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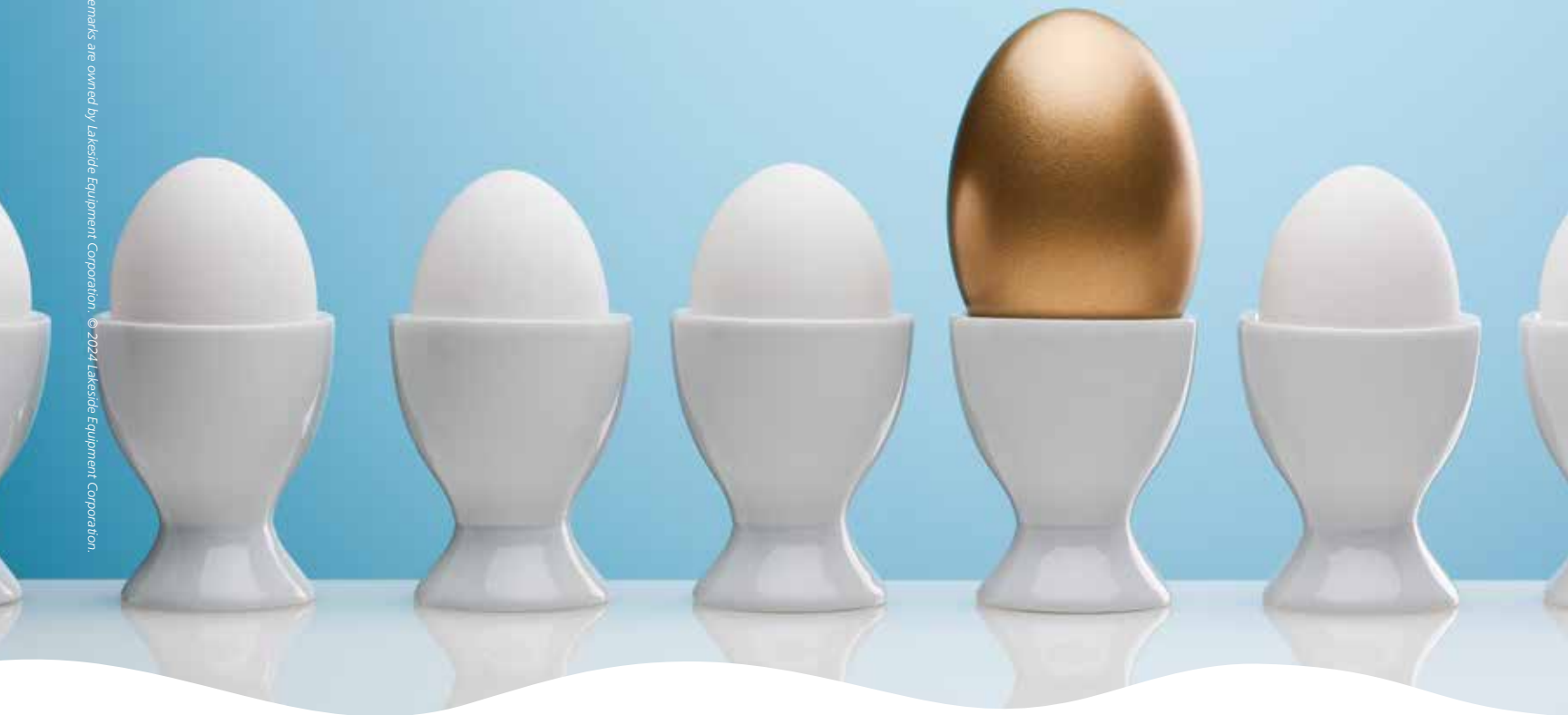
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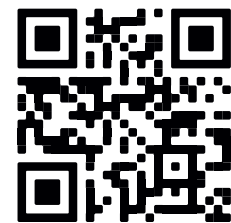


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let's be clear

Minding Your A-B-C-Ds

IN TAKING LICENSE EXAMS, THERE'S NO SUBSTITUTE FOR KNOWLEDGE AND PREPARATION. BUT SOME SPECIFIC STRATEGIES FOR MULTIPLE-CHOICE QUESTIONS CAN IMPROVE YOUR ODDS

By Ted J. Rulseh, Editor



So you've studied for the exam you must pass to attain your first or next-level license. You feel confident, but also a little nervous.

All that is fine — good preparation is the best predictor of success, and a little pre-test anxiety can help bring out your best. But you can slightly bump up your chance of success by knowing a few tips for dealing with multiple-choice questions. Here is some advice gleaned from various experts and from my own exam experience.

Invest time answering sample questions. Before taking my Graduate Record Exam (a part of the process for applying to graduate school), I went through a book of sample questions — not actual questions from the exam, but the same kinds of questions. So when I sat down for the exam it had a familiar feel; I was already in a groove. Your state or regional association most likely can provide sample questions, and you can find many at tpomag.com/study. Use resources like these in the days just before the exam.

Be ready to pace yourself. Know how many questions the exam will contain and how much time you'll have to answer them. Then you'll know roughly how long to focus on each question, and you won't have to stress about finishing on time.

Read each question very carefully. Some experts recommend reading each question twice, or underlining the keywords in the questions, so that you are fully clear on what is being asked. Misreading or misunderstanding a question will almost surely lead you to an incorrect answer.

Think first, then choose. Try answering the question in your head. Then look at the choices offered to see if one matches the answer you came up with. If so, that's probably the right one. A related strategy: Don't second-guess yourself. Trust your initial thought, because if you prepared properly and studied, it is probably right.

Use the process of elimination. Some questions may include suggested answers that are obviously not the correct ones. Eliminate these, especially if you're unsure of the correct answer. Then you'll have better odds that your educated guess from the remaining choices will be right. Use this technique in particular with questions that require math calculations. Often you'll be able to tell right away that one or more choices are not even in the ballpark.

Don't second-guess yourself. Trust your initial thought, because if you prepared properly and studied, it is probably right.



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Don't overthink it. You need to read the questions and make your choices with care, but don't analyze excessively. Some questions will be difficult, but don't make it harder on yourself by assuming the test creator is trying to trick you. Usually the question and the correct answer will be straightforward.

Don't get hung up. If a question really has you stumped, don't just take a wild guess, and don't linger to long over it. Skip it for the time being and come back to it later. If you've paced yourself properly, you'll still have time to give it due consideration.

Don't be superstitious. Avoid worrying about patterns you might see in your answers. For example, the mere fact you've answered "B" four times in a row does not mean you have made mistakes. Exams are built with correct answers positioned randomly. Rely on your knowledge; be confident that you have chosen correctly.

Beware of last-minute changes. Review the test after you complete it and check your work, but don't change any answers unless you have a good reason to do so, such as if you discovered new information later the test that would affect an answer you selected earlier. Remember, you studied. Trust yourself.

These strategies should help you use your time wisely, make good choices, and avoid silly mistakes. They won't do you much good if you enter the exam room unprepared. Study appropriately, get a good night's sleep, approach the exam confidently, and in all likelihood that first or next-level license will be yours when the exam is completed. **tpo**

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RECYCLED WATER

A Winning Brew

Charlotte Water, Town Brewing and Xylem recently announced Renew Brew, the first beer in the Carolinas brewed with QC Water, a sustainable recycled water. It's a limited-edition pale ale, and first debuted at the Queen City Brewers Festival where it won Best in Show during a blind tasting competition.

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CLEAN WATER INITIATIVE

Cornell University Paves the Way

Cornell University’s College of Engineering is tackling a nationwide challenge with a new project in Puerto Rico that aims to help small communities finance, build and operate drinking water systems. The WaterSAVERs project’s goal is to develop a national framework for deploying sustainable water systems in often-overlooked areas.



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RESPONSIVE LEADERSHIP

Ensure You’re a Good Boss

The results of a new study should serve as a wake-up call for managers: 24% of 1,500 employees polled say they currently work for the worst boss they’ve ever had. The key behavior that garnered either a worst- or best-boss ranking was responsiveness, according to the study.

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- 1) The PFASigator system operates at atmospheric temperatures and pressure and does not require constant monitoring. Pictured with a pilot system is Ben Johnson, field assistant.
- 2) The PFASigator technology uses UV light to catalyze the chemical reaction that breaks the carbon-carbon and carbon-fluorine bonds in PFAS molecules.

