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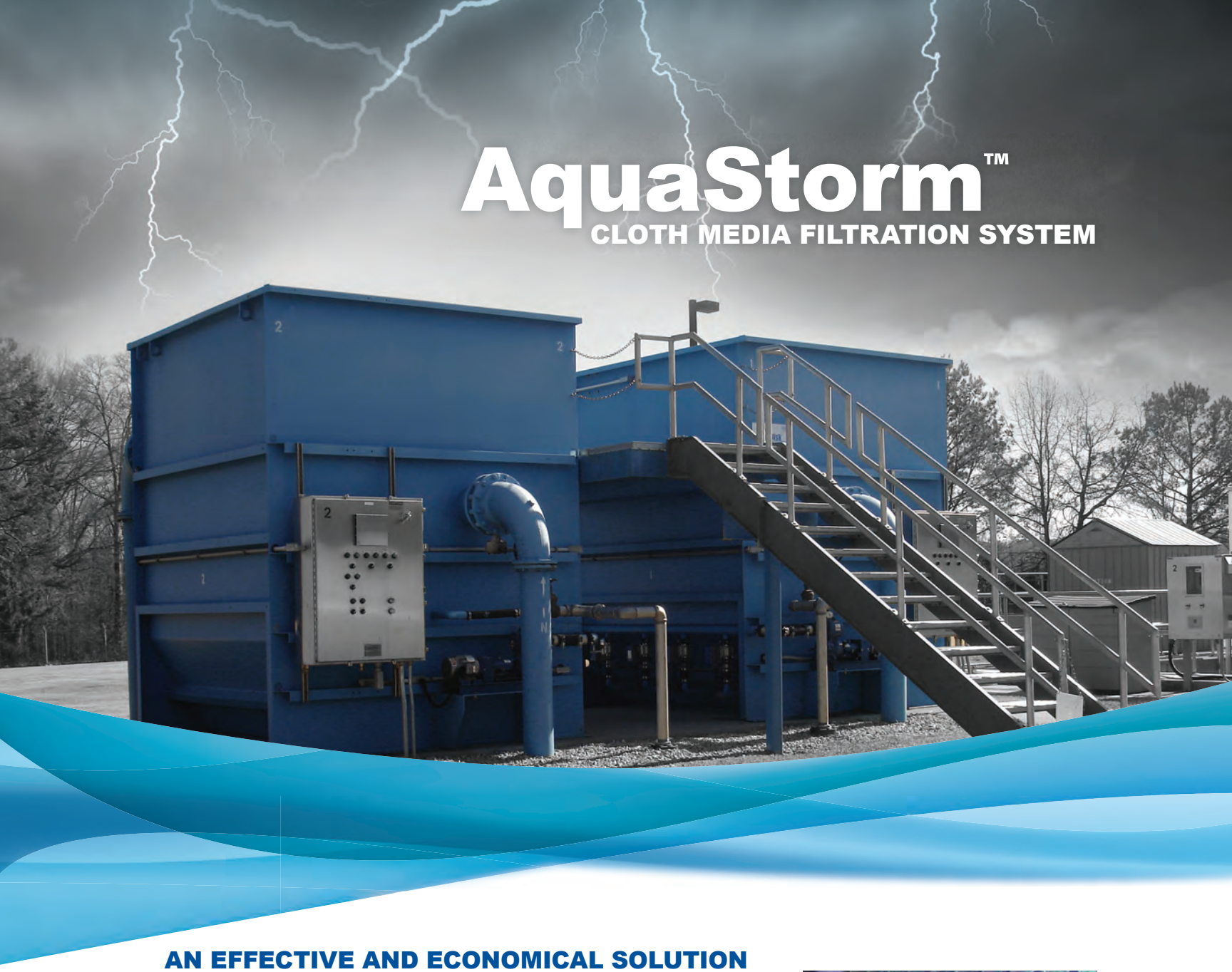

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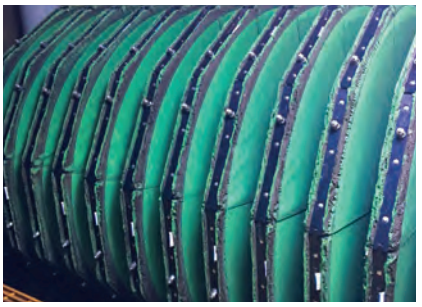

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November 2019



## top performers




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# How Do You Hire the Right Person?

## IT'S OFTEN PERSONALITY ATTRIBUTES — NOT SKILLS AND EXPERIENCE — THAT SEPARATE EXCELLENT JOB CANDIDATES FROM THE AVERAGE AND HELP MAKE GOOD ORGANIZATIONS GREAT

**By Ted J. Rulseh, Editor**

**Craig Patrick:** *"You're missing some of the best players."*
**Herb Brooks:** *"I'm not looking for the best players, Craig. I'm looking for the right ones."*
— From the movie *Miracle*

In today's economy, it can be hard for treatment plants to find qualified people. Finding the right people can be even harder.

Current thinking holds strongly that the best person for the job often is the one with the most education, the requisite skills and the most experience. In fact, hiring on those criteria alone can be a recipe for mediocrity.

Public and private sector organizations have found that stellar performers stand out based on certain personality traits that can lead directly to key benefits. Call them what you will — attributes, soft skills, emotional IQ — these are qualities that can't be taught. They can make or break a team member and, by extension, the organization as a whole.

It's not hard to teach a new person how to rebuild a pump or use the SCADA software, for example, but it is difficult or impossible to turn a loner into a team player or an order-taker into an innovator.

### AT BEST SECONDARY

An article in *Chief Executive* magazine (Nov. 8, 2012) asks, "Have you ever hired a person who had all the right skills and experiences? They interviewed well, had all the right answers, their resume read like the job description, and after you hired them they fell flat on their face? Why does this happen? Mainly because the person's skills and experiences are not primary indicators of their ability to do your job. These are at best secondary indicators and more often than not misleading indicators."

Research shows that this is true whether hiring for leadership positions or for the front lines. So, what kinds of personal attributes trump skills and experience as predictors of a team member's success? They can include resourcefulness, honesty, ingenuity, work ethic, initiative, empathy, self-confidence, attention to detail.

It's important to hire for attributes because of how hard it is to instill them. Many managers hire based on two wrong assumptions: that people can succeed at anything if they try hard enough and that people's weak areas are the ones where they have the most room to grow.

How, for example, can a supervisor teach a team member to be resourceful or self-confident? Current thought holds that if a person isn't resourceful at age 8, he or she won't be at age 30. The person may improve

It's not hard to teach a new person how to rebuild a pump or use the SCADA software, for example, but it is difficult or impossible to turn a loner into a team player or an order-taker into an innovator.

some in that area but not enough to succeed in a job (such as plant operations) that often requires being exceptionally resourceful.

## THE RIGHT QUESTIONS

It's possible to interview candidates with specific attributes in mind. For example, an interviewer looking to evaluate a person's ingenuity might say, "Tell me about a time when you helped your team solve an especially challenging problem in a cost-effective way."

An even better approach, some experts say, is not to ask for examples from the past but to ask how the person will apply his or her abilities if hired for the job at hand. "If they can't use these effectively in your company and your position," the *Chief Executive* article says, "then they may be a great person, but they aren't the right candidate."

The trick is essentially to have the person imagine him/herself in the job. The means asking, for example, "If an upset occurred in our activated sludge process, what steps would you follow to diagnose the issue and resolve the problem?"

Selecting people for attributes certainly worked for Herb Brooks, the coach of the 1980 U.S. Olympic hockey team, which pulled off the miracle victory over the Russians. It also works for many great public and private sector organizations, large and small. Chances are it can work for your organization too. **tpo**

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UNIVERSITY STUDY

## Microplastics in WWTP Processes

Plastics in our waste streams are breaking down into tiny particles, potentially causing consequences for human health and our aquatic systems, according to recent research from the University of Surrey in England and Deakin's Institute for Frontier Materials. The team found that nano- and microplastics break down further during treatment processes, reducing process performance.

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OVERHEARD ONLINE

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PFAS REGULATIONS

## How Far Is Too Far?

As if the wastewater industry doesn't have enough public perception issues, the conversation around per- and polyfluoroalkyl substances (PFAS) has reached a fever pitch. As a result, many states and municipalities across the country are moving toward tougher PFAS limits in water and wastewater treatment. In this online exclusive article, Ned Beecher of the North East Biosolids & Residuals Association sheds light on the subject.

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HIGH-SCHOOL TRAINING

## Jumpstarting Wastewater Careers

Recruitment shortage has been a bogeyman of the industry for several years, and one municipality in central Florida is taking steps to address it. A new program undertaken by the City of Altamonte Springs will take high school students through wastewater operator training. Not only that, but by the end of the class, the city hopes to have the high school seniors pass the Class C state exam.

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## A Problem. A Magazine. An Expert. A Solution.

EDITOR'S NOTE: *The writer of this letter has written many articles for* Treatment Plant Operator *magazine.*

To the editor:

I wanted to share with you how *TPO* magazine recently helped a community.

I wrote an article for *TPO* some years ago about midge fly larvae in a small wastewater treatment plant ("Where Have All the Solids Gone?" June 2012 edition). A few weeks ago, I received an email from a person who works with a county agricultural extension office in northern Alabama who found my article online.

He asked if I could offer some help to the operators of a community treatment plant that was experiencing a trickling filter fly infestation. The surrounding neighbors were up in arms, the media was all over it, and the plant operators were at a loss for what to do.

After a few emails back and forth, I spoke on the phone to the plant supervisor, a very nice gentleman who just needed to talk to someone about the problem and bounce some ideas across. I shared my experience with trickling filters — some of the ones here in Florida that had similar problems and how we helped correct them.

He gave me some plant data; I ran a few calculations and offered some advice. He and his staff came up with a brilliant way to modify the trickling filter arms to slow down the rotational speed, providing more water volume over each square foot as the arm passes by. They used operator and mechanic ingenuity to overcome a problem using parts they had on hand.

I heard from him recently: The filter flies are about 90% gone. The neighbors are saying they do not see any flies and they are thanking him for his efforts. I'm so happy that I was able to help him, basically sitting at my desk here in Florida, crunching some data! That's why we do what we do.

Thanks again for publishing a very useful and interesting periodical!

**Ron Trygar, Certified Environment Trainer**
**Senior Training Specialist**
**University of Florida TREEO Center**
**Gainesville, Florida**

# Switch Hitter

PAULA ELY STARTED HER CAREER AS A LAB TECHNICIAN BUT NOW DIVIDES HER TIME BETWEEN LAB TESTS AND PLANT OPERATIONS IN THE TOWN OF GREAT BARRINGTON

STORY: **Ted J. Rulseh** PHOTOGRAPHY: **Scott Eisen**

Paula Ely was surprised a couple of decades ago when her clean-water plant superintendent took her aside and said, "I want you to become an operator."

Surprised because she was perfectly happy working in the lab at the Pittsfield (Massachusetts) Wastewater Treatment Plant. "I don't want you to stay in the lab," Tom Landry, her boss, told her. "One day you're going to run this plant."

Despite some misgivings, Ely took the courses needed to pass her Grade 4 license exam. She has no regrets. Today she doubles as the assistant operator and lab technician for the Town of Great Barrington Wastewater Treatment Facility. Last year she received an Operator of the Year award from the U.S. EPA New England office.

Bill Ingram, wastewater superintendent, observes, "Paula generates the numbers we operate the plant by. When I give school tours, I take them to the lab, introduce them to Paula and tell them she is the glue that holds this plant together. She's very accurate and precise and really cares about her job. She has been a fantastic asset to the Town of Great Barrington."

## SURPRISING APPEAL

Ely grew up in Dalton and earned a bachelor's degree in psychology from Worcester State University. After that, she worked for brief spells as a shoe store manager and certified nursing assistant: "You need a master's degree to do anything in psychology."

Paula Ely, assistant wastewater operator and lab technician, Town of Great Barrington Wastewater Treatment Plant

Ely uses her powers of observation during walk-arounds to detect signs of trouble, like a wet spot on the floor or noise from a motor coupling. She then brings her concerns to the plant superintendent, head operator or mechanic.

> "When I give school tours, I take them to the lab, introduce them to Paula and tell them she is the glue that holds this plant together."
> **BILL INGRAM**

## Paula Ely, Town of Great Barrington, Massachusetts

POSITION:
**Assistant wastewater operator/ lab technician**

EXPERIENCE:
**26 years in the industry**

EDUCATION:
**Bachelor's degree, psychology, Worcester State University**

LICENSING:
**Grade 5 wastewater operator**

AWARDS:
**2018 Operator of the Year, U.S. EPA New England Region**

GOAL:
**Continue learning and become plant superintendent**

Paula Ely relies on lab test results as a key indicator of how the treatment plant is functioning.

## UNDER THE SCOPE

Part of Paula Ely's job is to make sure the bugs are happy. She does that in part by regularly putting them under the microscope.

"Twice a week, or more if necessary, I put a slide on and take a look," Ely says. Most of the time, the process and its microbiology are stable, but a few issues come into play. For example, in winter, ice can build up on top of the I-beams that hold the surface aerators in the secondary treatment basins.

That means the operators have to shut the aerators down long enough to go out and knock the ice off because chunks of ice that fall off on their own can damage or break the aerator paddles. "When that happens, we seem to get an increase in a filament called *Sphaerotilus natans,* which looks like a tree under the microscope," Ely says. "It impedes settling of the sludge and can create bulking. Then we could lose our sludge if there's a rain event."

To combat the filaments, operators add a low dose of sodium hypochlorite to the basin. "Then I put a slide on and I can see little blank spots in the filaments. That tells me the hypochlorite is working." She also measures the sludge volume index as an indicator of filament growth.

Changes in the weather can also bring about changes in the microbial populations: "For example, in summer we see more crawlers, such as *Aspidisca* and *Euplotes.* We also see numerous types of rotifers, such as *Epiphanes, Philodina* and *Proales.* They are fun to watch under the microscope, and they are the hardest workers at the plant.

"In general, we have really healthy sludge."

While working in a nursing home, she cared for a man whose son, a frequent visitor, happened to be an operator at the Pittsfield treatment plant. Ely recalls him saying, "You have a bachelor's degree. Why are you working here? There's an opening at the wastewater treatment plant in the lab."

That was in 1993. Ely got the Pittsfield job: "I really enjoyed it. I was surprised. I didn't realize how detailed the work was, how accurate you had to be and how much the job entailed. I found it mentally stimulating.

> "One of the main things I do is be very, very observant. If I see a wet spot on the floor in the basement, I'm asking, 'Why is it wet there? Is there a pipe leaking?'"
>
> **PAULA ELY**

"I liked the fact that the tests we ran in the lab indicated how the plant was running. As a lab person, I could tell the operators: 'This is what's going on in the digester. The volatiles are up.' I thought it was pretty neat that we could determine how the whole plant ran just by grabbing samples throughout the process."

### MOVING ON

Her mentor at Pittsfield was the late Joel Gordon, a chemist: "He was a very smart man." It was a few years later that Landry tapped her to study for her operations license. By 1998 she had her Grade 5 license (Grade 7 is highest) and was working the night shift at the plant, a 17 mgd (design) facility with an activated sludge process and trickling filters. That schedule enabled her to be home with her two children by day.

Then in summer 2004 she took her current job at Great Barrington. By that time, her children were in school and into sports; working the day shift and fewer weekends fit better with their schedules. In addition, "I had the opportunity to come back into the lab. The job met all my needs at the time and still does."

The Great Barrington plant (3.2 mgd design, 2.0 mgd average) received a 2016 U.S. EPA Regional Wastewater Treatment Plant Excellence Award. It was built in 1974 and has been through various upgrades, most recently in 2014 and 2016.

Influent passes through a FlexRake bar screen (Duperon) and then a Grit King grit removal system (Hydro International). The flow then enters two primary clarifiers, followed by two secondary treatment basins with surface aerators (Clow Corp.). Typically, at any given time only one secondary basin is operating. Ferric chloride is added for phosphorus removal at the point where return activated sludge enters the basin.

From secondary treatment, the flow enters either two clarifiers or one Envirex clariflocculator (Evoqua Water Technologies). Clarifier effluent passes to a chlorine contact chamber; sodium bisulfite is added for dechlorination before discharge to the Housatonic River.

Primary and waste activated sludges are pumped to a gravity thickener and dewatered on two belt filter presses (BDP Industries). Contractor Synagro picks up the dewatered materials and hauls it offsite for incineration.

### DIVIDING TIME

Ely spends the majority of her time in the lab but makes routine daily checks to ensure the plant is operating as it should. "The plant sort of runs itself," Ely says. "Teamwork is what makes the plant run nicely the way it does." Besides Ely and Ingram, the team includes David Soules, chief operator; Jerry Morey, mechanic; John Malumphy, equipment operator; and Lee Soules and Ryan Shimmon, collections system operators.

