kentucky/Tennessee Section.

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James Pendleton Plant Superintendent Harpeth Valley Utilities District Wastewater Treatment Plant Nashville, Tenn.

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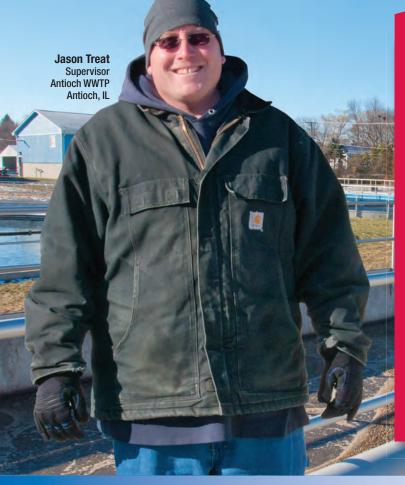
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 Optional Sensor Daily Auto-Testing



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www.analyticaltechnology.com



## **Operators EVERYWHERE Trust USABlueBook**

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

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

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

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

## Featured Products From USABlueBook

0 to 4.00 ppm

(free & total)

## Use the same water sample to measure both free and total chlorine!

#### LaMotte DC1500 Chlorine Colorimeters

- Durable IP67 waterproof housing --- ideal for use in the lab or out in the field
- · Liquid DPD version yields instantaneous results
- 2-year warranty

Increase efficiency-measure free and total chlorine with the same water sample! Ultra-portable units feature a large backlit graphical LCD screen and a rechargeable lithium ion battery. User-friendly keypad and simple menu-driven control make operation easy.

	1 ,			
DESCRIPTION	# TESTS	STOCK #	EACH	
Chlorine Colorimeter, Liquid Version	144 Free/144 Total	86262	\$ 425.00	FDA
Chlorine Colorimeter, Tablet Version	100 Free/100 Total	86263	425.00	EPA
Optional SMART Link Software	_	27747	74.60	COMPLIANT



LaMotte

data points

For more information, see page 674 in Master Catalog 127, or visit www.usabluebook.com.





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Range:

Sample: 10 mL