‘Forever’ No Longer

A LIGHT-ACTIVATED CHEMICAL TECHNOLOGY IS DESIGNED TO BREAK PFAS MOLECULES INTO HARMLESS COMPOUNDS ON SITE IN A BROAD RANGE OF OPERATING CONDITIONS

By Ted J. Rulseh

PFAS treatment poses special challenges in that the work is not over just because these “forever chemicals” are removed from the water stream. After their removal, the question remains: what to do with the PFAS-containing granular activated carbon, ion-exchange resin or membrane filtration reject water. Increasingly, attention is turning to methods that destroy the PFAS, converting the chemicals to harmless substances. That is the approach taken by PFASigator technology offered by Enspired Solutions, a women-owned business in Lansing, Michigan.

The process uses a proprietary chemistry that the company says is proven to mineralize PFAS in solution. Photo-activated reductive defluorination chemistry is coupled with UV light to stimulate a reaction that disassembles the PFAS molecules.

The equipment is modular, compact and mobile. It is designed to be deployed and operated downstream of a process that concentrates PFAS in solution. The company says it destroys PFAS at a cost comparable to existing capture and disposal options.

The technology operates on site in a variety of circumstances that include a pH range of 3 to 12 and aerobic or anaerobic conditions. Denise Kay, company CEO, talked about the treatment method in an interview with *Treatment Plant Operator*.

tpo: What was the motive for developing and introducing this technology?

Kay: There is a growing need to reduce the mass of PFAS in the environment because of how it’s affecting drinking water sources and human health. Our technology destroys the PFAS instead of capturing it and moving it to a different location. It is also a very energy-efficient technology.

tpo: How did you devise this method of treatment?

Kay: It uses a chemical reaction specific to the destruction of PFAS that we identified in the scientific literature. We discussed the status of the tech-

nology with the publishing authors. They had a U.S. patent and were looking for someone to license it for commercial purposes.

tpo: In basic terms, how does the treatment process function?

Kay: An aqueous solution containing PFAS is fed into our machine. We add reagents and expose the solution to UV light, which catalyzes a chemical reaction that breaks the carbon-carbon and carbon-fluorine bonds in the PFAS molecules and reduces them to nontoxic forms. We can run a secondary reaction in the same reactor to break down the reagents we added.

“The PFAS are broken down into water, fluoride ion, and nontoxic simple carbon compounds such as acetic acid, which is vinegar.”

DENISE KAY

tpo: What are the end products from the destruction of the PFAS?

Kay: The PFAS are broken down into water, fluoride ion and nontoxic simple carbon compounds such as acetic acid, which is vinegar. The end product can be released to a wastewater treatment plant.

tpo: Is this a standalone treatment technology?

Kay: It is intended to be one component in a larger water treatment system. We have found that it pairs very well with a technology called foam fractionation. If you take water containing PFAS and pass bubbles through it from the bottom, the PFAS creates a foam on the top. The PFAS is now in the foam and the water is relatively PFAS-free. The foam quickly collapses down into a liquid, a PFAS concentrate, which then goes into our machine.

tpo: How would you describe the capacity of your treatment units?

Key: Capacity is very site-specific. However, generally speaking, the system will handle 50 to 150 gallons of PFAS concentrate per day.

tpo: How does that translate to the total volume of PFAS-containing water treated?

Key: We look at how many orders of magnitude, meaning tenfold decreases, we need to achieve and what PFAS compounds are present. Most foam fractionators can easily achieve a thousand-fold concentration, or 5,000-fold, or some say up to a million. So for example, if PFASigator is paired with a foam fractionation system doing a thousand-fold concentration, and is taking in 50 gallons of concentrate per day, then the total system flow is 50,000 gpd.

tpo: How do you scale up to the flow required for a municipal water treatment plant?

Key: Our equipment is modular. Units can be deployed side by side or in series. Importantly, foam fractionation is also site-specific. For any site there needs to be treatability testing, on both the foam fractionation and PFAS destruction sides. Then we can scale a system that is appropriate for the site.

tpo: How is the technology delivered to the end user?

Key: It is an equipment purchase. The equipment is about the size of two large refrigerators, so it's a small footprint and relatively easily mobilized. Our approach is to sell or lease the equipment to the customer and train them to operate it. We also require a subscription to supply the reagents and the end user license for the intellectual property.

tpo: How has this technology been proven for commercialization?

Key: It started with peer-reviewed scientific publications, which were quite rigorously done. We took the concept from bench scale and developed commercial-scale equipment, which we have tested with funding from the Department of Defense on up to 10 concentrates from various defense facilities. We've also completed our first field pilot trial in Grand Rapids, Michigan.

tpo: What was the nature of the input stream in that field pilot?

Key: It was PFAS-contaminated groundwater at an industrial facility. We were pumping groundwater, putting it through foam fractionation and destroying the PFAS in the foamate. We were able to achieve the criteria the client had to meet to send the end solution to the wastewater treatment plant. In Michigan, wastewater plants are being regulated on the amount of PFAS they can release to surface waters, so they are going upstream to identify who is releasing PFAS and requiring them to address it.

tpo: What makes this technology energy efficient?

Key: There are various technologies that destroy PFAS by different means and to different extents. Many require very high temperatures and pressures. Our system functions at atmospheric pressure and standard temperatures, around 40 degrees C. The energy from the UV light stimulates our reagents to release electrons, which react with the PFAS. We have

a direct transfer of energy from the light to PFAS destruction without having to heat up or pressurize water. Another basis for energy efficiency is that there are two chemical processes to destroy PFAS: oxidation and reduction. We use reduction, which is far more energy-efficient.

tpo: What is involved in operating this technology?

Key: The equipment is automated. Operators watch by way of a remote screen for any alarms that the system isn't functioning as expected. Every 30 days the system requires a replenishment of the reagents and calibration of the fluoride probe. Operator feedback is that when they look at the equipment, all of the components of the reactor are familiar, from existing water treatment technologies. For example, there is an automatic fluoride measuring system of the kind used in drinking water treatment. A primary part of the reactor is UV lighting similar to a water disinfection system. So it all looks familiar to operators. **tpo**

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Horacio Palacios helps operate a water system that includes 10 booster stations, 13 storage tanks, 30 regulating valves, 30 wells and more than 600 miles of mains.

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HORACIO PALACIOS DIDN'T INTEND TO BECOME A WATER PRODUCTION OPERATOR. BUT NOW HE CAN'T IMAGINE DOING ANYTHING ELSE.

STORY: **James Careless**
PHOTOGRAPHY: **Eric Swanson**

Horacio Palacios wasn't looking to get into the water world right out of high school.

"It kind of fell in my lap," recalls Palacios, a water production operator with 15 years' experience at Las Cruces Utilities. The payoff was a satisfying career in which he has made his mark. He was named 2022 Outstanding Operator of the Year by the New Mexico Water and Wastewater Association.

Palacios was born in Phoenix; his family then moved about 400 miles east to Las Cruces. "I pretty much grew up here and have stayed in Las Cruces my whole life," he says. "My family is real close. I was raised by my mom, my grandma and my aunt. Las Cruces is a little town where everybody's really, really nice and helpful."

Palacios attended Mayfield High School in Las Cruces and graduated in 2006. "I had planned on going to college to be a firefighter," he says. "But right out of high school I found that I was going to have a child."

LEARNING THE ROPES

Faced with supporting a family, Palacios immediately started looking for work. "I had a buddy who was in Las Cruces Utilities," he says. "I applied for a job there. The interview and hands-on field test went well, so they hired me.

"And so pretty much right out of high school, I jumped into the water world, not really knowing what I was getting into. Fortunately, a lot of the guys I started off with were older. They helped me out by showing me how to run a water treatment facility from the ground up."

His first job was in water distribution, which he did for 10 years: "Throughout that time I was testing for the New Mexico water operator certification levels, of which there are four. So in those 10 years, I earned my certifications as I worked my way up from a crewman, a back operator, and a serviceman, all the way to a crew leader.

"I chased those water levels until I got my Level Four. Then a position opened in water production, which is where I am now.

I'm a water operator and pretty much in charge of the wells, the booster pumps, the pressure regulating valves and disinfecting the water."

AQUIFER SYSTEM

Las Cruces Utilities produces 6.5 billion gallons of drinking water annually, pumped from the Mesilla and Jornada Bolsons deep aquifers. To run the system, the utility employs 10 booster stations, 13 storage tanks, 30 regulating valves, 30 wells and more than 600 miles of mains.

"We don't have any surface water around here," Palacios says. "We pump the water out of the ground and hit it with chlorine gas. And there are some wells that we inject PO4 polyphosphate to control iron and manganese and minimize red water. We pump about 28-30 mgd during summer. During winter, it goes down to 15 to 16 mgd."

Las Cruces also operates the Jornada Water System, which it acquired in 2016. That system produces 670 million gallons per year; it has eight booster stations, 12 storage tanks, four regulating valves, 14 wells and more than 90 miles of mains.