In morning rounds, Ely checks that the surface aerators are turning and in general looks carefully for any sign of trouble. "One of the main things I do is be very, very observant," she says. "If I see a wet spot on the floor in the basement, I'm asking, 'Why is it wet there? Is there a pipe leaking?'

"When I go down into the return sludge pump room, I listen to the motors. A wobbling noise might tell me a coupling is going. If something sounds like it's straining, the bearings might not be OK. I listen and look at things and bring issues to the superintendent, head operator and mechanic. 'This doesn't sound right. Can you come and check it with me?'

> "The plant sort of runs itself. Teamwork is what makes the plant run nicely the way it does."
>
> **PAULA ELY**

The Town of Great Barrington Wastewater Treatment Plant team includes, from left, Jerry Morey, mechanic; John Malumphy, equipment operator; Paula Ely, assistant operator and lab technician; David Soules, chief operator; and Bill Ingram, superintendent.

"That's a lot of what we all do. We walk around making sure everything is functioning properly. Because we're on top of it so much and constantly doing planned maintenance, we really don't find a lot of problems.

"We're not staffed 24 hours, so we want to make sure everything is good when we leave. We don't want to find that the primary sludge pumps stopped working overnight. I check the chemical feed pumps and keep an eye on chemical levels to make sure we order them at the appropriate times."

## DATA AT WORK

As for lab work, Ely takes grab samples throughout the plant: the raw influent, the flow entering and leaving the primary clarifiers, the flow leaving the aeration basin and the final effluent before discharge to the river. "We chlorinate and dechlorinate April 1 to Oct. 31," Ely says. "During those times, there's more testing because we have to make sure we have a high enough chlorine residual to kill the bacteria."

With samples in hand, Ely goes to the lab, calibrates her instruments and runs both compliance and process control testing: "It all basically coincides, because if you don't have good process control, then you will be out of compliance.

"I do an analysis to quantify the mixed liquor suspended solids so I know we have enough bugs to treat the BOD that's coming in. Through calculations, I determine how much to waste. I set up BOD tests three days a week. I test TSS three days a week for the primary and final effluent and five days a week for the influent.

"We have to maintain a certain percent removal for BOD and TSS. BOD is a five-day test, so we find out what happened five days ago. But after working here for so many years, I know that if our TSS is X, then our BOD is going to be Y." She runs a total phosphorus test on the final effluent once a week.

Ely likes to "number-crunch" on the computer. "Our flow changes due to rain events," she says. "I made a program up where I can enter in the maximum flow for the day, the rain for the day and the average flow, so we can track it over time and see if I&I (inflow and infiltration) is an issue. If all of a sudden we got an inch of rain, did our flow spike up?

"I do that just for information, to help us keep track of the weather. If we know in advance that a storm event if coming, there are different things we can do. For example, we can put the Duperon screen on manual instead of a timer and say, 'We're going to run this continuously just in case.'"

Influent from Great Barrington (population 7,750) is mostly domestic wastewater, plus about 2.4 million gallons of septage per year. Haulers discharge septage at a receiving station at the head end of the plant. "It's a little bit like taking plug loads because we don't have a holding tank where we can slowly trickle it in," Ely says. "We see a little spike in the flow, but it hasn't created any issues, and the revenue is helpful."

## PROMOTING THE PROFESSION

Ely enjoys the camaraderie on her team: "There's a sense of purpose in what we do because we're working to keep the environment healthy and people healthy."

Plant tours for community members and groups from schools and colleges are part of life at the facility. "I like it when people come here and see what we do," Ely says. "I don't think most people have a concept of what it takes to keep a place like this running and complying with the permit. There's a saying that if what you're doing looks easy, it's because you know what you're doing. We make it look easy because everybody here knows what they need to do. Everybody.

"Wastewater treatment plant personnel are underrated, and I'm glad we can let the general public know that it's not an easy feat we achieve each day — to put out clean effluent and leave the environment in better shape than if we weren't here." **tpo**

# Which Water Is Which?

A CONTEST TO IDENTIFY WATER AT DIFFERENT STAGES OF TREATMENT CHALLENGED VISITORS TO AN EDUCATIONAL EVENT IN ROUND ROCK, TEXAS

**By Sandra Buettner**

A water plant team member explains how an in-line chlorine analyzer works and how it helps make sure the water is safe to drink.

Suppose you were shown four jars of water representing stages of water and wastewater treatment. Could you identify them?

Perhaps as a water professional you could, but it wasn't so easy for attendees at the Water You Drinking? festival held in Round Rock, Texas, on May 8-9 to celebrate the American Water Works Association's 2019 Drinking Water Week. The contest was part of the two-day event, which included exhibits, contests, giveaways such as rain gauges, and a tour of the Round Rock Water Treatment Plant.

The event, in its sixth year, was held at the water plant, which provides 93% of the drinking water for the city's 114,000 residents. About 30 people attended each day, including a mix of adults and their homeschooled children.

"The idea of the event is to educate people on how their water gets to them and how their wastewater flows out, and to get them involved in the water and wastewater world and what they can do to help us," says Brandon Pritchett, water operations superintendent for the city.

## EXHIBITS AND DISPLAYS

The event ran from 3 to 5 p.m. both days. In the first hour, the attendees visited booths from various functions like inflow and infiltration, stormwa-

Stormwater system team members used a diorama to show how runoff can pollute bodies of water.

Parents and kids got an up-close look at treatment processes during the water plant tour at the Water You Drinking? event.

> "The idea of the event is to educate people on how their water gets to them and how their wastewater flows out, and to get them involved in the water and wastewater world and what they can do to help us."
> **BRANDON PRITCHETT**

ter, water conservation, the water and wastewater environmental labs, recycling and others.

The I&I group displayed a camera truck that showed what happens when there's a break in a sewer line. The equipment included a tractor camera that took video inside a pipe for visitors to observe on a screen. The stormwater group had a diorama display to which team members added water to show how runoff carries contaminants with it.

The water conservation group passed out literature and talked about conservation rebates and how to find, identify and address water leaks in homes. The laboratory booth had an interactive beanbag toss game that taught attendees about testing for coliform bacteria. The recycle center staff told about what items to recycle and not recycle and the importance of keeping recyclables out of landfills.

Besides the camera truck, utility equipment on display included a vacuum truck for clearing wastewater lines and a trailer carrying items used to repair fire hydrants.

## HARD CORR COMPETITION

After the first hour, the parents and children watched a Hydrant Hysteria competition in which two waterline maintenance team members took apart and reassembled a fire hydrant in just under 90 seconds. The team has won the Texas Section AWWA championship in that event in the past two years.

The Hard CoRR team (CoRR stands for City of Round Rock) took fifth place at the 2018 national AWWA conference competition and competed again in the 2019 nationals.

During the water plant tour, attendees observed the coagulation-flocculation, sedimentation, filtration and disinfection steps. They took a guided tour around the treatment structure and learned about the computer system that controls plant functions.

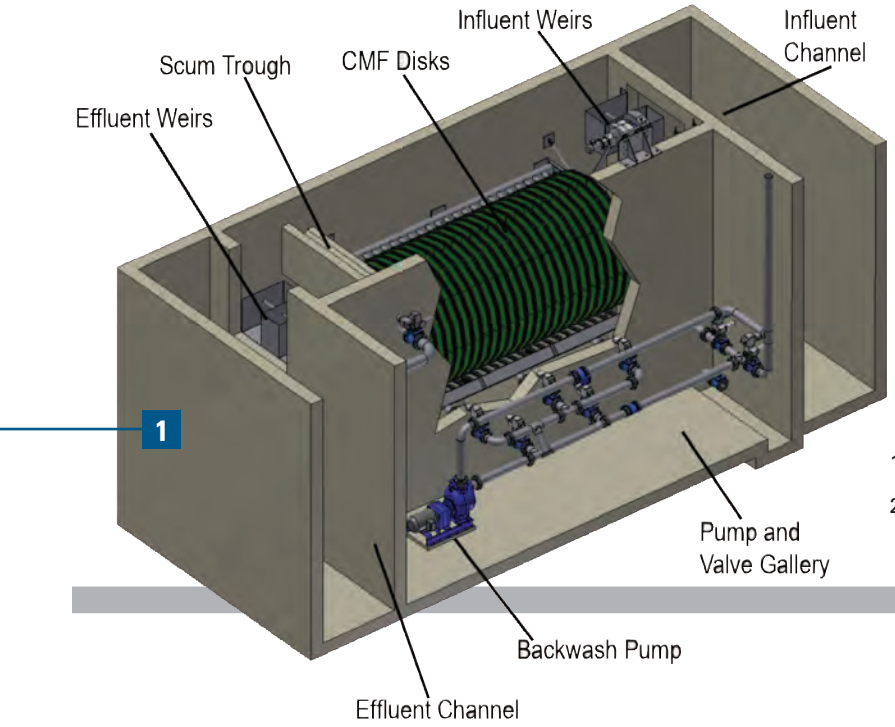
## WATER YOU DRINKING? CONTEST

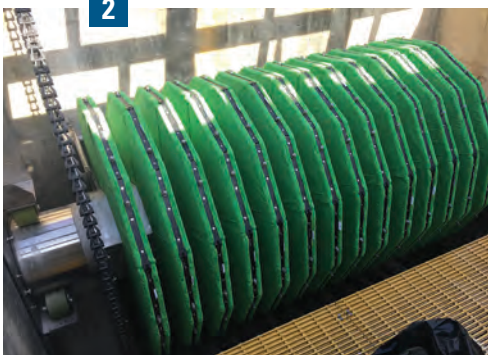
A popular contest at the event included four jars containing samples of water: raw lake water, potable water, Type 1 reuse water and treated wastewater. Attendees were asked to identify which was which. After two days and about 60 people, only one person, a grade school girl, identified all four. She received a collapsible water bottle and earned bragging rights.

It was the first time this contest was included, and it was well received. "It will definitely be used in future Water You Drinking? events," Pritchett says. "Through this contest, attendees were able to see the different stages of the water." tpo

### What's Your Story?

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




1. An artist's rendering of the complete AquaStorm system.
2. The AquaStorm system uses pile cloth media in a disc configuration to treat wet-weather flows to wastewater treatment plants.

# Taking on Storm Flows

## A NEW CLOTH DISC MEDIA FILTER TECHNOLOGY IS DESIGNED TO PRODUCE HIGH-QUALITY EFFLUENT FROM PEAK WET-WEATHER FLOWS AND CAN DOUBLE AS A TERTIARY FILTER

**By Ted J. Rulseh**

Peak wet-weather flows have always been challenging to clean-water plants, and heavy rainfalls in the past few years have brought the problem into sharper focus.

The persistent question is how to handle peak flows while still producing effluent that meets permit limits and protects the receiving waterway.

Now Aqua-Aerobic Systems has introduced the AquaStorm pile cloth media filtration system. It is engineered for wet-weather applications and designed to provide high removal efficiency and to produce high-quality effluent, even under varying influent conditions.

The system uses a disc configuration with design features to deal with the specific challenges of peak flows. It uses the company's OptiFiber PF-14 pile cloth media and operates with three zones of solids removal to treat peak flows without chemical addition. John Dyson, AquaStorm product manager, talked about the technology in an interview with *Treatment Plant Operator.*

**tpo: What was the reason for bringing this product to market?**

**Dyson:** Treatment plants have difficulty dealing with peak flows that exceed plant biological design capacity. This technology allows us to treat those peak flows without doing a full biological treatment process. It enables the plant to easily meet its permit limits while preventing the discharge of untreated peak flows, either at the plant or out in the collection network.

**tpo: How and where can this system be deployed in the collection network?**

**Dyson:** It could be at a pump station where the flows overwhelm the pumps or in places where combined sewer flows get so high so quickly that the network cannot physically move that water to the treatment plant. It provides 80% to 95% solids removal, after which the water can be effectively disinfected before discharge to a river or stream.

**tpo: How would this technology fit into a typical clean-water plant process?**

**Dyson:** One application is in a train parallel to the main treatment plant process. It allows the plant to operate up to its peak biological capacity where it can produce good effluent. The peak flow over that amount goes through the AquaStorm system to remove solids, BOD and any kind of particulate matter. Generally, because the influent in wet-weather conditions is quite diluted, we can produce very good effluent quality. Then we recombine the flow from our system with the effluent from the main plant and easily meet TSS, BOD and other permit limits. The other main option is to use the system in a dual treatment mode.

> "In dry weather, the system can work as a tertiary filter."
> **JOHN DYSON**

**tpo: How does the AquaStorm process function in a dual treatment configuration?**

**Dyson:** In dry weather, the system can work as a tertiary filter. When

wet weather occurs, we can take the excess peak flow, route it around the biological process, recombine it with the effluent from secondary treatment and then filter all the water. In a way, it's like getting tertiary filtration for free.

> "It's very compact. For perspective ... it has about 15% of the footprint of a primary clarifier."
> **JOHN DYSON**

**tpo: How does this technology differ from other cloth media filters?**
**Dyson:** Because we're dealing with primary influent, floatable material has to be removed. So the base design has been changed so we can remove scum and floatables periodically by hydraulic decanting. Primary influent also contains some large and heavy particulate matter. So we designed a collection system in the bottom of the unit that removes about 30% of the solids by a settling process.

**tpo: What are the advantages of this particular system for treating wet-weather flows?**
**Dyson:** First, the startup is very simple. Wet-weather flows often occur very quickly. Our system can sit dry, and when a peak flow comes, it goes into operation automatically. Second, we can achieve very high water quality without the addition of chemicals. If there is some dissolved component, such as phosphorus, that has to be removed, we could add a coagulant, but the chemical addition is simple because we just have to form a very tiny floc, which the pile cloth media filter then removes.

**tpo: In simple terms, how does the process work?**
**Dyson:** Influent enters the filtration tank, which contains the pile cloth media filter discs in a vertical arrangement. Larger and heavier solids are allowed to settle. Other solids collect on the surface of the cloth. When the water level rises to a high-level mark, backwash is initiated. The filter is never offline; we only backwash a portion of the discs at any given time. As the discs rotate, we use the water that's being filtered for backwashing. It reverses back through at a very high velocity. That stands up the fibers and removes the solids from the cloth.

**tpo: How are settled and floatable solids removed from the system?**
**Dyson:** After six to 10 backwashes, we pump the settled solids from the collection system at the bottom of the unit. Every eight to 12 hours, we do a hydraulic decant of the scum and floatables. The water level is allowed to rise above the preset backwash level. As the water level increases, the scum is removed by flowing over a weir.

**tpo: How does this system accommodate constrained spaces?**
**Dyson:** It's very compact. For perspective, based on engineering studies I have seen, it is generally about 10% smaller than a ballasted clarifier. It has about 15% of the footprint of a primary clarifier.

**tpo: How well has this technology been accepted so far?**
**Dyson:** We have one plant showing great results after almost two years of operation. Several other plants have systems under construction, and several more have entered into design. They vary from small facilities that might have to filter 1 or 2 mgd at peak flows to facilities that need to treat 150 to 250 mgd under peak-hour conditions. We see a lot of interest in the Eastern U.S. In the past couple of years, it has rained heavily from Oklahoma east. That means a lot of plants have been dealing with significant excess flow. **tpo**

# Big Challenge? No Problem.

WATER PLANT TEAM MEMBERS IN SAN MARCOS PULLED TOGETHER TO IMPROVE OPERATIONS AND CONSISTENTLY EARN THE TEXAS OPTIMIZATION PROGRAM AWARD

STORY: **David Steinkraus** | PHOTOGRAPHY: **Olivia Ogren-Hrejsa**

## San Marcos (Texas) Water Treatment Plant

www.gbra.org/operations/sanmarcos.aspx

BUILT:
**1999, expanded 2006**

POPULATION SERVED:
**150,000**

EMPLOYEES:
**7**

FLOWS:
**21 mgd design, 13 mgd average**

SOURCE WATER:
**Canyon Lake reservoir and wells**

SYSTEM STORAGE:
**3 million gallons**

DISTRIBUTION:
**15 miles of water mains**

ANNUAL BUDGET:
**$2.5 million (operations)**

KEY CHALLENGE:
**Water quality and operating efficiency**

Southwest Texas is a dry place and fast-growing place. That's a double-edged problem that the San Marcos Water Treatment Plant is helping to solve.

The plant, in the City of San Marcos, is operated by the Guadalupe-Blanco River Authority through a 1997 regional agreement to serve people along the Interstate 35 corridor between San Antonio and Austin.

"So that agreement was forward thinking," says Jerry Sharp, San Marcos plant manager (who has retired since his interview for this article). "That was why we expanded the plant in 2006." Growth had begun before the 2006 expansion: From 2010-18, the population of Hays County, which includes San Marcos, increased 41% according to the U.S. Census Bureau. Cities around San Marcos saw water demand increasing slowly but steadily. Through the authority, San Marcos is a water wholesaler to other area utilities.