The majority of the pumps used in Las Cruces' wells are a mix of vertical turbines and submersibles. The smaller pumps move about 80-115 gpm, while the larger pumps deliver up to 3,000 gpm.

"US Motors [Nidec Motor Corp.] is the brand we use for our vertical turbines ranging from 15 hp to 700 hp," Palacios notes. "A majority of our submersibles are Grundfos. Our pressure relief valves are mainly Cla-Val. We currently have two wells that run off Caterpillar natural gas engines."

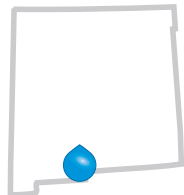
This utility is also charged with managing a Superfund site. "We pump that water out and air-strip it to separate [the tetrachloroethylene] from the water," says Palacios. "Two wells currently pump to our Superfund aeration plant. Well 27 runs 24/7 at 235 gpm and Well 18 runs twice a week for six hours at 86 gpm."

"We can only pump so much water out because we're just trying to skim the top of that aquifer." The TCE has an oil base, so it's

“A lot of the guys I started off with were older. They helped me out by showing me how to run a water treatment facility from the ground up.”

HORACIO PALACIOS

Horacio Palacios,
Las Cruces (New Mexico) Utilities



POSITION:
Certified Water Operator

EXPERIENCE:
15 years in the industry

CERTIFICATION:
Water Operator Level 4

GOAL:
Finish strong with the city, continue learning and be set up for the next step after retiring from Las Cruces



Horacio Palacios,
certified water operator,
Las Cruces Utilities



Palacios demonstrates a water production diorama for students at the Pascual Rodriguez Jr. Griggs Walnut Groundwater Plume Superfund Site Treatment Facility.

“As for our crew, it’s a great bunch of guys. Over the years everybody went and got certifications, and we all ended up in water production.”

HORACIO PALACIOS

started off with a lot of these guys in water distribution. Over the years everybody went and got certifications, and we all ended up in water production.”

The team includes Level 4 operators Joshua Mort, Luis Arellano, Steve Ascarate, Gino Sepulveda and Ron Acosta, and Level 3 operators Ernesto Valenzuela and Chuck O’Donnell. Ronald Borunda is water deputy director, Paul Gamboa is supervisor, and Jacob Cabrales is project coordinator. The electricians are Eric Quiz, Adrian Valles and Diego Caro. Water production labor is performed by Andres Flores and Jesus Baca.

Palacios cites no major crises in operating the system; it’s just a case of keeping up with ever-increasing customer demand. “Las Cruces is growing quite a bit, and so we’re constantly trying to stay ahead of where we

need to put wells and tanks and boost the water up, especially during the summers. It can get pretty hot over here in Las Cruces.”

FAMILY TIME

When not keeping Las Cruces water clean and drinkable, Horacio Palacios spends time with his wife Monica and sons Ethan, 15, and Zander, 9.

“I try to be with my family every minute that I can,” Palacios says. “Your parents are always telling you that time flies. Well, when you have your kids and you’re constantly going to work, it does really fly by.

“And so I just try to hang out with my kids. The majority of the time we go camping, we go out to the hills a lot, we hunt and fish. I also coach a youth basketball club team here in Las Cruces. We do a lot of traveling to El Paso (Texas) and Albuquerque just to get these boys out of here.”

MEETING DEMAND

“Summer is our busy season. Usually during the winters we try to do our maintenance. That way, come summertime, we’re ready to roll and we don’t have too many issues with a lot of our wells and boosters running 24/7.”

The best part of his work? “I really enjoy service calls when I go out and talk to someone, knowing that I started from installing and went all the way up to pumping water and disinfecting it,” Palacios says.

“When a customer has a question, I’m pretty confident I can give them the correct answer. As well, we have a water conservation display that we show to school kids to explain how our system works and where our water comes from. It’s a model diorama with the aquifer, pumps and pipelines, all showing how our drinking water gets from the ground to their homes and schools. It really opens their eyes.”

Palacios appreciated winning Operator of the Year: “It was a little gathering here at one of our local hotels,” he says. “I was able to invite my sons

floating on top of the aquifer. “It’s a slow process, but the plume from the time we started is starting to shrink, so we are cleaning that water.”

JOB SATISFACTION

Las Cruces Utilities has eight operators to run the water system, and most have Level 4 (highest) certification. “We take turns being on call,” Palacios says “Our system is controlled and monitored by SCADA software, so the calls can come in at any time for high tank levels, customer tests for chlorine polyphosphate and water hardness.

“As for our crew, it’s a great bunch of guys, a lot of old-timers. I



Palacios works in an arid landscape where groundwater is the only water source. The water tank mural depicts an Aztec paradise called Tlalocan.

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U.S. Patent 11,598,696 & 11,768,132

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“When a customer has a question, I’m pretty confident I can give them the correct answer.”

HORACIO PALACIOS

and my wife, and they were there to see me receive the plaque. It was a really great feeling because my two sons and my wife were always there watching me study throughout the night to earn my certifications.

“For every level I passed, they were always with me when I would receive that certification in the mail. That’s why it was really nice for them to watch me receive the award. They’ve experienced the journey with me from start to finish.”

LOOKING AHEAD

Having started with Las Cruces right out of high school, Palacios only has nine more years to qualify for full retirement. When that happens at the ripe age of 44, he may head off to a larger water utility, or perhaps open his own water testing business.

For now he is in no rush to leave. “The city has been great to me,” he says. “I started off at 18 years old. It has been a great and fun career ever since I started. It has never really felt like work since I started in the water world. I’ve never had a day where I’ve woken up, maybe after a late-night main break, and I didn’t feel like getting up.” **tpo**



Palacios checks the SCADA system that controls and monitors the water system. Operators are on call and respond to alerts and address customer needs.

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Sleuthing for Water Savings

A WATER DETECTIVES GAME HELPS THE WEST BASIN MUNICIPAL WATER DISTRICT TEACH CHILDREN HOW TO BE GOOD WATER STEWARDS

By Sandra Buettner

California's West Basin Municipal Water District has created a fun and engaging online detective game to teach children how to conserve water at home.

A part of the district's Water Star Student Conservation Program, the Water Star Detective game was launched in 2010. It is an extension of a water recycling facility school tour program started in 1996.

The district's world-class Edward C. Littles Water Recycling Facility provides recycled water to commercial and industrial customers throughout its service area in Los Angeles County. Located in El Segundo, California, the facility produces 30-40 mgd.

GAME ON

Every year, 3,000 to 5,000 students in grades 3-12 take part in the tour and program. The detective game is an entertaining part of the experience and augments the event.

It was created in 2010 by district staff members Alexis Tate, public information officer; Ron Wildermuth, communications manager; and Noelle Collins and Darryl Ramos-Young, public information specialists, with help from a consultant.

The program and the game were promoted directly to educators and through Facebook and Instagram. The online game begins with a sea star



The district's education program includes a water recycling facility school tour program that originated in 1996.



The Water Star Detectives game features several criminal water-wasting suspects.



Players in the detective game are given clues to help them identify the party guilty of wasting water.

mascot (Water Star Detective) who represents the living organisms in the watershed. After that, eight monster characters pop up on screen to music inspired by the *Law and Order* television show theme.

The monsters represent bad behaviors that waste water. Through a series of clues, students decide which monster is the culprit. Bad behaviors include long showers, leaky faucets, dishwashers and laundry machines with less than full loads and hosing off driveways instead of sweeping. To encourage students to play repeatedly, the culprit clues change every time.

"The Water Star Detectives game is the first spark of learning for the kids on how to save water and preserve life in the watershed," says Janel Ancayan, public information specialist.

"Through the game and the program, children learn how to recognize bad water behaviors at home and how to correct them. They learn to conserve water and how they can educate family members on using water more responsibly."

After taking the tour and playing the game, the kids receive a kit of items that they can use at home to help in their water-saving mission. The kit includes:

- A five-minute timer for showers
- Toilet tank bank, a device that saves 0.8 gallons per flush.
- Toilet detection tablets: a blue dye in the toilet bowl that indicates a water leak
- An activity booklet that teaches about the water cycle
- Paper Fix-It tickets that kids can issue to family members who waste water

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BEFORE



AFTER

MEASURES AND METRICS

The game and program have been popular with educators and the students. Since 2010, more than 50,000 students and hundreds of teachers have taken part. With the take-home kit and the knowledge they gain about conservation, kids can educate family members, extending the district's reach. The water savings from using the learning tools and information the kids are taught, average 20 gallons per person, per day, says Ancayan.

Students register on the district's website that they are implementing family conservation measures and are entered in raffles for prizes that include bacteria plush dolls, also featured during facility tours.

In 2022 alone, through the efforts of children and families, the district estimated savings of more than 500,000 gallons.

COMPREHENSIVE EDUCATION

The district has programs other than the Water Star Student Conservation Program that encourage students to conserve water. Staff members speak in classrooms and take part in school assemblies. A student art contest focusing on water conservation.

The district partners with schools to promote water careers, and staff members take part in school science, technology, engineering, art and mathematics programs and fairs. In addition, the district has a program in which students collect coastal water samples and work with staff to gain lab experience. The students analyze the samples for bacteria levels, and the data is published to encourage advocacy for watershed protection programs.

Ancayan was working at a school STEAM fairs when a student came up to her and told how much he loved the tour and how much he learned. She concludes, "We encourage all the students to consider a career in environmental science studies." tpo

TPO welcomes news about your public education and community outreach efforts for this column. Send ideas to editor@tpomag.com.



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Safe by Design

A 2023 GEORGE W. BURKE AWARD IS A TESTAMENT TO A SAFETY CULTURE AND EXTENSIVE SAFETY TRAINING FOR THE HANOVER PARK CLEAN-WATER TEAM AND PUBLIC WORKS DEPARTMENT

STORY: **Steve Lund** | PHOTOGRAPHY: **Rob Hart**

The award-winning safety record at the wastewater treatment plant in Hanover Park is partly a result of planning and training.

But Chris Rebone, wastewater superintendent, says the workplace culture also plays a big role.

“I’m proud to say that safety is an aspect of our work culture here that I greatly appreciate,” Rebone says. “For everyone, from the newest employee to the mayor, that it is in the forefront of our minds.

“We are firm believers in quality of work, not quantity. We know the job is going to get done. If it takes 10 more minutes to complete a task, it takes

10 more minutes because that means it’s done right, and done safely.”

As of September 2023, it had been more than six years since the plant had a lost-time incident. Hanover Park received a 2023 George W. Burke Safety Award from the Illinois Section of the Central States Water Environment Association. The facility was also recognized as the Plant of the Year from the Illinois EPA for 1994 and 2013.

Rebone thinks training and planning have a lot to do with that record. “We’re constantly re-honing the skills that we already know and that I’m proud to say we are incredibly good at,” Rebone says.



The team at the Hanover Park Sewage Treatment Plant includes, from left, Lance Winterland, Brian Wurst, Patrick Jablonski, Chris Rebone (wastewater superintendent), Mike Klaus and Scot Lichtenberger.

Brian Wurst and Scot Lichtenberger with the city's Vactor combination sewer cleaning truck.



“On top of that, village-wide, we require every employee to complete two to three online safety courses every month. We select classes based on the time of year. So we have defensive driving in summer, and winter safety in the snowing months when we’re plowing.”

In addition to Rebone, the team members at Hanover Park Sewage Treatment Plant No. 1 are plant operators Lance Winterland, Scot Lichtenberger and Mike Klaus, and equipment operator Jim Hedman. T.J. Moore is public works director.

THREE-PASS DITCH

The plant was built in 1970 and upgraded in 1985 when nitrification and excess flow facilities were added. In 1997 it was consolidated with Sewage Treatment Plant No. 2, which was converted to a pump station. The village straddles two counties. Plant 1 serves the portion in DuPage County, and the part in Cook County is served by the Metropolitan Water Reclamation District of Greater Chicago.

At Plant 1, influent goes through screening (Muffin Monster grinder, Headworks bar screen) and a PISTA grit chamber (Smith & Loveless), and then to a three-pass Orbal oxidation ditch (Evoqua Water Technologies, part of Xylem). The influent is mixed with return activated sludge in the outer ring. The second ring is an anoxic zone, and the Envirex inner ring is aerated (also Evoqua).

The flow then enters three 348,000 Tow-Bro secondary final clarifiers (also Evoqua). From the clarifiers the flow goes through a post-aeration tank to increase the dissolved oxygen before UV disinfection (Trojan Technologies) and discharges to the West Branch of the DuPage River.

SEASONAL CHORES

Besides day-to-day plant operation, there are seasonal chores, some (such as jetting and televising the sewer lines) handled by the regular staff and some (such as lining sewer pipes) handled by contractors.

“In summer, we are out in the field jetting and televising all the sewer lines in our town,” Rebone says. “We maintain 96 miles of sewer, so about a



The Hanover Park Sewage Treatment Plant No. 1 has a 2.42 mgd design capacity and treats an average flow of 1.56 mgd.

Hanover Park (Illinois) Sewage Treatment Plant No. 1

hpil.org/268/wastewater-treatment

BUILT:
1970, upgraded in 1985

POPULATION SERVED:
38,000 (collection system)

FLOWS:
2.42 mgd design, 1.56 mgd average

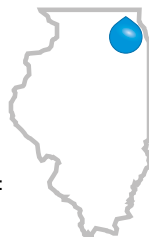
TREATMENT LEVEL:
Secondary

TREATMENT PROCESS:
Activated sludge

RECEIVING WATER:
West Branch, DuPage River

BIOSOLIDS:
Contracted dewatering, land application

ANNUAL BUDGET:
\$3.5 million



“ We have a common goal: Get the job done correctly and get everyone home safe. Every supervisor in public works is following the same belief.”

CHRIS REBONE



Chris Rebone, in black, and operator Lance Winterland use confined-space entry equipment in lowering Mike Klaus into a treatment plant storage tank for an inspection.



CCTV inspection is an essential part of sewer line maintenance for the team in Hanover Park. Brian Wurst controls the camera and records observations of pipe condition.

month before we know we're going to hit the busy season, we start practicing, going back over pretrip inspections on the Vactor truck. We lay out and inspect all the equipment. That gives us a chance to identify deficiencies and order replacement parts."

Sometimes Rebone brings in a manufacturer's representative to review proper use of the equipment, or sends some team members to manufacturer-sponsored refresher courses. But even with regular training reviews and safety courses, situations develop, such as breaks in sewer lines, that involve working very long hours, a safety hazard of its own.

"Emergencies happen, and overtime occurs, but we have rules in place," Rebone says. "An employee cannot work more than 16 hours in a 24-hour period. If they do hit that timeframe, they have to be off the clock resting for eight uninterrupted hours. There's no emergency that could happen where that person would come back into work. They're home, recuperating, getting ready for the next day."

ARMY TRAINED

Some people get their start in water treatment by going to a community colleges, university or engineering school. Chris Rebone, wastewater superintendent in Hanover Park, Illinois, started his career by joining the Army, where he spent 12 years as a water treatment supervisor.



Chris Rebone

His eight years of active duty and four years in the reserves, included two tours to Iraq and one to Afghanistan. While overseas he developed clean water sources for troops and local people.

"We developed wellpoints with mobile water treatment units," he says. "We filtered, chlorinated and processed water for different outposts. In Afghanistan, we assisted villagers in monitoring and protecting their wells from field contamination and runoff."

When stateside, he worked with units that distributed water for soldiers in training exercises:

"We would continuously train, working our mobile units. We had one piece of equipment able to desalinate. When I was stationed in Hawaii, we focused on training in desalination."

When he came back to Northern Illinois where he grew up, he was introduced to the wastewater side of the industry. "I initially thought I was destined to be a drinking water operator from all my training and experiences in the Army," he says.

"My first job out of the Army was for Illinois American Water, and it was there, as a relief operator, that I started getting experience in wastewater. I preferred the microbiology side of science and the field more than the chemistry side." He later earned an associate degree in science from Kishwaukee College and worked in St. Charles, Illinois, before moving to Hanover Park.

He continues to prefer working with wastewater: "Both have their challenges, but with wastewater, there's always something, always a challenge. Conditions are always changing based on weather and flows and the type of industry in town. It keeps you on your toes. I like being busy, and I like challenges."

“We are firm believers in quality of work, not quantity.”

CHRIS REBONE

The treatment plant team coordinates with other city departments to provide relief for those working long hours in emergencies. "All supervisors get together and game plan if we know it's going to be a long day or we'll need multiple crews," Rebone says. "We have a common goal: Get the job done correctly and get everyone home safe. I can tell you that every supervisor in public works is following the same belief."

MANAGING HIGH FLOWS

Hanover Park's plan-ahead style is evident in the handling of high-flow events. Since Rebone arrived in 2020, the plant has had no overflows despite numerous heavy rainfalls. One reason is that storage capacity was effectively increased by adjustments in plant operation.