### SURFACE AND GROUND SOURCES

Although Canyon Lake reservoir is the official source for the plant, raw water doesn't come directly from there. Instead, a 30-inch pipeline brings water 23 miles from Lake Dunlap, which like Canyon Lake was created by a dam on the Guadalupe River.

Raw water is injected with chlorine dioxide and then with coagulant. It flows through flocculation and sedimentation tanks, which are round upflow clarifiers with tube settlers. Water then passes through standard sand and anthracite filter media. Chlorine is added before delivery to storage and distribution.

San Marcos maintains wells as a backup supply, and last August those wells became necessary. "We had a high-service pump that went to ground, and that kicked the main breaker for the plant," Sharp says. "The emergency generator (Cummins Power Products) came on, but the fault had taken out another breaker between the generator and our main breaker, so we were getting no power, even with the generator running.

"The Guadalupe-Blanco River Authority has an electrical crew and we had them come in. They figured out that the fail-safe breaker between the line and the generator had faulted also. Once we got that reset, everything came back up."

It was a relatively simple fix once the electricians discovered what breaker to reset: "We didn't know that breaker was tied into that system — but we do now. So it was a learning process." When the plant went down at about 1 a.m., pressure in the distribution system also fell, and the SCADA system (Lookout from National Instruments) automatically switched to one of the wells.

The priority of the plant is to fill the storage tanks for San Marcos and other customers, which handle their own distribution sys-

The team at the San Marcos Water Treatment Plant includes, from left, Thomas Scott and Cory Sibley, operators; Eduardo Montana, division manager; John Gerland, chief operator; and Guy Caffey, operator.


> "A lot of rivers around here are spring-fed. So when we get a little bit of rain, we end up in a flood event — some big, some small."
> **JERRY SHARP**

Thomas Scott performs a hardness test on finished water in the San Marcos Plant Lab using a digital titrator. Tests are run daily on each shift.

tems. But the electrical failure didn't simply interrupt the overnight filling of tanks. "It's not your typical system where you pump your water during the day and then at night you refill tanks," Sharp says. "They use as much water here at night as they do during the day. It's pumping 24/7 here."

The difference in San Marcos is industry that works third shifts and irrigation that is done at night to reduce evaporative losses.

Cory Sibley washes down the edges of a filter with potable water during the start of the backwash process. This is done every 96 hours on each filter cell.


Awards line the wall of the San Marcos Water Treatment Plant office, including two five-year awards from the Texas Optimization Program.

## IMPACT OF RAINFALL

Turbidity is a key challenge for the San Marcos plant's team. "A lot of rivers around here are spring-fed," Sharp says. "So when we get a little bit of rain, we end up in a flood event — some big, some small. But every time we end up with excess water running into Lake Dunlap, it changes the water quality coming in as far as the alkalinity, pH and organic loading on the clarifiers."

That means jar tests and adjusting chemical feeds based on lab results. Team members have learned the plant well and have a good idea of how to change the system to compensate for problems, yet every rainfall still brings some surprise. "There's been so much expansion and so much growth that a lot of people are building on the watershed," Sharp says. "What used to be open property with watershed into the rivers is now populated. That's just the price of growth here."

In 2011, San Marcos had temperatures above 100 degrees F for 96 days straight. The authority and all its utility customers have water conservation plans for those cases, and all the customers have wells they can draw from. The utilities issue water restrictions based on their groundwater levels, while the authority does so depending on the water level in the reservoir. Building codes include mandates for low-flow toilets and showerheads.

The plant expansion completed in 2006 should be adequate to meet demand for several years, Sharp says. The economic downturn of 2008 stalled development, and that added about three years to the expected life of the expansion. In 2019 the plant produced 16 to 17 mgd during the summer pumping season, which begins in

May. In the next three to five years, the plant may begin touching its 21 mgd design capacity. There is space on site for further expansion.

## STELLAR PERFORMANCE

Evidence of how well the San Marcos team knows its plant is a second five-year award from the Texas Optimization Program, a way for water plants to improve their product quality. The TOP is a voluntary way for utilities to challenge themselves to do better. "It's based on filtration, your filtered water quality and your finished water quality," Sharp says.

The national limit for turbidity is 0.3 NTU. In the optimization program, the maximum is 0.1 NTU. The program monitors filtration, backwash, spikes after backwash and settled water quality.

"This plant is so well designed that we decided we could meet the rigorous criteria that the Texas Commission on Environmental Quality requires for the program," Sharp says. San Marcos joined the program in 2007 and has been a member ever since. The San Marcos plant's team had set its own goal of being optimized, and the TOP coincided with that goal.

"We went through several years of just learning to operate this type of system," Sharp says. "The upflow clarifiers are a little bit different animal than your rectangular settling basins or even the round settling basins. And we spent a lot of years optimizing this plant also."

## UP TO THE CHALLENGE

"There are some people, I've been told, for whom the TOP and the paperwork and the rigor of having to achieve 0.1 NTU just gets to be too much or they don't have the people on board that we do, who enjoy a challenge. Because it is a challenge; it's not something you could readily do without knowing how to get the most efficiency out of your plant."

In 2007 the team felt it had the plant figured out and the expansion was done. "And it turned out to be really beneficial to our customers," Sharp says. "It's about our customers and supplying them with the highest-quality water that's possible with surface water."

Although the Texas Commission on Environmental Quality will help find coaches for plants that need them, the San Marcos plant's team members worked out everything on their own. When Sharp and the original group of operators joined the plant in 1999, they had never seen such equipment: digital chemical feed pumps (Watson-Marlow Fluid Technology Group), flow pacing and automated valves.

"I came from a totally manually operated plant, and a lot of the guys who came here did too. It was a chore, but we stuck with it and learned each and every piece of equipment and the best way to operate it. We took our time, and over time it really worked out."

The plant is staffed 24/7. The people who keep it running smoothly today are John Gerland, chief operator; Tommy Walenta, operator; Leroy Garza; Richard Valadez; Thomas Scott; Guy Caffey; and Cory Sibley.

"We have a really good team of people," Sharp says. The atmosphere is team based, and staff members meet once a month to discuss safety and other issues. "Everyone carries their own weight, and everyone likes everyone else. This is probably the best group we've had in the 20 years I've been here." tpo

## COMPETING WITH OIL

When Jerry Sharp came to the San Marcos Water Treatment Plant in 1999, he joined two local people and three others who were recruited, like himself, from elsewhere in Texas. He is the only remaining member of the group that started the newly built plant, and it's less likely these days that operators can be recruited from elsewhere.

"When you have an opening, it's getting harder and harder to find someone who's certified in the water business," Sharp says. "I don't see that many people getting into the water business anymore." Even if the authority finds potential employees, the question is whether they will relocate and how much commitment they have to a water career.

The problem involves both mindset and competition from other industries. "There is still the oil field here in Texas, and that does purport to be more money," Sharp says. "It's less stable than the water business, but we have had people leave here to go to the oil fields."

Oil work is also much more physical, while water work is much more mental. The Guadalupe-Blanco River Authority Human Resources Department does all the recruiting, although Sharp does interviews. To expand the pool of candidates, the authority is starting an internship program.

There is already an internship for the laboratory and the accounting department, and the authority is working with high schools and colleges to set up one for the water and wastewater treatment plants.



John Gerland with the screen for the SCADA system that monitors plant operations and enables remote control.

Illustrator and author, Lori and Jon Harrison

# Teaching the Kids Why Water's Worth It

A NEW BOOK FROM TWO WEF STAFFERS TAKES KIDS ON A JOURNEY TO DISCOVER THE IMPORTANCE OF WATER AND THE PROFESSIONALS WHO TAKE CARE OF IT

**By Ted J. Rulseh**

It's an axiom in the water industry that protecting and conserving water is everyone's job. The authors of a new book from the Water Environment Federation are taking that message to the very young.

This year, Lori Harrison (author) and husband Jon Harrison (illustrator) created *Why Water's Worth It*, a 36-page children's book that tells the story of water in engaging, rhyming language. Lori is director of creative projects, and Jon is an art director with WEF.

The story takes readers on a trip through the world of water — its uses, how it's treated and delivered, the people who do the work, what it takes to protect and preserve it for the future, and more. It's a simple story, just one or two colorful, watercolor-style pictures (more than 40 in all) and a few lines of text per page:

***We need it to clean, to eat and to drink***
***It helps us to play, to work and to think …***

***Passionate people who love what they do***
***Work hard to clean water for me and for you …***

***We're all in this cycle, we all live downstream***
***We're in this together, we're part of this team …***

The book is available through www.wefmarketplace.org and major online channels. The Harrisons talked about their project, the motives behind it and their plans for it, in an interview with *Treatment Plant Operator.*

> "We consider water professionals as first responders, in the same manner as firefighters, police officers and EMTs. We thought it was valuable to show how important they are."
> **JON HARRISON**

**tpo: What is the history of the Water's Worth It campaign?**

**Lori:** Water's Worth It is a campaign Jon and I created that was launched in 2012 and was very successful. Last year we decided to pick it back up and revitalize the messaging. In the course of that, we branched out to incorporate topics we hadn't addressed, like resource recovery and stormwater. We also tried to make it more public-facing, whereas the initial audience consisted of WEF members and water professionals. In addition, we've had a lot requests for K-12 resources, so we decided to incorporate children, as the next generation of water leaders, into the messaging and the visuals.

**tpo: How did the relaunch of Water's Worth It lead to the creation of the book?**

**Lori:** For the relaunch of Water's Worth It at WEFTEC last year, we decided to focus on kids. Working with 522 Productions, a video company, we created a video built around a little girl reading a story about water. I wrote the script, and the production company created cover art for the book, which at that point was simply a prop; the book the girl was holding had nothing in it. Then once the video was released at WEFTEC, people started coming to our bookstore asking to buy the book.

**tpo: So you actually created the book in response to a demand?**

**Lori:** That's right. I worked with Jon to create a new storyboard for print rather than a video. He had to do about 40 original illustrations.

**tpo: How were the illustrations created?**

**Jon:** I started drawing by hand and did some mock-ups of what the artwork would look like, but then I took it over and drew everything on the computer. It's all done in Adobe Illustrator, but still somewhat freehand. We wanted to make sure we maintained a watercolor feel and a hand-drawn aspect.

**tpo: How long did it take to write the story?**

**Lori:** The story took about an hour. I did start with a basic structure from working on the initial storyboard. I knew what the beginning, middle and end would be, and I knew what my call to action would be. Rhyming is

*(continued)*

# Extra! Extra!

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slightly more challenging than straight prose, but because I had the structure already established, the words came together rather quickly.

**tpo: The illustrations must have taken quite a bit more time.**

**Jon:** I averaged about one two-page spread per day. I had to make sure we got the right action to capture the message of the lines on the page, and on top of that, I had to learn new techniques in how to create effective illustrations.

**tpo: Children's books need to target a specific age group. What's your age target?**

**Lori:** It's aimed at early readers, ages 4-8, but we think it has appeal to readers of all ages. We've had adults come to us and say, "I didn't know that." Everybody can learn something. The appeal is that we cover the gamut of water, wastewater and stormwater management, and even a bit of the water cycle, in simple rhyme and verse. There a lot of books about the water cycle, conservation, plastics and taking care of the environment, and that's all valuable. But our book covers how water is treated at all different levels. That sets it apart from other books.

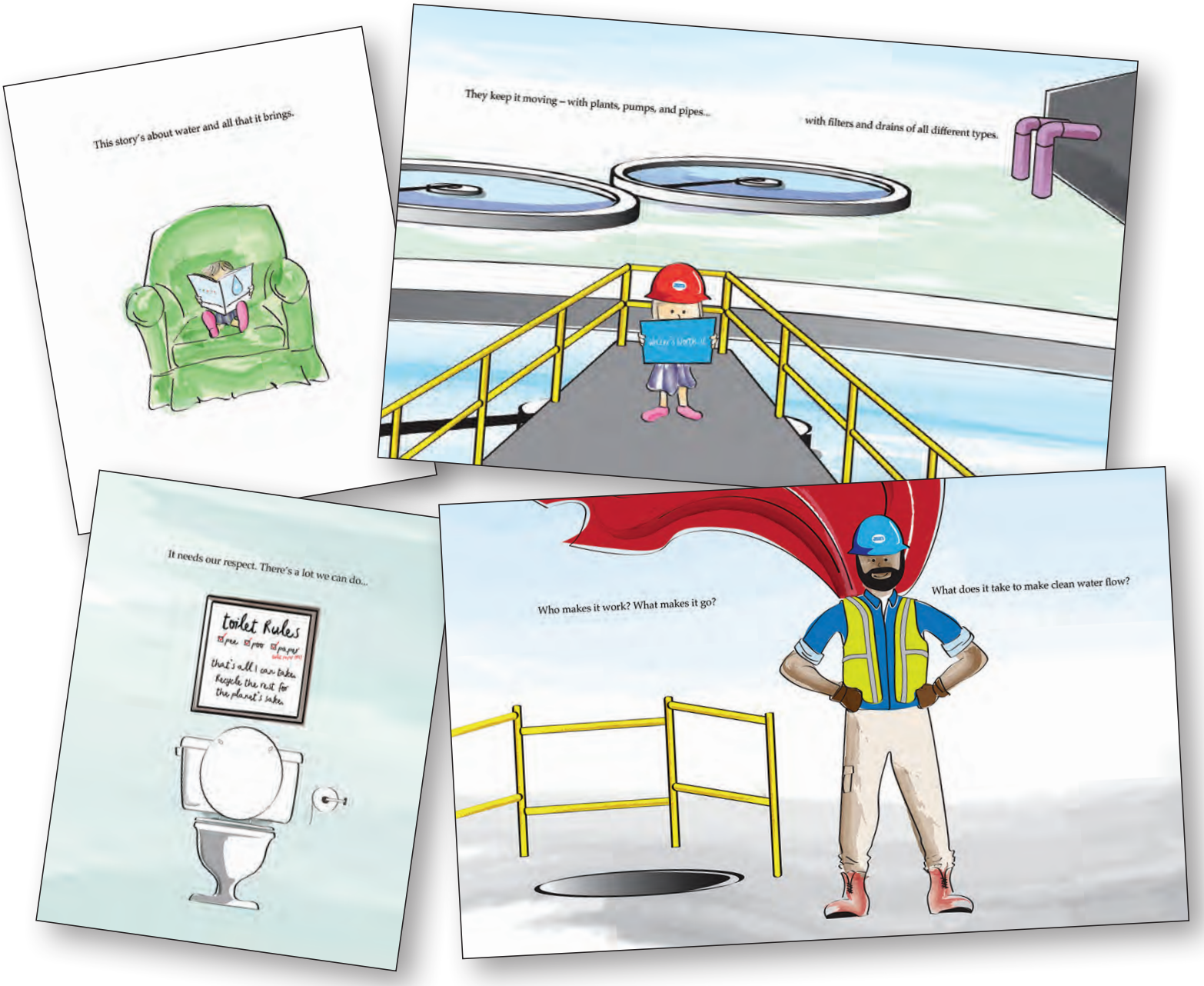
**tpo: At the back of the book are a couple of pages that seem more geared toward adults. What's the function of that?**

**Lori:** It's intended to make the book a teaching tool. Parents and teachers can use that information as a jumping-off point for discussion. We give tips not just telling people to be engaged, but also ways in which they can actually do it. That has been a very popular part of the book and is one way to reach a broader range of ages.

**tpo: Was it part of your intent to give credit to water professionals?**

**Jon:** Yes. We consider water professionals as first responders, in the same manner as firefighters, police officers and EMTs. We thought it was valuable to show how important they are.

**Lori:** We also tried to deliver the message that everyone has a role to play. While we want to recognize water professionals and the valuable work



they do, we all share responsibility to protect water. We want to empower children to feel like they are water protectors, too.

**tpo: How have you gone about marketing this book?**

**Lori:** We displayed it at the American Library Association annual conference in Washington, D.C. We were among publishers and thousands of books, and people actually came and sought us out. We're also marketing the book as a foundational STEM (science, technology, engineering and mathematics) and STEAM (science, technology, engineering, arts and mathematics) resource. When we launched it, we visited schools, and the response from teachers and librarians was overwhelmingly positive. Kids in grades K-3 are learning about science concepts, and the book helps teachers jump off and say, "This is how we use some of the science, technology, engineering and math in real life."

> "We're developing merchandise items as supplements to the book. ... We're trying to create products that reinforce the messages in the book."
> **LORI HARRISON**

**tpo: What comes next for your book?**

**Jon:** The book is now translated in Spanish and French. Somebody asked for a Korean version, which we are looking into.

**Lori:** We are working on a hardcover, library-bound edition, and we're looking into doing an e-book version. People at the library conference asked if we plan to do additional books, and we are exploring that idea. One thought is to cover different water topics. Another it to have an age progression: maybe bump it up to 9- to 12-year-olds and then to older kids until we dovetail with the technical focus that WEF is traditionally known for.