Rebone says, "One of my first goals was to take a good look at the process and how we were operating, looking for efficiency gains. I realized that



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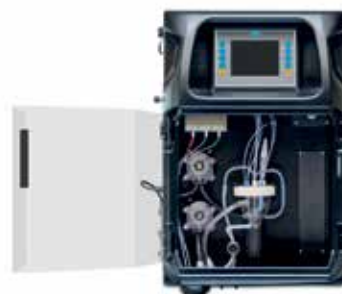
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Chris Rebone (right), shown with Patrick Jablonski, began learning the wastewater trade while serving in the U.S. Army.

we didn't need to have every available tank full. We could handle the capacity just in certain areas. Then when we have weather events, we reduce the number of callouts — people having to come in during a storm — because we created compensatory storage within the plant."

The staff has avoided overflows by anticipating problems likely to occur in a heavy rain or high wind event and making sure each team member has a step-by-step procedure to follow. "When we know we're going to have a high rain event, we make our changes as a group," Rebone says. "We walk through so everyone knows what changes have been made.

"Everyone's on the same page, and we have the plant set up so that if there is a call for a high tank level or a high flow rate, it will only require one person to come in. Then any changes needed as a result are done through the system. There's no physical, hands-on interaction. They're communicating with me when they get in, during the changes being made, and when they leave to go back home."

There are written standard operating procedures for high-flow events. Each pump station has a list of the top five problems likely to occur, and the operator has a step-by-step procedure for every one. The strategy was tested in August 2023 when heavy rains and high winds hit the area. Plant 1 made it through without any overflows.

"The staff did an amazing job preparing our standby generators for use during expected power outages," Rebone says. "We had two outages and were able to use the generators to keep two lift stations in operation. We leaned on experience and had set up an initial response crew with a backup crew on standby if needed. For those events we only needed one crew."

NEW TRAINING SITE

Hanover Park's emphasis on training is about to reach a new level. The village is developing a new training facility on the site of the former Plant 2.

"At the public works facility, we actually dig out and deploy the trench box and go through the procedures for that," Rebone says. "We're working to develop a training area at an offsite location where we plan to install different-sized pipe.

"That will enable us to train team members to operate the heavy equipment, to dig and deploy the trench box, and actually see it hands-on, seeing it go in. Then they can enter safely and start becoming proficient on installing repair clamps and new pipe."

The former plant site has lots of space and is used for multiple purposes, including providing space for people to keep beehives. In 2024 it will also be used for training, so the treatment staff can continue their streak of injury-free work. Other village employees will also use it.

"That will be public works-wide," Rebone says. "It will provide training opportunities for everyone." **tpo**

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SOME DAYS GET LONG

As much as the staff at Hanover Park, Illinois, Sewage Treatment Plant No. 1 tries to plan for every contingency, sometimes things just go wrong. That happened in summer 2021 when a sinkhole was discovered above a 16-inch force main serving thousands of people and several neighborhoods.

It looked like a simple repair at first, but while putting a repair sleeve on it, the crew discovered multiple breaks in the line, says Chris Rebone, wastewater superintendent. "We are always prepared for breaks," he says. "We have the trucks set up. The equipment is staged and checked out. We're prepared, but this kept growing and growing.

"Pretty soon I was talking to the public works director, and then the village manager because of the expense of hiring a contractor to complete the job. It was constant reacting, reacting, reacting. We never got a break in the action to sit back and say, 'OK, these are my next 10 steps.' Everything was a new hurdle."

To keep the system working, they had to use an excess flow basin and set up bypass pumping to a neighboring community. In the end, a contractor replaced about 100 feet of pipe. About 26 hours after the

sinkhole was discovered, everything was back operating normally.

"A 20-foot section of 16-inch pipe is incredibly heavy, and you need some pretty heavy equipment that we just didn't have," Rebone says. Part of the pipe was in a forest preserve, complicating the situation. Trees had to be taken down, and restoration had to be considered.

Rebone thinks his crew did a good job under the circumstances. "We take the time and effort," he says. "We put the energy into checking out our equipment and making sure things run and are properly maintained. We have repair clamps on the shelf ready to go. You can't prepare for that very specific incident, but you can do your very best to be pretty close, and we were. It was just a big project that grew some legs on us and started running away."

Rebone is philosophical about the event: "I'm actually thankful that it happened. Now we know exactly what to do if there's another break on that line. We have a written standard operating procedure on how to divert flow from the lift station, how long we can stay shut down, and a contact list of everyone to call. It led to us being incredibly prepared."



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CITY OF DULUTH IS STUDYING THE FEASIBILITY OF USING HEAT FROM THE LOCAL SANITARY DISTRICT'S WASTEWATER TREATMENT PLANT EFFLUENT TO WARM COMMERCIAL BUILDINGS

By Steve Lund

Raw sewage comes in warm to the Western Lake Superior Sanitary District due in part to some large industrial facilities.

That's fine with the operators of the district's 35 mgd (average) wastewater treatment plant, which serves Duluth, Minnesota. "Because we are a biological system, there is an advantage to the heat that comes in," says Marianne Bohren, executive director. "The treatment system handles that very well."

The heat in the effluent drew the attention of the city of Duluth, which received a \$700,000 grant from the U.S. Department of Energy to assess using some of that heat for buildings in a nearby commercial district. "If the heat can be captured and used for a higher purpose, that's great," says Bohren.

The plan being studied is to connect heat exchangers to the effluent stream and to warm water in a closed pipe that would run 1.7 miles away from the plant and back. The heat in the loop would be amplified with one or more heat pumps. More than 200 buildings could potentially connect to the pipeline loop, which would be buried under a street to be reconstructed in 2026.

SEEKING RECIPIENTS

Mindy Granley, chief sustainability officer for the city, says, "If you're going to do district energy, you might as well put those pipes in the ground when you have the street open." Doing that would make the project less expensive, but there are dozens of details to address in deciding whether the project makes economic and environmental sense.



Aerial view of the Western Lake Superior Sanitary District wastewater treatment plant. The effluent flows along the pier into the St. Louis River.



Warm effluent from the plant creates an area of open water in the frozen St. Louis River in Duluth. The city is using a U.S. Department of Energy grant to study the feasibility of using heat from the effluent to heat buildings in a commercial district.

"The funding we received is only for analysis and design," Granley says, "So the first step is to ask: Will this work? Is it affordable? And is it desired by the community? That's what the grant will help us do: Design it, analyze it, put some cost estimates together and work with community, including the businesses along the pipeline route to see if it's desired or not."

Working with the consulting firm Ever-Green Energy, the city expects to go building by building along the path of the heating loop to see which ones can use the heat easily, which would have challenges, and which may not want to connect at all. Most of the buildings along the loop are commercial or multi-family residential.

A Revenue Stream?

Deriving value from excess heat in a wastewater treatment plant's effluent stream isn't just a pipe dream.

Ken Smith, CEO of Ever-Green Energy, a consulting firm that has worked on projects involving the capture of heat from wastewater plant effluent, says more and more such projects are being proposed and pilot tested in the United States and Canada. There are also some very large projects in Europe.

"This is a growing area of interest," he says. "There can be significant carbon reductions and energy savings. There is a benefit to the facility as well, because if they're recovering heat out of the effluent, they're lowering the temperature of the effluent. There's certainly an environmental benefit to that."

But is there economic value to wastewater treatment plants that share

the warmth? "I think potentially there should be some monetization of the energy," Smith says. The value might come from the replacement of fossil fuels. Although Duluth's proposed project would require substantial investments, it could help heat numerous buildings, displacing a great deal of natural gas or coal.

There's another way to monetize the heat in effluent streams, Smith observes: "In Maryland, energy recovered from wastewater is considered renewable and counts toward some renewable energy credits. Those credits could have value that could be shared.

"We are very early in this effort, but it's carbon-free energy that we can use. We're very hopeful and bullish on the idea, not only in Duluth but in other locations as well."

“Part of the process is to analyze the buildings themselves,” Granley says. “When we wrote the grant application, we had 27 letters of support from businesses that are excited about the prospect of geothermal, because they’re looking to stabilize their heating costs over time.”

VARIABLE TEMPERATURE

Among many issues, the study will assess how potential changes in the temperature of the effluent might affect the heating district.

“Maybe these industries that are contributing heat to the effluent will find a way to recover their own heat and reuse it,” Granley says. “Then they wouldn’t be sending it to the district anymore. We’re having the consultants model it if all these industries are running, or if they are not running.”

There are also seasonal variations in the effluent temperature. Carrie Clement, manager of operations and maintenance at the district, says the effluent normally ranges from 75 to 90 degrees F, but in spring when snowmelt enters the flow, it can drop into the 50s.

The project could still be feasible with effluent temperatures at the low end of the range, says Ken Smith, CEO of Ever-Green Energy: “That is still a very good source of thermal energy. Of course if we’re going to use it for heating, higher temperatures are better. But in the Upper Midwest, typically where we see ground loops and ground-source heat pumps, they’re operating on the order of 55 degrees.”

SPACE CONSTRAINTS

Although the district has no need for the effluent’s heat after it leaves the treatment plant, the regional wastewater and solid waste authority does have concerns about the space required for any additional equipment needed. The plant is on the banks of the St. Louis River near where it flows into Lake Superior.

“We have a very limited footprint,” Clement says. “When we do capital improvement projects now, we’re often looking for how we are going to fit them in. We have future projects, too. If there is to be a heating system, it can’t interfere with our current and future processes.”

In fact, the district is already in the middle of a capital project. Since 2000 the plant has been using biogas from its digesters for heat. In 2024, three new Jenbacher engine-generators will be installed to use all the biogas for power production as well.

Smith thinks there are ways the district heating equipment could be fit into the wastewater treatment plant without interfering with the wastewater treatment process. “There are lots of ways to do it,” he says. “We’ll just have to pick the best solution. First, we don’t want to disrupt the process. Then we’re going to look at the most cost-effective and efficient location to put it in.”

DETAILS NEEDED

District Executive Director Bohren points out that heating buildings off the treatment plant campus is outside the district’s traditional mission: “We’re a regional wastewater treatment facility, but we certainly encourage this project to be evaluated as to whether it’s workable.

“We do heat recovery internally and have the opportunity to do more, but all the heat that’s coming in is more than we would ever use on site,” she says. “So, if there’s a way to make this work, we’re as interested as anybody. We’re cautiously optimistic,

but we need to know what it looks like and how it interacts with our cost structure, our operation and our space. Those details are not available yet.”

Granley realizes that many questions need answers before the project can get a green light.

“It’s a big idea with lots of moving parts,” she says. “Who’s going to run the system? What are the rates going to be? Who is going to reimburse whom? Where will the heat exchangers go? Where will the pipes go between the wastewater treatment plant and the neighborhood?”

“Funding from the Department of Energy helps us explore what the project showstoppers are and what the benefits are to our carbon-reduction goals and to the businesses. Can we reduce carbon and stabilize costs for energy? If we could do both, that would be pretty cool. But how does it work? That’s what this money is about, to explore those questions and de-risk the decision on whether to move forward.” tpo

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THE CLEAN-WATER PROFESSION IS IN DALE GRUDIER'S FAMILY BACKGROUND. THE FAMILY APPROACH EXTENDS TO HIS LEADERSHIP OF A MAJOR COLLECTION AND TREATMENT SYSTEM ON LONG ISLAND.

STORY: **Jim Force** | PHOTOGRAPHY: **Erica Schroeder**



The Bergen Point Wastewater Treatment Plant uses an activated sludge process with 40 mgd design capacity and plans to expand to 50 mgd.

Wastewater treatment is a family affair for Dale Grudier II.

Now director of operations and maintenance at the 40 mgd Bergen Point treatment facility serving Suffolk County Sanitary District 3 in West Babylon, New York, Grudier got his start by going out on sewer calls with his late father back in the 1970s.

He joined the Suffolk County Department of Public Works in 1985, helping operate the scavenger waste facility. Today he holds a 4A (highest) Wastewater Operator license and oversees a staff of 100.

His wife Donna is also an operator, in charge of the treatment plant at the New York village of Northport and president of the New York Water Environment Association.

Now his daughter Deanna is studying for her operator's license after starting out as an operator at another of Suffolk County's 26 wastewater facilities. She likes the profession and noting the similarity of the relationship Dale Grudier had with his father (see sidebar).

SPRAWLING SYSTEM

The Suffolk County Sewer District No. 3 collection and treatment system serves a densely populated area on Long Island, immediately east of New York City. It comprises more than 1,500 miles of sewers and keeps growing as new housing projects around the county are connected to the system.

Dale Grudier, director of operations and maintenance, wastewater treatment, Suffolk County Sewer District No. 3

“People generally don’t know it, but it’s amazing what we do here.”

DALE GRUDIER

The plant itself is a basic activated sludge process, operated in the contact stabilization mode. Originally designed for 30 mgd, it was built in the 1970s and brought online in 1980. It has since been expanded to 40 mgd, and plans are to expand to 50 mgd in the near future.

“We have eight influent pumps (Flowserve), capable of going up to 180 mgd,” says Grudier. The headworks include three Infilco Degremont climber bar screens (Veolia Water Technologies) and an airlift grit system (Walker Process Equipment). The plant has three of these systems, and they are rotated to keep them free of clogging.

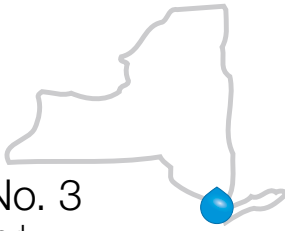
Eight primary tanks follow, and the overflow passes to 12 aeration basins equipped with fine-bubble diffusers (Aquarius). Treated water settles in a cluster of six circular clarifiers. The flow then passes through a four-channel UV light disinfection system (Trojan Technologies) before discharge to the Atlantic Ocean. “We have four large effluent pumps (Flowserve) to pump against the tide,” Grudier says. A small portion of the effluent is chlorinated and used around the plant.

Suffolk County recently finished a project to replace its outfall, boring a new 3-mile tunnel under the Great South Bay to replace a concrete line that was showing signs of rupturing. “The original line was trenched across the bay and environmentally we couldn’t do that again,” explains Grudier.

The solids operation has been updated as well. An old multiple-hearth furnace was shut down in 2004, and the county has been beneficially reusing its biosolids ever since. The solids are thickened on gravity belt thickeners (Alfa Laval) and dewatered on Ashbrook Winkle belt presses.

“Everything’s trucked out of here,” says Grudier. The material goes to landfills where there is a biogas recovery requirement, to mine reclamation or to composting sites. All electrical lines are directed to a SCADA system supplied by iFIX (GE Digital). “Howden provided the program to run our activated sludge process which ties into our SCADA,” says Grudier.

Dale Grudier II, Suffolk County Sewer District No. 3 Bergen Point, New York



POSITION:
**Director of Operations and Maintenance,
wastewater treatment**

RESPONSIBILITIES:
**Operate and maintain the treatment plant,
collections system**

YEARS IN PROFESSION:
36

EDUCATION:
**Associate degree, mechanical technology,
Suffolk County Community College**

CERTIFICATION:
Grade 4A Wastewater Operator

AWARDS:
**2022 William D. Hatfield Award, New York Water
Environment Association**

GOALS:
**Develop young staff, leave plant and collection
infrastructure in a healthy condition on retirement**



Dale Grudier displays one of the Operations Challenge trophies his plant's staff members have won over the years.



The plant's iFIX SCADA system was supplied by GE Digital.

BROAD RESPONSIBILITIES

Grudier is responsible “for pretty much everything that goes on here. Every time I got promoted, I got another swath of responsibilities.” Four managers report directly to him: George Mueller, director of operations; Jon Waring, director of maintenance; Felipe Gonzalez, collection system supervisor; and administrative staffers Dawn Peterson and Cheryl Goldman.

“We have a strong support team,” Grudier says. Getting and keeping operators and mechanics is his biggest challenge, and pay is the biggest issue: “We just lost an operator to the next county where a private company is operating the treatment system. The pay is better there.”

Grudier implemented pay increases about a year ago, but the issue remains at the crisis stage.

Finding the right kind of people is also difficult. “This is a new generation,” Grudier says. “We need the kind of person who says ‘I’ll be there’ when the phone rings at midnight.” Prospective operators have to work hard to pass tests and gain certification. A varied skill set is needed, too: mechanics, hydraulics, housekeeping, math, biology, chemistry.

“There are distractions today, and cellphones,” says Grudier. “Training is everything. We’re coping as best we can. We have our up-and-comers but right now we’re down six operators. It takes a special kind of person.”

DEVOTED CAREER

Grudier is exactly that kind. Following his family background and his time in the scavenger waste area, he transferred to the main plant as a trainee. He began taking courses that led to his license in 1988. He spent 14 years operating the multiple-hearth furnace. He made time to earn an associate degree in mechanical technology at Suffolk County Community College. He has completed NASSCO certification training and is pursuing collection system certification.

“We need the kind of person who says ‘I’ll be there’ when the phone rings at midnight.”

DALE GRUDIER

After the hearth furnace was shut down, Grudier took other positions, and by 2009, he was operations crew chief on the 11 a.m. to 7 p.m. shift. He was promoted to director of operations in 2017. When the director of operations and maintenance retired, Grudier took that position and also became responsible for the collections system.