**tpo: Do you see any spinoffs down the road?**

**Lori:** We're developing merchandise items as supplements to the book. On the WEF Marketplace, we have some Water's Worth It T-shirts, and we have since added things more related to the book, like reusable stainless steel straws, magnets and a window cling that can be put on a toilet; it shows the Toilet Rules sign that's in the book. We've developed a tote bag with illustrations from the book that kids can color. We also have free teacher resources that can be downloaded from www.watersworthit.org. We're trying to create products that reinforce the messages in the book.

**tpo: This must be quite an enjoyable experience for the two of you.**

**Jon:** When I was asked as a kid what I wanted to be when I grew up, it was to be an illustrator.

**Lori:** And I always wanted to write a children's book. So we stumbled into it, but we've had a dream come true. It's nice to branch out into a new way to use creativity and reach a new audience. In the front of the book, there is a dedication page with a picture of a little water hero drawn by our daughter, Penelope. So it's an entire Harrison family project. tpo

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# Heavy Duty

## CHOPPER PUMPS HELP A UK-BASED WATER AND WASTEWATER AUTHORITY CONVERT FROM CONVENTIONAL ANAEROBIC DIGESTION TO A THERMAL HYDROLYSIS PROCESS

**By Chris French**

With an investment of 60 million euros aimed at producing 30% more green energy from its largest wastewater treatment works, Severn Trent Water's upgrade of its 12 anaerobic digesters has put people and pumps to a stern test.

Severn Trent, one of the largest water and wastewater companies in England and Wales, had experience in advanced digestion of sludges, but conversion of its conventional digesters to a new thermal hydrolysis process involved a difficult transition phase requiring a specialist pump selection.

The Minworth Sewage Treatment Works (280 mgd design, 120 mgd average) serves a population equivalent of 2.5 million in the Birmingham area of England. Each of its dozen 1.32 million-gallon digesters had built up an amount of settled grit and rags that made the legacy solids difficult to pump.

The solution was a set of chopper pumps with custom-sized impellers. The pumps were used to remove diluted solids, macerate the rags and deliver the material to the new digestion process.

The combined heat and power system at Minworth Sewage Treatment Works in England can generate 8 MW continuously.

### RENEWABLE ENERGY

Severn Trent Water was founded in 1974 as a regional, state-owned authority responsible for water supply management and wastewater treatment. It is located in the catchment areas of the Severn and Trent rivers, from which it takes its name. All told, the company provides services to more than 4.3 million homes and businesses.

Severn Trent generates about 34% of the energy it uses from renewables. In seeking to reach 50% by 2020, the company engaged MWH Treatment to design and build a three-stream thermal hydrolysis plant using Cambi technology.

Making the anaerobic digestion process more efficient through hydrolysis provides the added benefit of producing biosolids cake classified as enhanced product fertilizer with potential use in growing crops for human consumption. The Minworth site already had a combined heat and power plant able to generate over 8 MW continuously and a gas-to-grid process producing up to 26,500 cubic feet per hour of biomethane.

Cambi's advanced thermal hydrolysis process reactors destroy pathogens before digestion. They are designed to treat 77,000 dry tons of biosolids per year. For many years at the Minworth plant, solids were moved from holding tanks to the digesters for about 15 days of retention time and then on to secondary digesters before dewatering.

### CHALLENGING MATERIAL

Richard Thomson, project director at MWH Treatment, notes that upgrading to the new digestion process meant sourcing pumps capable of a demanding duty point.

"We knew of other treatment plants that had issues with sludge recirculation," Thomson says. "The head and the pipework distance were a concern in the design, not to mention that the pumps would have to be capable of handling that very challenging legacy sludge without blockages or breakdowns."

LEFT: Richard Thomson of MWH Treatment was instrumental in designing the chopper pump application. ABOVE: The Landia chopper pump provides continuous maceration of rags and debris.

Installing the thermal hydrolysis process upstream of the existing digesters means screening the sludge, dewatering it to 22% solids and then diluting it to 16% solids before hydrolysis. Then, inside reactor vessels for 22 to 30 minutes, the material is held at a pressure of 87 psi at a temperature of 359 degrees F to destroy pathogens.

To further break up the cell structure, the material is depressurized into flash tanks. This produces a hot hydrolysed material that is diluted 3-to-1 with sludge from the digesters and cooled in heat exchangers to bring its temperature down to 108 degrees F. "This is where the crucial role of the pumps comes in," Thomson says.

> "Since going online in March, April and July last year — four pumps at a time, one on each digester — they've been very good operationally, especially having to work under such duress for those first three months."
> **RICHARD THOMSON**

## COLLABORATIVE SELECTION

"We knew that, especially for the first few months, taking legacy sludge directly (at 5,300 gallons per, total head 72 psi) from the 12 digesters all the way back through to the hydrolysis plant would see the pumps face an arduous duty," Thomson says.

"The decision on which manufacturer to work with was made by Cambi, which recommended Landia based on good performance on various sites. This led to a healthy collaboration as we designed the most efficient solution for the application. In fact, Landia was the only chopper pump that could achieve what we needed."

During selection, MWH Treatment and Landia looked long and hard at impeller sizes for the 40 hp, 3,000 rpm chopper pumps, choosing one in the middle of the range to allow for flexibility. "This design feature showed how versatile its pumps are, giving us the opportunity to change in the future if necessary," Thomson says.

The small footprint of the pumps was also important, as space at the Minworth plant is limited. Thomson and his team at MWH Treatment set about designing a series of pump tables that fit in with existing pipework configurations and with removable wheels so the units could be moved around in the digester galleries to enable easy servicing at waist height.

## CONTINUOUS DUTY

"It has been crucial to be able to get the digester sludge back to the hydrolysis plant so it can be blended with the hydrolysed sludge, put through the heat exchangers and then pumped back to the digesters," Thomson says. "Diluting the hydrolysed sludge improves the characteristics of it for the success of the whole process.

"Since going online in March, April and July last year — four pumps at a time, one on each digester — they've been very good operationally, especially having to work under such duress for those first three months. You could hear them chopping the troublesome filamentous material. From a process perspective, the pumps' continuous maceration is very advantageous."

To cope with the backlog of legacy sludge, flushing sequences were introduced to control the flows and mitigate the risk of blocking plug valves. The plan worked; now flushing is no longer required. On a two-year build program to convert the traditional digesters to new hydrolysed sludge tanks, a three- to six-month clean and shutdown required for the digesters wasn't viable. That made it all the more critical for the pumps to work well.

## WORKING HARD

"On our SCADA, we've been able to see the trending data on the pumps' performance, including current, flows and head," Thomson says. "It demonstrates just how hard the duty was in those first three months. As the sludge has gradually improved, so has the efficiency of the pumps. Less rags mean far less energy required.

"Not surprisingly, the pumps haven't come through completely unscathed, but a couple of bearings and just one cutter replacement means nothing when one considers the sheer scale of the task in such an important and statement-making upgrade in energy recovery for the water industry." **tpo**


A tour group walks through the WaterHub greenhouse.

# Greenhouse and Park

AN INNOVATIVE WATER RECLAMATION PLANT AT EMORY UNIVERSITY PROVIDES WATER FOR BOILERS AND COOLING TOWERS AND ADDS RESILIENCY TO THE UNIVERSITY'S WATER SYSTEMS

**By Steve Lund**

A small plant in Atlanta that uses hydroponics to treat wastewater saves money for its host by producing reclaimed water that can be used in place of potable water for boilers and cooling towers and for toilet flushing.

The 400,000-gpd WaterHub on the Emory University campus was developed by Sustainable Water, a private company based in Glen Allen, Virginia. One part of the plant looks like a greenhouse, and the other part looks like a park with raised-bed gardens.

The treatment process is based partly on hydroponics; plants essentially grow in the wastewater stream. The plants consume some of the nutrients in the wastewater, and their roots host bacteria that break down organic material. The treatment plant provides reclaimed water at lower cost than potable water. Additional savings come from reducing the amount of wastewater going into the municipal system.

## NOT AT ALL TYPICAL

"The single most nontraditional thing about this plant is the aesthetic," says Tim Baldwin, the plant's designer and senior vice president of McKim & Creed, a Raleigh-based engineering company. "The smell, the noise, the look — all of that is very different."

The plant occupies two small sites across the street from each other. The site with the greenhouse is wedged between a maintenance building and a research building, and the gardens are flanked by a fraternity house and a baseball field. The plant draws wastewater from several university buildings.

On the greenhouse side, all facilities are covered, and the airspace above the tanks is contained and scrubbed. "There is no odor of any kind because of the containment," Baldwin says. "We collect and scrub all the headspace, all the airspace above the water level. With the additional filtering power of the plant beds, it's very organic in both function and aesthetic."

## MICROBIAL DIVERSITY

The influent is screened and then flows into an anoxic tank with moving bed biofilm reactors, and from there it goes to an oxygenated tank with more MBBRs. The MBBRs add habitat for the greater variety of bacteria needed to enable the plant to operate in such a small area. The stream then moves to the greenhouse, where plants are held up by rocks but are essentially rooted in the wastewater. Film and fabric media in the tanks host bacteria, as do the plants' root systems.

"We're creating conditions for happy, hungry bugs that eat and reproduce and make more baby bugs that are also hungry," Baldwin says. "You are getting very large, very diverse populations of bugs in a very compact footprint and volume.

"The addition of fixed film provides habitat for additional microorganisms that may not be found in suspended growth, so it makes a more diverse ecology. That makes the plant more resilient, more able to withstand a toxic shock. The chances of having a massive die-off of bacteria from any shock are greatly reduced."

## WETLAND TREATMENT

From the greenhouse, the waste stream moves to outdoor hydroponics treatment, where plants native to Georgia are in beds with concrete walls and where the water level rises and falls several times a day, similar to a coastal wetland. That's another way of creating habitat for a wider variety of microbes.

Some of the wastewater is diverted from the headworks to an area called the Demonstration Reciprocating Wetlands. "It provides another opportunity for study and research," Baldwin says. "Because we're in a college environment, it was important to provide educational and research opportunities."

From the wetlands, the water flows into a clarifying tank. Then the effluent is filtered and disinfected with UV light. The solids from the clarifying


ABOVE: The greenhouse portion of the WaterHub at Emory University.
BELOW: The outdoor portion of the WaterHub looks like a garden, but the plants are grown hydroponically.

tank are sent back to the municipal sewer system without dewatering. The reclaimed water goes into an underground storage tank to supply heating and cooling plants and to provide toilet flushing at residence halls.

The plant opened in 2015. Matt Vinson, manager of WaterHub operations for Sustainable Water, was the plant's operations manager in its early years. "The facility generated a lot of interest," Vinson says. "More than 4,000 people have toured through that facility — water and wastewater professionals, government officials, high school science classes."

## ADDING RESILIENCY

Big savings are built into processing water this way: "We're treating the wastewater where it is created, and we're using the reclaimed water right there where we clean it up. We're saving the cost of transporting that water in two directions."

The business model is tied to the municipal rates for water and wastewater treatment.

"In places where water is plentiful and cheap, the economics might not work out," Vinson says. "In areas where water is in short supply or there is high cost for water or wastewater treatment, all of a sudden it makes the economics work." Other factors make decentralized plants such as Emory's attractive: "You have people wanting to build sustainability into their businesses. You have the redundancy and resiliency aspect of it."

The plant, which produced more than 250 million gallons of reclaimed water in its first four years, passed a major resiliency test in its second year. The county water system sustained a break in a 36-inch water main, causing a significant drop in water pressure. Some businesses had to close, and Emory students were sent home.

"There was no water pressure on campus that day, but we were able to supply reclaimed water for the HVAC systems on campus," Vinson says. "You have millions of dollars of research that sit in air-conditioned buildings that might fail if the air conditioning goes out. We were able to provide water for heating and cooling that the municipal system could not supply."

## CLEAN AND BEAUTIFUL

Yet another factor adds to the appeal of the treatment plant: "It's a glass greenhouse with beautiful banana trees and ginger growing in it. It's pretty. It doesn't smell. It's a nice addition to the campus, not a traditional concrete and steel building."

Vinson helped to open another similar plant this year in Richmond. Sustainable Water has several WaterHub plants in various stages of design or development. McKim & Creed is in the design or construction of other reclaimed water facilities, including one at Chatham Park in Pittsboro, North Carolina. tpo

# Smooth Sailing

## THOUGHTFUL PLANNING AND OPERATIONAL EXCELLENCE PROVIDE AN AWARD-WINNING COMBINATION IN BLOOMINGTON-NORMAL, ILLINOIS

STORY: **Steve Frank** | PHOTOGRAPHY: **Bradley Leeb**

Matt Mink checks biosolids consistency in the gravity belt filter press (Komline-Sanderson) at the Bloomington-Normal Water Reclamation District Southeast plant site.

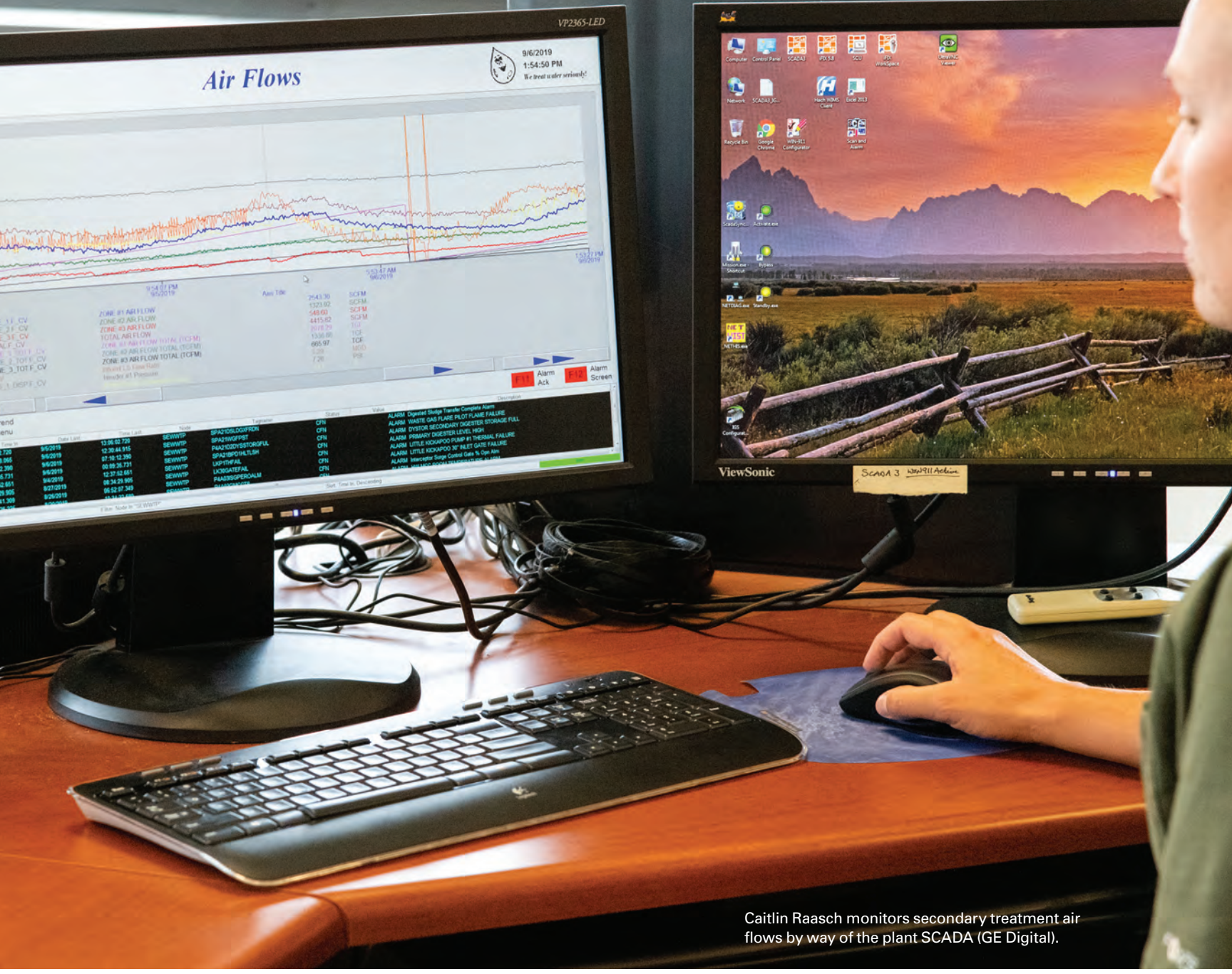
When the Bloomington-Normal Southeast Wastewater Treatment Plant won a 2018 Plant of the Year award from the Illinois Association of Water Pollution Control Operators, team members were ecstatic.