He received the William D. Hatfield Award from the New York WEA in 2022. He has served on the Long Island Utility Operations and Maintenance Committee and is operator representative to the NYWEA board of directors

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LIKE FATHER, LIKE DAUGHTER

Dale Grudier's daughter Deanna, age 30, is following the family career path, studying for her operator's license while working in the Suffolk County wastewater treatment facility that serves the State University of New York campus at Stony Brook.

It didn't start out that way. She studied baking in college, but couldn't find a job in that field. So at her dad's suggestion and signed on at the Stony Brook treatment plant as a helper. That was eight years ago, and the position has enabled her to experience many tasks in the wastewater process.

"I've had a taste of everything in the last eight years, working for the different departments," she says. She appreciates that the job is close to her home, and the schedule works out well with her duties as a parent of two. On light duty during pregnancies, she's helped with paperwork, laboratory reports and permitting.

"I'm not sure I want to be the boss someday," she says. "I like this position. It's interesting. It's good to know that we are producing clean water for the community." The family clean-water tradition might well continue. "My son is five and he seems very interested in water," Deanna says. "He keeps asking if he can come to work with me."

and the Governance Council, where he was instrumental in educating members about the viability of the Professional Operator credential.

Outside the office, Grudier is a martial artist and holds a fourth-degree black belt in judo. He enjoys mountain bike racing, camping and relaxing with his wife and their children.

THE CHALLENGE

Nothing marks Grudier's career more than his involvement with the Operations Challenge, which brings operator teams from around the country together to demonstrate their skills and compete for top honors. "It's like a brotherhood," he says. "Everyone is into it, all together. It helps operators see other professionals, it involves all disciplines, it builds more pride among operators in what they do, and it takes away old stigmas about the profession."

For 10 years, Grudier was a member of the Long Island Brown Tide team. That enabled him to go out and educate the community about the importance of wastewater treatment. The team appeared on a TV station in Buffalo after the challenge was held there. Though no longer a member of an Operations Challenge team, he now judges local and national competitions.

He remembers his days as a competitor fondly: "It was a great learning experience. You're a team, and you cover the ins and outs of equipment. In the safety event, you learn the proper procedures. You work quickly, but especially in the lab event, you need to take the time to be exact. You don't want penalties."

COMMITTED TO EXCELLENCE

"You make a commitment to practice twice a week, and then every day leading up to the competition. When I was involved, I wanted to practice even more." Traveling around and meeting other operators was also rewarding: "You form connections, operators you can call and consult with if you needed to. It instills pride in our profession."

Grudier is most proud that several New York chapters have entered the competition. The state had four teams at the nationals in 2022. "Our younger operators are doing well," he says. "We're trying to promote the contest to chapters that don't yet participate."



Treated water passes through a four-channel Trojan UV3000 Plus disinfection system before discharge to the Atlantic Ocean.



The pump room at the Bergen Point treatment plant includes pumps from Flowserve.

Grudier can tell when a plant is sponsoring an Operations Challenge team, because that facility invariably looks sharp and operates well. That's important to him: "People generally don't know it, but it's amazing what we do here." He treats it like family. Because it is. **tpo**

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The Grandview plant crew displays an incentive check from the local utility for reducing aeration energy costs. From left, Ismael Montes, Kern Skinner, Michael Coronado, Dave Lorenz (plant superintendent), Tim Indicot and Eric Mandina.



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ENERGY-EFFICIENT MIXERS AT A WASHINGTON LAGOON FACILITY TAKE OVER WORK PREVIOUSLY DONE BY AERATORS, CREATING A FAST-PAYBACK PROJECT

By Harvey Hibi

Electricity can account for up to 40% of a wastewater treatment plant's operating budget and a significant share of a municipality's total energy bill.

Accordingly, many cities are focusing on saving energy and improving environmental performance. In Grandview, Washington, treatment plant superintendent Dave Lorenz and his crew did exactly that. Their efforts recently culminated in the form of a check for \$146,964 from the local power company's energy-saving incentive program.

The check was based on annual savings of some 620,000 kWh, enough to power about 55 homes. The energy savings came from adding mixers to the city's lagoon treatment system instead of relying solely on aerators.

The mixers distribute oxygen in the water column much more efficiently than aerators. With the energy savings along with revenue for treating wastewater from the area's food processors, Lorenz expects the facility to be revenue-neutral in two years, and after that revenue-positive.

MANDATE TO UPGRADE

Grandview, in south central Washington along the Yakima River, is a hub for fruit and vegetable processing: apples, cherries, grapes, hops, asparagus, corn, wheat and more. Major companies operate processing and cold-storage facilities that employ many of the community's 11,000 residents.

Changes to the wastewater treatment plant over time have reflected the needs of the growing region and best practices for wastewater management. In 2000 the state Department of Ecology required the city to move from spray fields and land-application to a U.S. EPA NPDES permit in order to reduce secondary pollutants in groundwater and enable discharge of UV-disinfected effluent to the Yakima River.

The city installed an 18 million-gallon aerated and lined lagoon that included eight 75 hp splash aerators (600 hp total) to generate and distribute dissolved oxygen. To keep the water suspended and circulating, Lorenz ran four aerators at a time, two on the east end and two on the west end, alternating the other four every 24 hours.

For a time, four aerators met the lagoon's oxygen requirements, but increased flows from a growing population and from the food processors — 60% of the load — added to the facility's BOD and TSS loads.

In addition, a six-week harvest season beginning late September increased the industrial discharges by 1 mgd, adding to the 1.5 mgd average flow and requiring all eight aerators to operate.

"As our flow increased and BOD and TSS loading grew, the eight existing aerators no longer fulfilled the function of oxygenating and mixing the water," says Lorenz. "We didn't really need to add that much more oxygen; we just needed additional mixing to have the solids come in contact with aeration. We thought we needed four more aerators for an additional 300 hp."

FOCUS ON ENERGY

However, a study from consultant Cascade Energy identified an alternate solution. "Our job was to calculate energy savings, estimate the potential Pacific Power incentives and encourage the city to invest in an energy efficiency upgrade," says Craig Phillips, senior engineer.

Cascade recommended adding four energy efficient mixers to take over the mixing function. That enabled the treatment facility to turn off half the aerators and save significant energy. "We were able to put



One of four SolarBee mixers being installed using a crane at the Grandview lagoon.



An aerial image shows location of the four new mixers as well as the eight aerators. After the mixers were installed to take over the mixing function, only two of the eight aerators operate at a time.

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in mixers with the 600 hp of aeration we already had," says Lorenz. Within a few days of operating the four utility-powered GridBee and sun-powered SolarBee mixers, along with four aerators, Lorenz knew he could shut off 150 hp of aeration.

Aerators are reasonably efficient at creating DO but inefficient at distributing it. That makes it expensive to operate aerators just for mixing. For 10 months of the year, the Grandview facility requires 80-90 hp to produce DO and 200-225 hp to distribute it. In harvest season it requires 250-300 hp for DO production and the same 200-225 hp for distribution.

"Not only have we reduced the need for four additional aerators," says Lorenz. "We are now operating only two, one on each end of the lagoon." The aerators are run alternately for 12 hours; the mixers run 24 hours.

FAST PAYBACK

"I'm excited about what has happened here," Lorenz says. "I knew that we would save some energy by not adding four aerators, but I was surprised we could cut our aeration needs in half — go down to two aerators instead of four." Another advantage to the mixers is that they are maintenance-free. "There are no bearings to grease; no monthly and annual maintenance."

The city expects the mixers to pay for themselves in two years from energy savings. Factor in the \$147,000 incentive check and the payback is closer to one year. That savings will help pay for a future update already being planned.

Adding two more 18 million-gallon lined lagoons will allow the facility to discharge all effluent to the river and mothball six existing unlined lagoons, completing compliance with the state mandate. With that update, Lorenz expects that, with mixing, the aerators will run every four hours instead of every eight hours.

"The biggest success of adding mixing to this project is dollars; the money we will be saving over the life of the facility," says Lorenz. "Energy prices will increase, but we will continue to save on that cost."

How Mixing Works

The water column in a lagoon splits into three zones: aerobic water (top), facultative slurry transition layer (middle), and anoxic sludge blanket (bottom).

Stratification occurs in the top two layers, especially in summer. Temperature stratification limits natural mixing, and much of the super-saturated dissolved oxygen in the top layer is lost to the atmosphere instead of being used for treatment.

Aerators pull water from a short distance in all directions; they can't pull water horizontally from a long distance. GridBee/SolarBee circulators pull water only horizontally, in a manner similar to pulling a rope.