Randy Stein, executive director and sports fan, likened it to winning the "Stanley Cup of wastewater." On its way to the award (in Group 1 for plants larger than 7.5 mgd), the plant racked up 12 consecutive Gold Peak Performance Awards from the National Association of Clean Water Agencies.

The Bloomington-Normal Water Reclamation District was formed in 1919 and serves Bloomington, Normal, and the Village of Downs and subdivision of Crestwicke in central Illinois, with a total population of 134,000. The award recognizes safety, permit compliance, operations staff knowledge, and cleanliness and maintenance. A long-standing habit of excellence and effective planning set the plant up for the award.

### CONVENTIONAL ACTIVATED SLUDGE PLANT

The Southeast plant (7.5 mgd design) began operating in June 2005. Jake Callahan, director of operations, describes it as a "conventional activated sludge plant." Preliminary treatment includes Spiralift screw pumps (Evoqua Water Technologies) and a Waste Tech Model 1300 bar screen with three-eighths-inch separation (Kusters Water, division of Kusters Zima Corp.) followed by a




Caitlin Raasch monitors secondary treatment air flows by way of the plant SCADA (GE Digital).

grit trap (Smith & Loveless) and grit washer (Parkson Corp.). The lift stations to the two primary clarifiers use three 125 hp Pentair - Fairbanks Nijhuis pumps. Each clarifier has a Toshiba sludge density meter.

Anoxic tanks are upstream of the five aeration tanks. "They help control the filaments in the activated sludge process," Callahan says. "We run a higher solids retention time and get good nitrification in winter when the biology slows down. And we don't observe any settling issues with the biological floc in our secondary clarifiers." The anoxic tanks have Environmental Dynamics International FlexAir mini-panel fine-bubble diffusers. Blowers are 300 hp Turblex Model KA10SV-GL210 operated with dissolved oxygen control.

Flow then goes to the two 115-foot-diameter center-feed secondary clarifiers for settling. Tertiary treatment consists of a traveling bridge filtration system. Media is anthracite coal on top, followed by coarse and then fine sand. Final effluent is disinfected by a TrojanUV UV4000 system. "This system has worked well, has been stable and is easy to maintain," Callahan says. Final effluent is discharged to the Little Kickapoo Creek.

Solids are anaerobically digested to Class B standards, thickened and dewatered. Employees apply the material to farmers' fields within about 30 miles of the plant. "We haul it and we spread it," Callahan says. "That way they know where it's been applied and the application rate is correct. Things are going pretty smoothly." One reason is the SCADA software: "A lot of thought was put into our WIN-911 software, which dials out to the on-call operator when there's a problem."

## Bloomington-Normal (Illinois) Southeast Wastewater Treatment Plant

BUILT:
**2005**

POPULATION SERVED:
**134,000**

FLOW:
**7.5 mgd design**

RECEIVING WATER:
**Little Kickapoo Creek**

TREATMENT LEVEL:
**Secondary**

TREATMENT PROCESS:
**Activated sludge**

BIOSOLIDS:
**Land-applied**

ANNUAL BUDGET:
**$2.5 million (West and Southeast plant operations)**


The team at the Bloomington-Normal Southeast Plant includes, from left, Tyler Graf, Randy Stein, Tom Anderson, Matt Mink, Caitlin Raasch and Jake Callahan. The plant is named for Callahan's uncle.

Callahan checks the status of the TrojanUV4000Plus (TrojanUV) disinfection system.

The plant also has a unique post-disinfection treatment stage: An experimental constructed wetland removes nutrients from about half of the plant's discharge. The wetland has hiking trails and bird-watching sites that make it a getaway for area citizens.

Plant managers sent Jon Outlaw, operator, and Tom Anderson, chief mechanic, to run the plant when it started up in 2005. Stein notes that the plant was designed to run with just one operator and two maintenance people. The operator and maintenance person sent to run the plant in 2005 are now nearing retirement.

## CRITICAL TRAINING

In 2019, the district began rotating three of its experienced operators to the Southeast plant two weeks at a time so they could learn the process. Six operators cover the Southeast plant and West plant, the larger of the district's two plants.

The West plant site has two treatment plants that discharge to Sugar Creek. One is a two-stage fixed-film plant with rock filters for BOD removal, nitrifying towers for ammonia removal, deep-bed sand filters and UV disinfection. The other is a conventional activated sludge plant with low-head traveling bridge sand filters, UV disinfection and post-aeration.

The district's operations and maintenance team, in addition to Outlaw and Anderson, includes:

- Josh Stevens, West plant chief operator
- Mason Willis, operations foreman, and wastewater operators Ian Magerl, Caitlin Raasch, Jason Beach, Matt King and Matt Mink
- Brian Romine, solids foreman
- Southeast plant maintenance staff members Brant Ladick and Tyler Graf.

The Southeast plant is a one-operator, five-days-a-week, eight-hours-a-shift gig. It has an advanced SCADA system — GE Digital with Allen-Bradley PLCs (Rockwell Automation) — that talks to the West plant via radio telemetry. Operations and maintenance staff are always on call for extreme weather or upsets. The SCADA system can alert the on-call operator when the plant is not staffed, and operators can respond to many alarms via their cellphones without having to report in.

In the first six months of 2019, the district hired three new operators and amped up its training. "We're trying the get some of the younger staff exposure

at the Southeast plant," Callahan says. "We want them to become familiar with the treatment systems there and have more opportunities to make decisions on their own." This is where the two-week rotations help.

## COACHING THEM UP

The rotations and cross-training also help with communication and information transfer among operators. "Communication and collaboration have been important to our success," Callahan says. "They've taken ownership and strive to find information and work together. With three new operators hired in six months, our senior operators have taken the initiative to coach up new operators."

> "We run a higher solids retention time and get good nitrification in winter when the biology slows down."
> **JAKE CALLAHAN**

"They're all actively pursuing certifications, and continuing education is something they appear to enjoy. They're also rewarded when they get those certifications."

The staff is active in professional organizations. Stevens is past president of the Illinois Association of Water Pollution Control Operators; Magerl is president of the Central Illinois Professional Wastewater Operators organization. Stein and Callahan regularly attend meetings of the Illinois Association of Wastewater Agencies, a manager-level organization.

Caitlin Raasch uses a solids meter (YSI, a Xylem brand) to measure mixed liquor suspended solids levels in an aeration basin.

The district regularly sends operators offsite and even out of state for advanced training. "We encourage taking advantage of educational opportunities," Stein says. "We send people out all the time, including to the University of Wisconsin-Madison. Their programs typically last four to five days and cover topics of interest to the district. We're not afraid to spend money on education."

## NATURAL NUTRIENT REDUCTION

Constructed wetlands for removing nutrients from effluent have been around for a while, but not all agencies that have the idea had the institutional foresight that the Bloomington-Normal (Illinois) Water Reclamation District did.

In 2006 — the year after the Bloomington-Normal Southeast Wastewater Treatment Plant came online — Kenneth Schroeder, district board chairman, opened the valve that allowed effluent to flow to 18 acres of experimental constructed wetland next to the plant. "The focus was to show the ability of wetlands to further clean effluent," says Jake Callahan, director of operations.

Schroeder believed the plant could coexist with nature and be a plus for the community. He supported the wetland idea and the 280 acres the district acquired around the plant as a buffer, now a wildlife refuge named for him. The wetlands comprise 18 acres, the plant sits on 15 acres and the remaining acres became the wildlife preserve, complete with trails, bird-watching stations, forest, prairie and savanna.

The district maintains the preserve, and citizens have access to it from dawn to dusk daily. The wetland post-disinfection treatment idea didn't work at first; it was far too popular with waterfowl, which ate all the plants.

A consultant diagnosed the problem. Now, the first two 18-inch-deep ponds (the original wetland ponds) are used as cooling ponds for effluent, which is discharged at about 55 degrees F during winter. Three final 12-inch-deep ponds host vegetation that performs nutrient removal during the growing season.

The final three shallow wetland ponds receive the cooled effluent in winter, freeze and get a sheet of ice. The plants in the shallow ponds thrive and pop up again in the spring, and nutrient removal works as planned.

Callahan observes, "We get about 90% nitrate-nitrogen removal from April through October and about 50% total phosphorus removal."

## NUTRIENT REMOVAL

The Southeast plant was designed with a nutrient-removal-ready footprint. "We expect the Illinois EPA to issue a new permit in August 2020 with a compliance date of 2030," Callahan says. "Not as much construction will be required at the Southeast plant as at the older West plant to enable it to meet permit; it's newer and more ready to host new processes."

One useful new capability is an Orion 420 weather station (Columbia Weather Systems) at the Southeast plant and another at a pump station about 10 miles upstream. These stations record rainfall intensity and duration. The district has integrated real-time weather data into the SCADA system; that helps operators predict impacts on plant operations. Having weather data interfaced between SCADA and lab data software helps in post-event analysis and eliminates hand entry of data.

The staff has also reduced the electric power bill at the Southeast plant. As the local electric utility's largest customer, the district has worked with utility staff to find a win-win on high-demand summer days when power consumption for air conditioning is high and the electric utility wished the treatment plant would use less power.

> "We expect the Illinois EPA to issue a new permit in August 2020 with a compliance date of 2030."
> **JAKE CALLAHAN**

The district tied a 2 MW, diesel standby engine-generator (Caterpillar Inc., Electric Power Division) into its SCADA system. When the electric utility tells the district to shed the treatment plant's electric load for the next four hours, an operator enters the changeover times into the SCADA system.

## RATE SAVINGS

At the appointed moment, SCADA fires up the generator and performs a closed-transition transfer of demand to it. At the predetermined time to switch back, SCADA returns the power draw back to the electric utility and shuts the generator down.

Using the standby generator for primary power for those four-hour peak demand periods gets the district a substantial electric rate reduction throughout the year. The district had to modify the standby generator to produce lower emissions and comply with air-quality regulations affecting primary power sources.

**Bloomington-Normal Southeast Wastewater Treatment Plant PERMIT AND PERFORMANCE**

| | INFLUENT | EFFLUENT | PERMIT |
|---|---|---|---|
| **CBOD** | 124 mg/L | < 2.0 m g/L | 10 mg/L |
| **TSS** | 225 mg/L | 1.8 mg/L | 12 mg/L |
| **Ammonia nitrogen** | 23.09 mg/L | 0.05 mg/L | 1.6 mg/L |

The district is considering a new blower system for the Southeast plant that will use less horsepower and allow operation with lower dissolved oxygen values. The flow train through the secondary process will also change. "We're parallel plug flow now, but we're capable of serpentine flow in series," Stein says. "We could possibly have a split serpentine flow through five aeration basins."

There are also plans to nitrify and denitrify in the aeration tanks. "We're already investigating the software our SCADA system will require to do this," Stein says. Some methods that might be used to remove phosphorus at the Southeast plant have been piloted at the West plant.

An innovative measure is in place to control influent at the Southeast plant. Although the plant's collections system is a separate sanitary sewer system, excessive inflow and infiltration during sustained wet weather has shown the potential to flood the plant grounds.

To prevent that, a 54-inch interceptor lies in a mostly flat grade approaching the plant for temporary influent storage. Flow travels from the three communities about 6 miles to the plant, and there are virtually no connections in the final 3 miles.

With the aid of a highly accurate electrohydraulic actuated sluice gate (REXA) for surge control in the almost-flat interceptor, roughly 1.23 million gallons of influent can be stored there and throttled slowly into the plant. "It works well," Callahan says.

Stein observes, "When we have a 3-inch rain overnight, I don't get nervous about flooded pump stations." tpo



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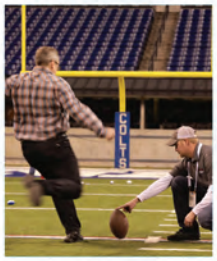

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# Birds Galore

Aerial view of Clear Creek Wastewater Treatment Plant and the 10 ponds being rehabilitated and established as a destination for bird-watchers.

## PONDS AT THE WASTEWATER TREATMENT PLANT IN REDDING PROVIDE A MECCA FOR CALIFORNIA BIRDERS AND WILDLIFE WATCHERS

**By Jeff Smith**

Ponds at wastewater treatment plants are like magnets for birds and bird-watchers, especially those along the migration flyway in California's Central Valley area.

Among them is the Clear Creek plant in Redding, along the Sacramento River, which serves as its receiving stream. A 93-acre portion of the property contains 10 ponds, each about 7 feet deep, that were process ponds when the plant was built in 1961. Since then, two upgrades and expansions have altered the use of the ponds — except for the birds' purposes.

### DESTINATION FOR WALKS

"The ponds attract a large variety of resident and migrating birds each year," says Troy Mitchell, wastewater utility supervisor. The ponds draw a fair number of birders, too, especially from members of the local National Audubon Society chapter. Large groups can visit as well. Each year, the Wintu Audubon Society includes the Clear Creek ponds as a destination for it Second Saturday Bird Walk.

These are often full-day events held at various locations on the second Saturday of each month. The Clear Creek plant has been noted by the society as one of the top five bird-watching destinations in its county.

During the latest upgrade and expansion that began in 2007 and upped the dry-weather design flow to 9.4 mgd and wet-weather flow to 40 mgd, the ponds were closed to the public because of safety concerns during construction. Not everyone was happy.

### BIG UPGRADE

The seven-phase plant upgrade included treatment improvements and wet-weather flow enhancements. New influent pumps, a toxic gas scrubber system, and a chemical feed and storage facility were added. Chlorine and sulfur dioxide equipment was rehabilitated, and a new biofilter system was installed for odor control.

> "There are lots of birds in and around the ponds, and they build their nests out there because we are right along the Sacramento River and in the flyway."
> **TROY MITCHELL**

Clarifiers, the headworks, pump stations and filters were renovated. A new blower building was constructed, aeration basins were rehabilitated for nitrification and denitrification, and one of the ponds was converted to a facultative sludge lagoon. Overall, 10 ponds are used for emergency water storage.

When construction ended in 2014, the bird-watchers were back and happy again. Once through the main gate, they park in a designated area, sign a release-of-liability form and are given the combination to a lock on the pond area access gate.

### DIVERSE VISITORS

Waterfowl such as American avocets, northern shovelers, Bullock's orioles, greater yellowlegs and blue-winged teal are commonly seen in the ponds. One birder reported seeing 500 birds of 19 species in a single day. "There are lots of birds in and around the ponds, and they build their nests out there because we are right along the Sacramento River and in the flyway," Mitchell says. "We see a lot of wildlife, too."


The Clear Creek team includes, from left, Troy Mitchell, chief plant operator; Barbara Pozek, lab technician; Danny Webster, senior lab technician; Mel Garner, operator in training; Jason Marsh and Chris Kindig, senior operators; and Matt Thompson, operator in training. Missing are George Coughran, working supervisor; and Tim Conley, operator.

Other than a 6-foot-wide gravel walkway around and between the ponds, there are no special viewing structures, park benches or picnic tables near the ponds. Beyond grass mowing and weed control, the site needs no special maintenance.

Mitchell is glad the birders are back and he and his staff welcome them, but safety is his greatest concern: "We have had people actually go into a sludge lagoon, and we can't have that. It's always got to be safety first." tpo

# A Blend of Generations

## A STRONG AND EXPERIENCED MAINTENANCE TEAM IS CRITICAL TO BLENDING OLD AND NEW TECHNOLOGIES AT A HIGH-PERFORMING TEXAS CLEAN-WATER PLANT

STORY: **Jim Force**
PHOTOGRAPHY: **Olivia Ogren-Hrejsa**

By skillfully managing a combination of old and new, the Duck Creek Wastewater Treatment Plant has racked up an enviable compliance record and a wall full of awards.

Maintenance has been the key. Under the direction of Don Dudley, recently retired, Duck Creek plant's nine-person maintenance team has kept the facility operating at peak performance. The plant, in Garland, Texas, never misses its permit requirements for CBOD, TSS and ammonia nitrogen.

Built in 1962, the plant (40 mgd design) has been expanded and upgraded several times since. Some of the key equipment dates back to the 1970s. "Maintenance is important for sure," says Alex Stuart, plant superintendent. "Operators can only do so much. If it's not working, we can't move water."

The facility has earned four Gold Peak Performance Awards from the National Association of Clean Water Agencies and has platinum in sight for 2019. In addition, the plant was named

The team at the Duck Creek Wastewater Treatment Plant includes, from left, Shane DeLaPena and Jorge Rodas, instrumentation and electronics; Juan Rodas and Chris Gates, operators; Earl Gibson, assistant superintendent; Donovan Musgrave, Jim Griffin and Angel Perez, operators; Alex Franclemont, instrumentation and electronics; Brandon Little and Jorge Jasso, operators; Alex Stuart, plant superintendent; Robert Ramirez, operator; and Oscar Hernandez, John Higgins and Juan Arroyo, maintenance.

Effluent is disinfected in a chlorine contact basin before discharge.

> "Maintenance is important for sure. Operators can only do so much. If it's not working, we can't move water."
>
> **ALEX STUART**

2018 Category 3 Municipal Treatment Plant of the Year by the Water Environment Association of Texas and won the association's 2018 George W. Burke Jr. Award for safety.

## REMOVING NITROGEN

Duck Creek plant, one of two plants serving the Garland area, accepts flow from the west side of Garland, the Town of Sunnyvale, and parts of Richardson and Dallas. ABS raw water pumps (Sulzer Pumps Solutions) feed an average flow of 22.5 mgd to the headworks, which consist of step screens (HUBER Technology), a vortex grit removal system and a Muffin Monster grinder (JWC Environmental).

After settling in a group of five circular primary clarifiers, the wastewater flows either to the old section of the plant, which includes trickling filters and solids contact, or to the new section where it is aerated by fine-bubble polyethylene diffusers in basins operated in the step-feed mode. Hibon - Ingersoll Rand blowers supply the air; variable-frequency drives throughout the plant were supplied by Robicon (Siemens Industry).

"We have 12 basins," Stuart says. "That includes 12 anoxic zones and 12 aerobic zones. It works really well." The step-feed system has actuator valves that allow operators to control the flow of primary effluent to anoxic zones, aerobic zones, and back again to accomplish the required nitrogen removal. The configuration also provides the crew enough redundancy to take down specific basins for repairs.

## FINAL TREATMENT

After the secondary clarifiers, the water is filtered in deep-bed mixed-media filters filled with gravel, sand and anthracite coal. Chlorine is used for disinfection and sulfur dioxide for dechlorination.

Operators feed eight 1-ton chlorine cylinders at a time, keeping eight as backup, as well as four 1-ton cylinders of sulfur dioxide at a time, with four as backup. Final effluent flows to Duck Creek, a tributary of the Trinity River, which flows into the Gulf of Mexico.

Solids are not processed at the Duck Creek plant. The material is stored in two former sludge digesters that have been converted to holding tanks and then sent by two large diaphragm pumps (ABEL Pumps technology) through a 13-mile pipeline to the city's Rowlett Creek Wastewater Treatment Plant, where it is dewatered and landfilled.

The Duck Creek plant is fully automated, using a SCADA system and Toshiba controls. Operators stay in touch via cellphones and email. Plant performance is consistent and exceptional. Effluent easily meets permit requirements of 10 mg/L CBOD, 15 mg/L TSS and less than 2 mg/L ammonia nitrogen.

LEFT: Earl Gibson, left, assistant superintendent, and Alex Stuart, Duck Creek Plant superintendent. RIGHT: Pumps at the chlorine contact basin.

# Duck Creek Wastewater Treatment Plant

Garland, Texas

www.garlandwater.com

BUILT:
**1962 (several upgrades since)**

POPULATION SERVED:
**177,000**

AREA SERVED:
**West portion of Garland, Town of Sunnyvale, parts of Richardson and Dallas**

FLOWS:
**40 mgd design, 22.5 mgd average**

TREATMENT PROCESS:
**Activated sludge, trickling filters, mixed-media filtration**

TREATMENT LEVEL:
**Tertiary**

RECEIVING STREAM:
**Duck Creek**

BIOSOLIDS:
**Pumped to Rowlett Creek Wastewater Treatment Plant, dewatered, landfilled**

ANNUAL BUDGET:
**$3.9 million**

Primary sludge pumps (ABEL) handle solids from the primary clarifiers.

## KEEPING IT GOING

The Duck Creek plant maintenance staff is charged with keeping the old and new plant systems coordinated and functioning well. The crew of nine, consisting of mechanics and instrumentation electricians, uses a Cityworks software system to manage preventive maintenance, work orders and equipment history.

The more experienced team members work four 10-hour shifts per week, while newer members work five 8-hour days. Once they have enough experience, they move up to four 10-hour shifts. "We all help them along," Dudley says. On a typical day, staff members come into the office to see if there are any pressing issues, then attend to 10 to 20 work orders generated by the maintenance software.

Dudley notes that the different types and ages of equipment can present unique challenges.

"The 200 gpm positive displacement sludge transfer pumps have operated relatively trouble-free since they were installed in 2008, but they are large and feature critical components," Dudley says. "It's a long line to the other plant. We look after the check balls and the diaphragms, which are hydraulically driven. Each pump has a 75 hp electric motor."

The old trickling filters also run well despite their age, but the crew pays attention to the motors, slowing them down to remove biomass as needed and let the units regenerate. Piping around the plant presents another maintenance challenge.

"Ever since they were installed, we've had a number of piping problems," Dudley says. "The previous staff put in several different pipe clamps. Some have lasted; others haven't. We're constantly repiping the older lines, taking one down at a time to work on it."

The plant's conveyors need to be cleaned regularly to remove snails, which end up in a dump container. Old wiring that often dates to the original 1962

A titration analysis is taken using a Hach TitraLab AT1000. Titration and pH are the routine tests performed at the Duck Creek facility.

**Duck Creek Wastewater Treatment Plant**
**PERMIT AND PERFORMANCE**

| | INFLUENT | EFFLUENT | PERMIT |
|---|---|---|---|
| **CBOD** | 276 mg/L | 3 mg/L | 10 mg/L |
| **TSS** | 278 mg/L | 3 mg/L | 15 mg/L |
| **Ammonia** | 20 mg/L | 0.05 mg/L April-November<br>0.9 mg/L December-March | 2 mg/L April-November<br>5 mg/L December-March |

plant needs to be replaced. The plant's instrumentation and electrical team has updated the plant controls "to the speed of light," in Dudley's words.

## FINICKY FILTERS

The plant's deep-bed filters are one of the staff's biggest maintenance challenges. "They are the original filters, dating back to 1962," Dudley says. "They're old carbon filters turned into gravel, sand and anthracite gravity filters, with 20 concrete cells, each 22 by 25 feet, containing 12 feet of media. They're a bit more mechanically intensive than we'd like, and they've occupied most of our maintenance time in the last couple of years."

The biggest task is maintaining the filters on the 92 24-inch valves. "They've not lasted as long as might be expected," Dudley says. "The sand eats up the shaft bearings in the valve housings." Another issue is replacing underdrains that have given way. It takes the maintenance crew a couple of days to remove and then refill the media.

"All of the filter units have been rehabilitated a number of times over the years," Dudley says. "In the 2003 upgrade, we changed over to fiberglass pipe and added valves to control the fill, drain and backwash cycles."

## EXPERIENCE COUNTS

The experience of the Duck Creek plant's maintenance crew pays off in many ways, one example being the headworks screens. "Our step screens are situated in concrete alleys," Dudley says. "We have to pick them up out of the alleys to perform maintenance on them. The original chain and hoist equipment supplied for the job was both cumbersome and dangerous."

Instead, the staff started using the plant's 30-ton crane to hoist the screens out of the channel and then place them on a steel beam and perform the maintenance. "It's a better way to do things," Dudley says. Most times, the staff performs all maintenance in-house, saving money on outside contractors. In some cases, like the current primary clarifier bridge mechanism replacement and improved sludge withdrawal system, the staff assists the supplier.

Stuart, who has been at the plant for 33 years, reflects on the challenges ahead for the Duck Creek plant. Nuisance odor control and infrastructure are the biggest. In addition to the new primary mechanisms, the plant team is repairing the headworks screens, replacing pumps and motors throughout the plant, and forecasting for capital improving planning. *(continued)*

## LOTS OF EXPERIENCE

When Don Dudley retired last winter from maintenance manager, he took nearly 30 years of experience with him. But he left behind a savvy maintenance team that, paired with the operational crew, gives the Duck Creek Wastewater Treatment Plant in Texas a ton of hands-on knowledge.

Earl Gibson, senior member of the maintenance staff, has 30 years on the job, starting out as a janitor. The rest of the maintenance staff consist of mechanics Oscar Hernandez (4 years), Juan Arroyo (12 years), Dustin Musgrave (3 years) and John Higgins (3 years).

Instrumentation electricians Alex Franclemont, Shane DeLaPena and Jorge Rodas have 15 years of experience among them.

On the operations side, Alex Stuart, plant superintendent, has worked at the plant for 33 years and holds a Class A wastewater license. Jim Griffin (32 years), Juan Rodas (30 years), Matt Cast (21 years), Zack James (12 years), Donovan Musgrave (7 years) and Robert Ramirez (4 years) also hold Class A licenses.

Brandon Little (4 years) and Angel Perez (5 years) hold Class B licenses. Jorge Jasso (2 years) holds a Class C license, and Chris Gates (2 years) holds a Class D license. Add it all up and it's more than 200 years of experience.

Stuart observes, "Without these employees, we wouldn't have won all the awards."

> "It's been a good career. I tell the young guys they won't be millionaires, but they can drive a new car, eat and have a nice roof over their head."
> **ALEX STUART**

### TACKLING ODORS

The team has also embarked on an extensive program to identify and monitor sources of odor and install new odor control technology. "In the headworks area, we're doing a pilot study on the effectiveness of using a hydrogen peroxide additive," Stuart says. "We are considering covering the headworks area in a future phase of the project." Also in progress or planned are covers for the primary splitter boxes, roofs and lids for the primary tanks, and deployment of biofilters and chemical scrubbers.

The Duck Creek plant emphasizes training and career advancement. "Employees get pay raises based on what they know and what they learn," Stuart says. "It's a skill-based pay system employed by the City of Garland." There's a strong emphasis on safety. Stuart emphasizes confined-space entry, lockout/tagout, CPR, chlorine handling and first aid.

"It's been a good career," Stuart says. "I tell the young guys they won't be millionaires, but they can drive a new car, eat and have a nice roof over their head."

Changes? Stuart has seen plenty. "I started as a baby right out of high school," he says. "It's a lot more technical than it used to be."

He calls the changes in controls "fantastic." They give operators more time to focus on cleaning and the little things a plant needs, instead of having to manually adjust flows and pumps: "It's been a big boost for us."

The ability to make old and new work together and still meet permit is especially rewarding in Stuart's view: "We've received the NACWA Gold Peak Performance Award four years in a row, and with our fifth, we'll receive the Platinum Award. That would be a real feather in our cap." tpo

Circular flow created by the pump (Gorman-Rupp) in the grit basin helps filter sediment from the wastewater.

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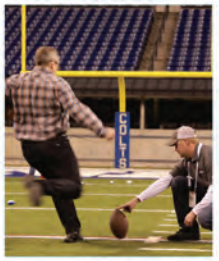

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# Treatment, Filtration and Stormwater

By Craig Mandli

## Aeration Equipment

### TRIPLEPOINT ENVIRONMENTAL ARES LAGOON AERATOR

Ares Lagoon Aerator from Triplepoint Environmental

The Ares Lagoon Aerator from Triplepoint Environmental combines aeration efficiency with turbulent mixing in a single, portable unit. It has a rugged, precision-machined solid hub with no seams to crack or leak. The coarse bubble static tube draws up to 7,800 gpm of water and liquefied organic matter from the floor to keep solids in suspension and prevent sludge accumulation. Diffuser Quick Connect ensures rapid, reliable installation of high-efficiency, self-cleaning fine-bubble diffusers. Independent testing demonstrates standard oxygen transfer of up to 2.4%/ft or 4 to 7 lb/O2 per horsepower hour, translating to up to 60% energy savings. Its high negative buoyancy ballast is 30% lighter out of the water for easier installation and maintenance. Attached to an onshore blower via laterals or individual air lines, it has no moving parts in the water and simply drops in from the surface for lagoon upgrades without downtime. **800-654-9307; www.tpenv.com**

## Blowers

ZG blower package from Eurus Blower

### EURUS BLOWER ZG BLOWER PACKAGE

The ZG blower package from Eurus Blower includes an internal sound-dampening feature lowering both sound and pulsations in blower packages with or without a sound enclosure. The package includes an integrated silencer, base frame, inlet filter/silencer with automatic belt tensioning and vibration isolators. Other components include a motor, drive, valves, flex connections and controls that are provided site specific and interchangeable. The complete blower skid package does not need to be sent to a blower repair facility in the event one item fails or needs rework. All critical components may be quickly replaced, substituted or repaired directly by the original supplier. **630-221-8282; www.eurusblower.com**

### HOWDEN 827 DVJ

827 DVJ dry-vacuum blower from Howden

The 827 DVJ dry-vacuum blower from Howden is a heavy-duty unit with integral ductile iron impellers. The casing headplates, gear cover and drive-end are gray iron. Carburized and ground spur timing gears are taper-mounted on the shaft and secured with a locknut, cylindrical roller bearings, splash lubrication on both ends, and easy-to-read sight glasses for maintenance. The blower is capable of handling high inlet temperatures for rough applications. An efficient discharge jet plenum design allows cool atmospheric air to flow into the cylinder, so the blower continues to run under blank-off conditions. It comes in a compact, lightweight package and delivers more than 5,700 cfm in an 8-inch gear diameter frame, as well as 28 inches Hg. **800-557-6687; www.howdenroots.com**

Blowers from NamWon Turbo One

### NAMWON TURBO ONE BLOWERS

Blowers from NamWon Turbo One are equipped with high-speed permanent magnet synchronous motors, boosting their maximum efficiency of around 98%. They include the latest innovations in air bearing, precision, machining impeller, high-speed high-efficiency permanent magnet motor, high-speed control inverter, automatic control logic and system design. They use an airfoil bearing that employs air as a lubricant, meaning they do not need separate lubricant and have a long service life. Maintenance costs are low because only the suction filter is replaced. There is no vibration and no need for separate sound proofing with a noise of 70 to 80 dB. **821-544-2280; www.nwturbo.com**

### ROBUSCHI ROBOX SCREW BLOWER PACKAGE

Robuschi Robox Screw blower package

The Robuschi Robox Screw blower package offers pressures up to 36 psi and flows up to 5,625 cfm. The efficient rotary screw blower offers energy savings of up to 30% when compared to previous blower technologies. The package offers the widest efficient turndown capability in flow to save energy. All enclosed packages come standard with the AirSmart G2 controller. This offers 24-hour monitoring and provides flexible data output via Ethernet or RS-232 port. **866-428-4890; www.gardnerdenver.com**

## Filtration Systems

biottta biological filtration system from AdEdge Water Technologies

### 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 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 it demonstrates hexavalent chromium, VOCs, iron, manganese and sulfide elimination in a single process. The low-volume discharge is easily managed as a nonhazardous waste stream. **866-823-3343; www.adedgetech.com**

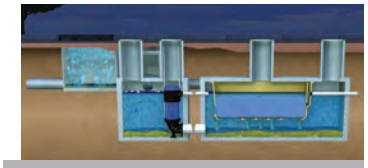
### ANUE WATER TECHNOLOGIES PHANTOM

The Phantom system from Anue Water Technologies provides point source odor elimination by infusing oxygen and ozone into recycled wastewater to react with and remove hydrogen sulfide and mercaptans

Phantom system from Anue Water Technologies

from collections system lift stations. It eliminates chemical feed systems, as well as ongoing corrosion and maintenance issues associated with vapor phase hydrogen sulfide. It has a small footprint and quiet operation (less than 60 dB) while providing an ideal solution for high traffic areas in neighborhood locations. Programming features allow the operator to vary the frequency and duration of the planned operational cycle each day. Rate with each duty cycle to address the varying odor levels that naturally occur at high and low flow periods in the collections system each day. These programming options match the odor control treatment to the problem, which reduces operational and maintenance expenses while achieving maximum performance. **760-727-2683; www.anuewater.com**

## BIOMICROBICS BIOSTORM STORMWATER TREATMENT SYSTEM



BioSTORM stormwater treatment systems from BioMicrobics

Easy-to-install, preengineered BioSTORM stormwater treatment systems from BioMicrobics can handle flows from 0.5 to 10 cubic feet per second and effectively filter and capture more than 90% of common pollutants such as trash, oils, sediment and other suspended solids that would otherwise end up in sewer overflows, waterways or the receiving environment. Used for primary and secondary applications, the offline, two-phase design consists of a StormTEE deflector screen to physically separate trash and large debris, and a fixed-film media that acts to separate liquids from solids and oil from water. Both treatment components can be used together to form a complete system or used separately for different sustainable site applications. The system allows for design flexibility and mounts easily in precast tanks with minimal maintenance. **800-753-3278; www.biomicrobics.com**

## ENVIRO-CARE SAVI GVS MULTIRAKE PERFORATED PLATE SCREEN

SAVI GVS Multirake Perforated Plate Screen from Enviro-Care

The SAVI GVS Multirake Perforated Plate Screen from Enviro-Care is a unique multirake design where the bars have been replaced by a stainless steel perforated plate to achieve higher debris capture. Multiple wipers remove the debris from the perforated plate and transport the screened material to discharge. Independent testing has proven that perforated plate screens have higher capture rates, which can be as high as 85% depending on design. It can be mounted in traditional channels at 75 degrees, or at 90 degrees for deep, narrow channels and wet wells. The low-maintenance design makes it a suitable choice for remote locations. **815-636-8306; www.enviro-care.com**

## SCREENCO SYSTEMS MEGA SCREEN 800

Mega Screen 800 septic receiving station from ScreencO Systems

The Mega Screen 800 septic receiving station from ScreencO Systems includes 51 square feet of screening area, fed by a 6- or 8-inch inlet with dual-fan spreaders that deflect waste down onto the screen, making the front screen almost self-cleaning. Complete vac tank clean-out is available with the optional side and front splash sheeting. It processes up to 1,000 gpm of wet well or septic waste with an 8-inch cam outlet fitting. The Dual Screen Design is nonmechanical and uses gravity to separate trash from the waste stream. The standard unit features all-aluminum construction with stainless steel, 3/8-inch-gapped bar screens on opposing angles and meets the Ecology 503 Regulations for septic screening. A bolt-on chute assembly allows trash to exit in either direction, and built-in forklift skids make the unit portable, allowing for setup virtually anywhere. **208-790-8770; www.screencosystems.com**

# Lagoon Products

## AMERICAN PLEASURE PRODUCTS UTILITY SERVICE BARGE

Utility Service Barge from American Pleasure Products

The Utility Service Barge from American Pleasure Products can provide a safe working environment and improve confidence when working on the water. The 8-by-12-foot work platform has suitable stability and flotation from using two 23-inch-diameter 12-foot pontoons. This barge can be used for servicing wastewater treatment ponds and lagoons. It includes aluminum frame construction with stainless steel hardware. The deck is covered with a nonslip nickel-plate vinyl for stability and easy cleaning. A heavy-duty protective handrail is included. To maneuver the barge, a heavy-duty outboard motor mount is included for small gasoline or electric motors. It is available with a 1,000-pound-capacity lifting crane, one life ring and weld-on lifting eyes on each corner. **989-685-2697; www.aquacycleusa.com**

## INDUSTRIAL & ENVIRONMENTAL CONCEPTS HEAT RETENTION COVERS

Heat retention covers from Industrial & Environmental Concepts

Heat retention covers from Industrial & Environmental Concepts can be essential for wastewater treatment plants where wintertime temperatures affect nitrification. Covers are available from R-4 to R-17 and have proven effective, reliable and low maintenance. Insulated covers can be used in both aerobic and anaerobic processes. An additional benefit of the covers is algae control and management of offensive odors. **952-829-0731; www.ieccovers.com**

## MARKLAND SPECIALTY ENGINEERING AUTOMATIC SLUDGE BLANKET LEVEL DETECTOR

Automatic Sludge Blanket Level Detector from Markland Specialty Engineering

The Automatic Sludge Blanket Level Detector from Markland Specialty Engineering controls solid-liquid interface levels and automates biosolids removal. Used in primary, secondary and backwash clarifiers and settlement tanks (including lamellas, dissolved air flotation units and decanting tanks), its use of LEDs enables it to locate both the settled silt or biosolids bed and overlying cloud layer, automatically adjusting beam intensity to accommodate different concentrations. Its slim profile is ideal for obstructed/constricted areas. It allows users to program pumps to operate only when necessary, helping

prevent carryover, optimize feed density for enhanced dewatering and avoid pumping thin biosolids or large volumes of water (as when a core hold is pulled). These efficiencies help reduce energy use, wear and tear on pumps and downtime for maintenance. No calibration is required. **855-873-7791; www.sludgecontrols.com**

## Membrane Bioreactors

### SMITH & LOVELESS TITAN MBR

TITAN MBR packaged membrane bioreactor system from Smith & Loveless

The TITAN MBR packaged membrane bioreactor system from Smith & Loveless includes high-performance flat sheet membranes, easy component access, intuitive graphical touch-screen PLC controls, smart advanced data monitoring and communications, reduced process complexity, and a streamlined membrane clean-in-place process. It is designed with a stable process tailored to permit requirements and capable of achieving high effluent quality and Title 22 approved water reuse. It has stainless steel componentry and streamlined electrical layout with an operator-friendly wire management system. The treatment plant will arrive in a complete and compact factory-built system with significantly less field assembly for even swifter installation and startup. **800-898-9122; www.smithandloveless.com**

LEAPmbr MBR from SUEZ Water Technologies & Solutions

### SUEZ WATER TECHNOLOGIES & SOLUTIONS LEAPMBR

The LEAPmbr MBR from SUEZ Water Technologies & Solutions uses a ZeeWeed membrane while incorporating significant innovations to meet your wastewater treatment challenges. The ZeeWeed membrane is tested to boost productivity 15%, while the unit's flexible design reduces the MBR footprint by 20%, saving on construction costs. It simplifies the design by reducing membrane aeration equipment and controls by 50% and helps reduce operating costs with a 30% energy savings. **866-439-2837; www.suezwatertechnologies.com**

## Mixers

### JDV EQUIPMENT NOZZLE MIX SYSTEM

Nozzle Mix System from JDV Equipment

The Nozzle Mix System from JDV Equipment is a dual-zone mixing technology that provides uniform mixing patterns that produce even distribution and a stable environment. It can help optimize solids suspension and contact to promote efficiency in a wide range of applications. The system is designed with pumps installed outside the tanks to facilitate ease of maintenance. The pumps are typically chopper pumps or pumps incorporating in-line 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. The high-velocity nozzles are mounted inside the tank and are oriented to discharge in a flow pattern that completely mixes the tank contents. **973-366-6556; www.jdvequipment.com**

### PARK PROCESS VORTAFLO

VortaFlo static mixer from Park Process

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-creating 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**

### VAUGHAN TURBO-S MIXER

Turbo-S Mixer from Vaughan

The Turbo-S Mixer from Vaughan is a small, powerful propeller mixer that is mounted vertically inside an 18-inch elbow and is capable of mixing a pit with just 2 feet of liquid above the floor. It incorporates an upper cutter above the propeller to stop wrapping and fibrous material binding to protect the mechanical seal. It can be used in dairy manure mixing and in municipal treatment plant anoxic zone mixing and oxidation ditches. It can be quickly implemented in primary influent channels, Bardenpho basin mixing, scum blanket mixing and primary sludge storage mixing. Additionally an optional turntable can allow it to be easily reaimed in the pit. **888-249-2467; www.chopperpumps.com**

Xelletor series separators from Flottweg Separation Technology

## Nutrient Removal

### FLOTTWEG SEPARATION TECHNOLOGY XELLETOR

Xelletor series separators from Flottweg Separation Technology include a rotor and scroll designed to reduce the consumption of polymer while also reducing energy consumption. Depending on biosolids quality, the centrifuge can save about 20% on energy while providing significantly better performance. It can increase throughput by up to 15%, reduce the volume of biosolids by as much as 10% and save up to 20% in energy and polymer consumption. **859-448-2331; www.flottweg.com**

### FLUENCE BREEZE

Breeze air stripper from Fluence

The Breeze air stripper from Fluence is an efficient technology capable of removing nearly 100% of volatile organic compounds and other gases dissolved in water. It serves as a low-maintenance, cost-efficient alternative for filters, packed towers and mechanical aerators for fast, efficient removal of contaminants from water and wastewater in a wide variety of applications, including potable water contamination and groundwater contamination. It includes compact and stackable framework, equipped with handles for easy transportation or relocation. Seven tank sizes are available, with three to nine aeration chambers. It offers stand-alone system functionality and interface capability with other treatment technologies. It is available in stainless steel or polypropylene construction and includes a removable cover, which provides access to the diffusers and easy routine maintenance. **763-746-8400; www.fluencecorp.com**

SWAN Analytical USA AMI Phosphate Analyzer

### SWAN ANALYTICAL USA AMI PHOSPHATE ANALYZER

The SWAN Analytical USA AMI Phosphate Analyzer enables the reliable monitoring of critical phosphate levels. Analog/digital outputs provide real-time feedback for system control. Built-in surveillance functions generate alarms if measurements are not valid, such as missing flow, empty reagents, valve and photometer functionality. To ensure proper corrosion control in the distribution system, ensure proper feed control at the water treatment plant and reduce operating expenses, proper monitoring is required. **847-229-1290; www.swan-analytical-usa.com**

## Sequencing Batch Reactor

### EVOQUA WATER TECHNOLOGIES OMNIFLO SBR MAX

OMNIFLO SBR MAX system from Evoqua Water Technologies

The OMNIFLO SBR MAX system with Jet Tech technology from Evoqua Water Technologies combines the benefits of a true-batch SBR with those of a continuous fill batch reactor process to treat wastewater influent flows to over five times design. The system optimizes hydraulic handling during storm flows, reduces equipment sizing and cost, and can trim energy costs over 15%. At low flow rates, the system operates in the True-Batch mode, and during peak flow events, the system automatically switches to operating as the GoFlo Continuous Fill Batch Reactor to dissipate peak flows and slash hydraulic overflow rates. It allows for the treatment of storm flows while maintaining excellent effluent quality. Quiescent settling is preserved at all flow rates up to storm flow. Influent velocity dissipation prevents sludge disturbance and short-circuiting. There is no need for additional EQ basins or oversized reactor basins. Simple automated controls make necessary adjustments easy. **www.evoqua.com** tpo

By Craig Mandli

## Ceramic membrane system solves disinfection byproduct challenge

### Problem

In 2010, a pine beetle infestation at the Basin Creek Reservoir in Butte, Montana, killed most of the surrounding trees, many of which fell into the water, increasing the organic matter level. The Butte-Silver Bow Water Utility received a violation notice from the state Department of Environmental Quality for exceeding its maximum contaminant limit for a certain type of disinfection byproduct. To maintain the use of the reservoir, filtration had to be added.

### Solution

The utility procured **Aqua Multi-Bore C-Series ceramic membrane system** from **Aqua-Aerobic Systems.** It consists of four trains, each with 100 modules arranged in ten 10-module rows. The backwash water is settled and treated with a backwash recovery train of two six-module rows. For both systems, each row has a complete set of valves and operates independently. Backwashes and cleanings are performed on one row at a time while the others remain in service. Jim Keenan, chief operator, says, "It saved a lot of infrastructure cost and a lot of pumping cost — that was a big advantage of this design."

**RESULT:**

At the 7 mgd design flow, the plant wastes less than 14,000 gallons, close to zero liquid discharge. "We've been really pleased with how well the system works and how efficient it is," Keenan says. **815-654-2501; www.aqua-aerobic.com**

## Carbon provides PFAS solution for Air Force base

### Problem

Eielson Air Force Base southeast of Fairbanks, Alaska, had perfluorooctanoic acid and perfluorooctane sulfonate (also called PFOA and PFOS) in drinking water that were above the U.S. Environmental Protection Agency health advisory.

### Solution

After considering options, the base leaders chose treatment with bituminous reagglomerated activated carbon. Testing determined that **Calgon Carbon's FILTRASORB 400** and **Model 10 GAC adsorption systems** could supply contaminant-free drinking water cost-effectively.

**RESULT:**

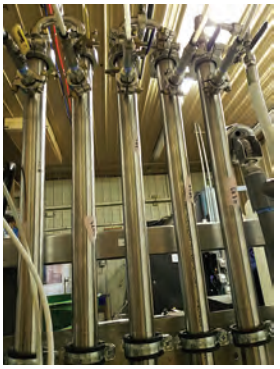
After two systems showed great success, the base added two more systems. Since then, per- and polyfluoroalkyl substances (PFAS) have been undetectable. **800-422-7266; www.calgoncarbon.com**

## Membrane system allows fish farm to treat and reuse wastewater

### Problem

The owner of a large Midwest fish farm needed to treat and reuse wastewater from its processing plant to prevent high-strength wastewater surcharges. Feedwater for the application test consisted of wastewater from a fish processing waste stream with 3,300 ppm COD.

### Solution



**Cerahelix** installed a single-stage system using five 1-meter, 19-channel membranes. Its **picofiltration process** — filtration with molecular weight as low as 400 Daltons — provides filtration at the molecular level and opens the door to new applications of ceramic membrane technology, while minimizing lifetime costs. The process uses a DNA template to form the pores that filter the water, controlling the pore size to extend the range of treatment applications for ceramic membranes from nanofiltration to high-purity picofiltration.

**RESULT:**

Results of the test, with no pre- or post-treatment, showed a reduction in COD over 99.9%. **800-604-0697; www.cerahelix.com**

## Extended aeration package plant specified for power plant wastewater

### Problem

A coal-fired power plant in northern Indiana needed a new wastewater treatment system. The plant is a zero-liquid-discharge facility; all wastewater streams are returned to a 3,000-acre cooling pond.

### Solution

**Delta Treatment Systems** provided a turnkey extended aeration package plant installed below grade at a design flow rate of 40,000 gpd. The system treats domestic wastewater less than 25 mg/L CBOD, 30 mg/L TSS and 125 cfu/100 mL fecal coliform. A lift station pumps the wastewater to the treatment system. A heavy-duty grinder at the receiving end reduces solids particle size. The design includes a flow equalization chamber to maintain consistent flow rates to the secondary treatment chamber during peak hours via time-dosed duplex nonclog submersible pumps. Duplex blowers are in fiberglass housings, and a control panel communicates with the operations room on site.

**RESULT:**

Delta Treatment Systems supplied all equipment necessary for proper operation. Water levels are continuously monitored with a VEGAPULS liquid level radar system. The system operates consistently and meets effluent requirements. **800-219-9183; www.deltatreatment.com**

## Injection process enables iron removal from groundwater

### Problem

In 2008 the City of San Angelo, Texas, was dealing with significant radium and iron in the water from the Hickory Aquifer wellfield. Ion exchange technology was chosen to remove the radium, but first the iron had to be removed to avoid fouling of the ion-exchange resin. This meant oxygenating the raw water while removing undissolved gas bubbles — all without breaking pressure.

### Solution


The **GDT sidestream injection process and pipeline flash reactor** from **Mazzei Injector** were selected to aerate, oxygenate and remove remaining gas bubbles in the wellfield's pressurized pipeline. The highly oxygenated effluent exiting the system is blended back into the wellfield's pipeline at a minimal pressure loss of less than 0.30 psi. The Hickory Aquifer Groundwater Treatment Facility typically had a flow rate of 2 to 8 mgd and pressure of 80 to 100 psi.

**RESULT:**

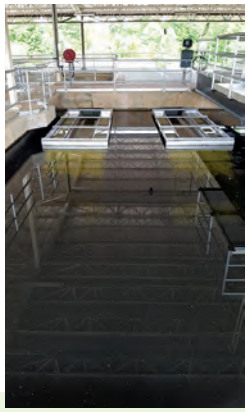
After aeration, the pipeline flow passes into pressurized detention tanks for 15 minutes to provide time for the insoluble ferrous iron to be oxidized to its insoluble ferric state. Media filtration then removes the oxidized iron, enabling the mainline flow to pass through the ion exchange beds for radium removal with no fouling issues. **661-363-6500; www.mazzei.net**

## Combined gravity settler and continuous media filtration systems used at pollution control facility

### Problem

The Cherokee County Water and Sewer Authority needed to achieve an effluent total phosphorus level of less than 0.14 mg/L at the Fitzgerald Creek Water Pollution Control Facility in Woodstock, Georgia. The plant treats municipal and poultry processing plant wastewater with an average daily flow of 5.0 mgd.

### Solution



After extensive on-site pilot testing, the authority chose an integrated design with **Parkson Corp.'s Lamella gravity settler** and **DynaSand continuous backwash media filter.** The gravity settler in a plate pack configuration includes Parkson Corp.'s EcoFlow technology, enabling 100% plate surface area utilization. Clarified water essentially free of TSS is then directed by gravity to the DynaSand filter modules for polishing. The single-stage, deep-bed filter system can achieve limits well below 0.14 mg/L total phosphorus.

**RESULT:**

The system continually delivers water quality of less than 0.1 mg/L ammonia, less than 0.07 mg/L phosphorus and less than 0.5 NTU. The plant consistently goes well below its NPDES permit requirements. **888-727-5766; www.parkson.com**

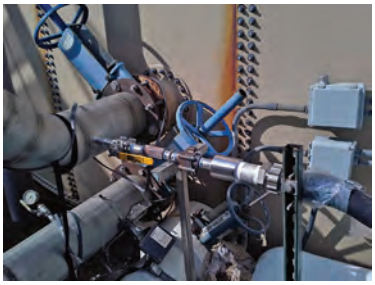
*(continued)*

## Aeration tank odor eliminated using pure oxygen injection

### Problem

A Midwest meat-processing plant's wastewater pretreatment facility produced an odor linked to insufficient dissolved oxygen in the first of three aeration tanks. Hydrogen peroxide had been used to control odor, but it was costly and of suspect effectiveness. The addition of new aeration equipment was constrained by the aeration tank's structural cover.

### Solution



**Praxair** demonstrated that odor could be eliminated through **restoration of aerobic conditions** in the first aeration tank. The shortfall in oxygen transfer could be corrected through injection of pure oxygen into the recirculating waterline of the jet aeration system of that tank. A demonstration showed that DO above 0.5 mg/L could be maintained for about half of the day, eliminating the sulfide odor.

**RESULT:**

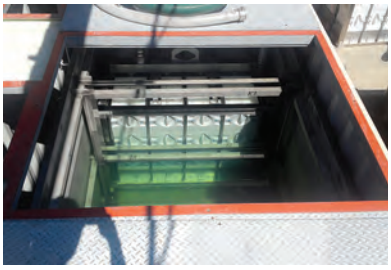
The cost of adding pure oxygen was less than the previous approach. The plant expected savings of 74%. **800-772-9247; www.praxair.com**

## Facility installs MBRs for increased capacity and water reuse

### Problem

The Santa Ynez Band of Chumash Indians operates a hotel and casino in California. Wastewater used to be treated by a sequencing batch reactor and sand filtration. As the hotel and its vicinity grew, the SBR capacity was exceeded, requiring an upgrade. Because the area is subject to drought, hotel expansion required water reuse.

### Solution



The band evaluated expansion of the SBR and abandoning the SBR in favor of a membrane bioreactor. An engineering study showed an MBR construction cost of $3.3 million versus $5.3 million for the SBR. **Econity MBRs** from **Schwing Bioset** were selected, and the system was built using two containers to minimize disruptions to current plant operations and to fit in the available space.

**RESULT:**

The facility's capacity has increased significantly. Effluent turbidity (0.05-0.2 NTU) exceeds California Title 22 requirements for reuse water. **715-247-3433; www.schwingbioset.com**

## Disc filter system allows facility to maintain capacity

### Problem

The 6 mgd activated sludge wastewater treatment plant in Camas, Washington, sought to replace its cloth media disc filters, as its pile cloth fabric experienced excessive fouling over time. The cloth was difficult to clean and maintain. The site needed a low-maintenance solution that would fit the existing filters' footprint and hydraulic profile.

### Solution

Gray & Osborne designed the filter upgrade based on **Veolia Water Technologies' Hydrotech Discfilter system.** The compact footprint and low headloss fit the available space and allowed for easy cleaning and maintenance. The filters include an automatic cleaning system. The control system automatically regulates the supplemental chemical cleaning process to remove foulants, enabling the filter media plant to maintain optimal capacity.

**RESULT:**

The system has run effectively since commissioning in 2013. The staff can easily maintain and operate the system. The filters meet effluent performance requirements and maintain the required flow-through capacity. **919-677-8310; www.veoliawatertech.com** tpo

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## WASTEWATER

**By Rick Lallish**

**What is the condition on a rotating biological contactor (RBC) that is identified by uneven shaft rotation, usually caused by uneven biofilm growth causing unbalanced weight distribution?**

A. Chaining
B. Loping
C. Fouling
D. Tepidity

**ANSWER:** B. Although RBCs are not as commonly used as in the past, knowledge of the operation and troubleshooting conditions is still important to a well-rounded operator. Loping is a common problem on RBCs. It is caused by uneven biofilm growth. The unbalanced weight condition causes the rotational speed to vary cyclically with each rotation. This causes the wheels to seem to jump or jerk. Gears may be damaged if this is not corrected. More information can be found in the Water Environment Federation textbook: *Wastewater Treatment Fundamentals I – Liquid Treatment*, Chapter 7.

## DRINKING WATER

**By Drew Hoelscher**

**How can an operator determine the approximate amount of noncarbonate hardness in a water sample?**

A. Take the average of the total hardness and the total alkalinity
B. Subtracting the total alkalinity from the total hardness
C. Add the total alkalinity and the total hardness
D. Divide the total hardness by two

**ANSWER:** B. After analyzing a water sample for total hardness and total alkalinity, an operator can determine the approximate amount of noncarbonate hardness by subtracting the total alkalinity from the total hardness. The difference between the two indicates the approximate amount of calcium and magnesium ions linked to other ions, such as sulfate and chloride (noncarbonated hardness). When the total hardness is less than or equal to total alkalinity, calcium and magnesium ions are linked to carbonate and bicarbonate ions (carbonate hardness), and the amount of carbonate hardness is equal to total hardness, indicating that noncarbonate hardness is not present.


ABOUT THE AUTHORS

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

## FCI - Fluid Components International Modbus option for compact air and gas flowmeters

The newly extended lines of ST51A and ST75A flowmeters from FCI - Fluid Components International offer the ability to communicate flow measurement information over Modbus about air or gases flowing in line sizes from 0.25 to 24 inches in a highly accurate, rugged and compact instrument. They combine dependable surface-mount, lead-free RoHS-compliant electronics with accurate, repeatable, all-welded, equal-mass flow sensors. The no-moving-parts design is virtually maintenance-free and leads to a longer life. The Modbus option meets the EIA/TIA-485 standard and provides mass flow rate, totalized flow and temperature data. They're ideal for use with single-function PLCs, pilot plant projects or large SCADA systems or complex plant distributed control systems.

**800-854-1993;**
**www.fluidcomponents.com**

## Palmer Wahl differential pressure chart recorders

Palmer Wahl differential pressure chart recorders feature an edge-welded, rupture-proof pressure cell for up to 30% added life span and improved linearity. The fully mechanical differential pressure cell with dual-bellows design requires no power and is made of 316L stainless steel. The pressure cell features overrange protection and pulsation dampening to compensate for variations in line pressure, as well as a temperature compensator to protect the unit from drift caused by ambient temperature changes. Available in 12-inch chart sizes, the pressure recorders are ideal for monitoring flow, filtration and liquid levels. Differential pressure ranges from 20 to 400 inches of water are available.

**800-421-2853;**
**www.palmerwahl.com**

## Neutra-Safe condensate neutralizing pump

Neutra-Safe NSP-50 condensate neutralizing pump combines the functions of two accessories — high-efficiency gas appliance condensate neutralization and condensate pumping — in one easily maintained accessory. It is sufficient for appliances with input capacities up to 500,000 Btu/h. A transparent chamber top is provided for visual inspection of the neutralizing chamber. The cover snaps on and off for easy replacement of neutralization media, which is contained in a disposable fabric sack for quick recharging. The NSP-50 features separate inlets for acidic condensate and nonacidic condensate.

**781-616-3951; www.neutrasafe.com**

# product spotlight
wastewater

## Cover systems offer odor filtration

**By Craig Mandli**

Controlling odors is one of the most important — and often one of the most challenging — aspects of wastewater treatment. Foul odors are typically the main source of complaints, igniting objections from neighbors and not only inconveniencing, but potentially endangering plant workers.

In an effort to combat plant foul odor issues, **Anue Water Technologies** has launched customizable **Geo-Membrane coverings** designed to eliminate those foul odors completely. The company employs technology leveraging its existing ozone and oxygen generation and related systems for the elimination of odor, corrosion and FOG in municipal and industrial wastewater.

"Anue is pleased to introduce this innovative, thoroughly tested and proven technology in the U.S., Canada and Caribbean region," says Paul Turgeon, Anue CEO. "These Geo-Membranes provide many more municipal and industrial customers an even lower-cost approach to sustainable odor control."

This technology consists of high-strength, flexible Geo-Membrane cover systems fitted with pockets that contain replaceable filter media. They are custom-engineered to fit each application and ensure exceptional broad-spectrum odor control. According to Turgeon, they can be used in practically any wastewater treatment application, such as headworks, tanks, sludge pits, open channels, vessels, manhole covers, truck bays, vertical vents and fugitive emissions from vent covers.

The 1/32-inch membrane (13/16 inch with filters inserted) is supported by a cable grid and batten bars above the surface, making it unaffected by aeration, changing water levels, foaming, bacteria and other common issues. This allows installation in even the toughest of locations. Custom access and viewing ports allow for uninterrupted maintenance. The filter design is engineered to allow gases and water to flow freely through the filters while they capture the odor-causing contaminants. Gas-specific filters for hydrogen sulfide and ammonia can be combined in the system for optimum control, even under grates and manhole covers. The membrane has an expected lifetime of over 10 years even in harsh environments, and the specialty engineered filter inserts last 9 to 18 months depending on emissions levels.

Geo-Membrane from Anue Water Technologies

According to Turgeon, the filters are designed to remove all malodors, helping eliminate the need for chemicals or scrubber equipment and greatly reducing employee hazard and OSHA risks.

"We see this as a system that can pay for itself within 6 to 12 months," he says. "This broadens Anue's product line to a wider range of odor control solutions." **760-213-7739; www.anuewater.com**

# product spotlight
water

## An efficient stormwater solution

**By Craig Mandli**

AquaDisk cloth media filter from Aqua-Aerobic Systems

While treating stormwater is a necessary evil for most municipalities, there are options that can help avoid sending it completely through a costly full-on wastewater treatment process. The **AquaDisk cloth media filter** from **Aqua-Aerobic Systems** is one of those options, as it can be used to filter stormwater at treatment plants or at remote locations.

The key to the technology is its OptiFiber cloth filtration media, which is engineered to accommodate the varying flows and characteristics of stormwater. The filter media provides low effluent TSS without the use of chemicals. According to Mark Hughes, product manager - filtration at Aqua-Aerobic Systems, years of trial went into development of the media.

"Over the past 30 years, Aqua-Aerobic Systems has developed and tested hundreds of media options," he says. "It is relatively easy to make a media that removes solids well, but it's very difficult to make one that backwashes effectively and lasts over time."

The unit itself has a small footprint and is mechanically designed to handle grit and scum. It enables effective TSS removal in a low-energy backwash system with no complicated startup. It can be enclosed in a building at the plant or at remote sites. In addition, the filter can be used for tertiary treatment between rain events.

"This technology has been applied for treatment of combined sewer overflows, in place of primary clarifiers, and in surface water treatment for industrial use," Hughes says. "We fully expect that the applications for this technology will continue to increase in the near future."

According to Hughes, the majority of research for the AquaDisk pile cloth media filter has involved developing cloth media for a variety of applications. Each media is tested extensively for tensile strength and elongation, long-term operation and backwash endurance before being introduced to the market. "This testing is done at our research and technology center long before it is ever installed at a plant," he says. "In addition, operating the filters and doing this testing ourselves allows us to offer firsthand experience and recommendations to our customers."

Hughes says that those years of trial and error have proven successful, as overall customers are "delighted with the technology."

"The most common feedback we get is that customers are surprised at how little attention and maintenance the filters require," he says. "We also hear customers who are amazed with the solids handling capacity during upset conditions." **800-940-5008; www.aqua-aerobic.com**

### Centrisys/CNP CalPrex phosphorous removal system

CalPrex from Centrisys/CNP is a high-rate, predigestion phosphorus-removal and -recovery technology that adds calcium hydroxide without ammonium. It is a high-value solution for facilities that need phosphorus removal and recovery before thermal hydrolysis, waste activated sludge and/or primary sludge prior to anaerobic digestion and post-aerobic digestion. The technology, licensed from Nutrient Recovery and Upcycling by Centrisys/CNP, incorporates a thickened sludge fermentation tank or acid digester to increase the amount of soluble phosphorous. Recovered phosphorus can come in the form of brushite or dicalcium phosphate dehydrate.

**262-654-6006;**
**www.centrisys-cnp.com** tpo

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## industry news

### Anue Water Technologies names new senior sales manager


Sharon Paterson

Anue Water Technologies announced the addition of Sharon Paterson as senior sales manager. She joins Anue with 15 years of wastewater industry experience, having most recently served in business development and marketing positions with Seaglass Consulting, Veolia and Envirosuite. Paterson earned her bachelor's degree in communications at Calumet College of St. Joseph in Indiana and her MBA from the University of Chicago Booth School of Business.

### Liberty Pumps names new president


Robyn Brookhart

Liberty Pumps announced that the board of directors elected Robyn Brookhart to the position of president. She replaces Charlie Cook who will remain CEO and chairman. She has been with the company for 22 years and has served in a variety of positions including sales and marketing, customer service, and manufacturing. Most recently she has been the company's executive vice president, as well as its chief operating officer, a position she will retain.

### Xylem advances commitment to sustainability, announcing 2025 signature goals

Xylem announced a set of goals that advances the company's sustainability commitment across three fronts: serving its customers, building a sustainable company and empowering communities through social impact initiatives. The new goals were published in Xylem's 2018 Sustainability Report: *Creating a Water-Secure World*. Highlights of the goals to achieve by 2025 include helping solve water affordability and scarcity issues, addressing the planet's resilience against climate change, building a sustainable company and empowering communities. **tpo**

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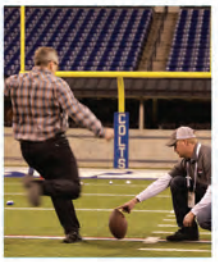

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# people/awards

The City of Midland, Michigan, promoted **Patrick Frazee** to director of wastewater services. He was hired as the city's wastewater superintendent in 2016.

**Jim Jones** of Black Hawk, South Dakota, was hired as training coordinator for the nine-state Midwest Assistance Program, which helps communities and tribal nations find solutions to their infrastructure and development needs.

**Paula Westrem** retired after 21 years as the wastewater superintendent in Osage, Iowa.

The Town of Bridgton, Maine, hired **David Madsen** as wastewater superintendent and **Miranda Hinkley** as finance/wastewater clerk.

**Ron Munds** was hired as general manager of the Los Osos Community Services District in California.

The U.S. Department of Agriculture awarded more than $5.1 million in financing to improve water and wastewater infrastructure in **Penobscot, Oxford, Washington** and **Aroostook counties** in Maine.

**Joseph Lucero,** a plant maintenance technician for the City of Escondido, was honored by the California Water Environment Association for conceiving a device that improved efficiencies and safety at the city's Hale Avenue Resource Recovery Facility. His creation turns a difficult two-person job on wastewater pumps into a safer process one person can complete.

**Mike Judice,** water/wastewater superintendent in Rayne, received the Wastewater Systems Operations Specialist of the Year South award from the Louisiana Rural Water Association.

**Flint Hills Resources** received a Certificate of Commendation from the Minnesota Pollution Control Agency for outstanding permit compliance at its wastewater treatment facility at the Pine Bend refinery in Rosemount.

The **Brunswick (Maine) Sewer District** and consulting engineers **Wright-Pierce** received the American Council of Engineering Companies of Maine's Engineering Excellence Award for using the construction management at risk alternative delivery method for the district's $22 million wastewater treatment plant upgrade.

The **Fort Collins Utilities (Colorado) Wastewater Department** received Platinum Peak Performance Awards from the National Association of Clean Water Agencies for the Drake and Mulberry water reclamation facilities.

The **Snoqualmie Wastewater Treatment Plant** received the Wastewater Treatment Plant Outstanding Performance Award from the Washington Department of Ecology.

The **York (Maine) Sewer District** received the 2019 Wastewater Utility award from the New England Water Environment Association.

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

# events

**Nov. 3-6**
AWWA North Carolina Section Annual Conference, Raleigh Convention Center. Visit www.ncsafewater.org.

**Nov. 3-7**
AWWA Water Quality Technology Conference & Exposition, Sheraton Dallas Hotel, Texas. Visit www.awwa.org.

**Nov. 6-8**
American Public Works Association, Nebraska Water Environment Association and AWWA Fall Conference, Younes Conference Center, Kearney, Nebraska. Visit www.awwaneb.org.

**Nov. 12-14**
American Water Summit, Omni Houston Hotel, Texas. Visit www.americanwatersummit.com.

**Nov. 13**
AWWA IT Forum: Cybersecurity, Anne Arundel County Bureau of Utilities, Annapolis, Maryland. Visit www.awwa.org.

**Nov. 14**
New England Water Environment Association Utility Management Conference, Courtyard Marriott, Cromwell, Connecticut. Visit www.newea.org.

**Nov. 20-21**
British Columbia Water & Waste Association SCADA and IT Conference and Trade Show, Anvil Centre, New Westminster, British Columbia. Visit www.bcwwa.org.

The **City of West Monroe's Sparta Reuse Facility** was named the 2019 Energy Conservation System of the Year for North Louisiana from the Louisiana Rural Water Association.

The **Upper Trinity (Texas) Regional Water District** received Peak Performance Awards from the National Association of Clean Water Agencies for each of its four water reclamation facilities serving several communities in Denton County.

**Jason Barnes,** Valdosta water plant superintendent, received the Elizabeth McEntire Award from the Georgia Association of Water Professionals for excellence public water system operation.

The **Edmonds Wastewater Treatment Plant** received an Outstanding Performance Award from the Washington Department of Ecology.

The **City of Vicksburg** received the State of Mississippi 2019 Water Treatment Plant of the Year award from the American Water Works Association.

The **Great Lakes Water Authority's Water Works Park** in Detroit received a Directors Award from the Partnership for Safe Water.

**Caryl Giles,** Spring Hill (Tennessee) water treatment plant superintendent, retired after 17 years with the department and a 40-year career in water treatment.

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