They can pull the same density of water at a prescribed depth and mix the water column, usually from the surface to about four to eight feet deep, from all areas of a pond. This horizontal laminar flow enables mixing deeper into the aerobic layer without disrupting the sludge or slurry layers.

Efficient mixing pulls the BOD load to the surface, where it contacts the high DO from the aerators. Mixing improves, reducing short-circuiting and increasing detention time, thereby improving BOD and TSS reduction.

ABOUT THE AUTHOR

Harvey Hibl (harvey.hibl@ixom.com) is a mechanical engineer and regional manager with Ixom Watercare. **tpo**

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RENEWABLE ENERGY, BIOGAS, MICROGRIDS AND ADVANCING-GENERATION TECHNOLOGIES OPEN NEW OPPORTUNITIES FOR RELIABLE, COST-EFFECTIVE, RESILIENT HEAT AND ELECTRICITY

By Ted J. Rulseh

Imagine a clean-water plant where previously vacant land is now occupied by solar panels. Where biogas is captured in a combined heat and power system. Where different power sources are dispatched at variable times of day to take best advantage of fuel and electricity prices.

Scenarios like that are increasingly practical as power control systems become more sophisticated, as government and utility incentives make renewable energy more affordable, and as engine-generators advance in efficiency and emissions performance.

On top of that, drinking water and wastewater utilities do not need to build the considerable expertise needed to operate complex power systems. In a concept called energy as a service, third-party operators can remotely monitor and manage the entire operation, optimizing efficiency and cost while shrinking the carbon footprint in line with sustainability goals.

Michael Phelps, an energy technical professional with Caterpillar Electric Power, works with consulting engineers and contractors to support design for power projects that often integrate multiple energy sources. He talked about power generation trends and challenges in the water and wastewater treatment sector in an interview with *Treatment Plant Operator*.

tpo: In the big picture, what market developments have created more options for clean and efficient power for businesses and communities?

Phelps: One big change is the creation of tax incentives under the federal Inflation Reduction Act. There are significant incentives for reducing emissions, and not just for renewables. Natural gas, biogas and combined heat and power can qualify, and so can carbon capture. In addition, some generating technologies have advanced. For example, emissions from diesel engines now can meet the U.S. EPA's strictest Tier 4 requirements. Solar power, battery energy storage, microgrids — it all can be brought together to achieve optimum cost and efficiency.

tpo: Are there utility-based incentives also?

Phelps: Grid stability has become important as power demand has gone up. Utilities offer incentives for customers to help stabilize the grid by bringing generation assets on line or taking loads offline when requested.

tpo: What are some possibilities of special interest to wastewater treatment utilities?

Phelps: One of the biggest is reuse of biogas. A lot of plants flare it off, but that's not good for the environment. They can reuse it. They can clean up that biofuel and burn it in generator sets. If they don't have enough biogas to run the genset, they

can blend it with natural gas, run a CHP system and use that excess heat in place of a boiler they would normally be running. That reduces the carbon they would create from the boiler and also the energy cost to run that boiler.



Michael Phelps

tpo: What barriers stand in the way of more biogas development?

Phelps: Facilities need to have incentives to clean that biogas and utilize it. Right now the incentives are better to clean the gas and deliver it to the natural gas pipeline, as opposed to burning it in engines. We still see biogas gensets in operation, but not as much as at one time because of the way the incentives have changed.

tpo: What has changed to make solar power and energy storage more feasible?

Phelps: A big part of that is government incentives, without which wind and solar typically would not pencil out. But with the federal, state and local incentives available, renewable energy makes sense. You have to do the math. It depends on what state or what part of the country you're in, but the incentives are making it work. Another thing that has made a big difference is the increase in power density in solar panels and batteries. We get more power out of the same size installation, and the costs have come down.

tpo: Is demand for solar being driven in part by sustainability initiatives?

Phelps: Yes. To a large extent that means reducing the carbon footprint. The bigger the customer, the more carbon they produce, and the more they want to do it. There's a desire to be better stewards of the environment. There's often a lot of space around water and wastewater plant sites, and solar panels end up being installed there.



Two Caterpillar C3508 engine-generators fueled with biogas are part of a combined heat and power system that helps the Gresham (Oregon) Wastewater Treatment Plant achieve net-zero energy. The units provide a combine 800 kW capacity.



An aerial view of the Gresham treatment plant shows the 475 kW solar power array that helps the facility achieve net-zero energy.

tpo: Is it feasible to pursue a zero carbon footprint?

Phelps: Zero carbon footprint is a challenging goal. It's very hard to achieve solely through renewable energy, because in an emergency, if you need to run at midnight or it's not a windy day, the only thing you can do is run a generator. A natural gas generator has a lower carbon footprint than a diesel. One way to achieve zero carbon with an emergency generator is by using green hydrogen, which we enable, but today there isn't an established, widespread hydrogen infrastructure yet.

tpo: What is the current state of the art in energy storage for solar?

Phelps: Lithium-ion is the dominant battery technology today, and their cost has come down so much over the last decade that the economics are working at scale. Lithium-ion batteries are the best option for midsize commercial systems like those at wastewater treatment plants. Bidirectional inverter technology has advanced as well. All those pieces have come together to make solar energy packages economically feasible.

tpo: What is the function of bidirectional inverters?

Phelps: A smart bidirectional inverter is critical to a solar power system. It has to be extremely fast to charge and discharge the batteries. There are three types of systems with inverters. In grid stabilization, rapid-discharging batteries support fluctuations in the grid. In grid following, the batteries charge when there is excess energy, and then discharge when the sun goes down or the wind stops. In grid forming, the battery system with the inverter actually produces the utility grid, and the wind and solar sync with and follow the inverter. That is a microgrid application.

tpo: How would you define a microgrid for someone who has not heard the term before?

Phelps: The simplest definition is that you have multiple power sources that can operate together within a confined boundary and with a defined load. A generator can be part of that, but it doesn't have to be. It can include wind and solar, as well as hydro and any sort of utility power, to supply power to the load in the most economical fashion. Today's microgrid controls can tie everything together.

“With the federal, state and local, incentives available, renewable energy makes sense.”

MICHAEL PHELPS

area and asking, “Would this make sense for us?” Usually they can tell within five minutes whether the prospect is worth talking about. It does make sense in areas where the incentives are favorable. That's where energy as a service comes in.

tpo: What is involved in the energy as a service concept?

Phelps: Owners often need power and have opportunities, but they don't want to be in charge of knowing when to turn different power sources or different loads on and off. So a third party can come in and manage their assets remotely. There are different types of asset management. That could mean studying utility rates and doing day-ahead pricing, turning off some nonessential loads when it makes financial sense, starting gensets, or dispatching batteries. Knowing how to do that takes some pretty deep skills that facility owners typically don't have.

tpo: What other issues around power supply are top of mind today?

Phelps: Resiliency is a big issue. Water and wastewater treatment plants

tpo: How would you assess the viability of microgrids for treatment facilities?

Phelps: That starts with a feasibility study, which includes an understanding of the incentives. That is not something the average energy user is able to do, but many good consulting firms do that sort of thing every day. So it's a simple matter of calling a firm that knows the local

area and asking, “Would this make sense for us?” Usually they can tell within five minutes whether the prospect is worth talking about. It does make sense in areas where the incentives are favorable. That's where energy as a service comes in.



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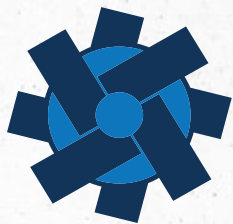


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The Atlas Copco logo is positioned in the top right corner of the advertisement. It consists of the company name "Atlas Copco" in a white, serif font, centered between two horizontal white bars. The background of the entire advertisement is a photograph of an industrial wastewater treatment plant. In the foreground, two large, dark grey industrial blower cabinets are situated on a concrete pad. A large, glowing green dome with a hexagonal grid pattern is superimposed over the blower cabinets. A glowing green padlock icon is centered between the two blower cabinets. In the background, there are various industrial structures, including a large circular tank and a building, under a clear blue sky.

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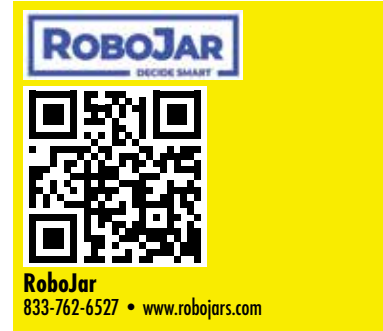
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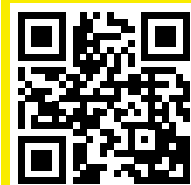
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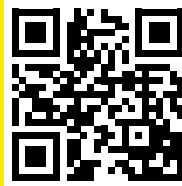
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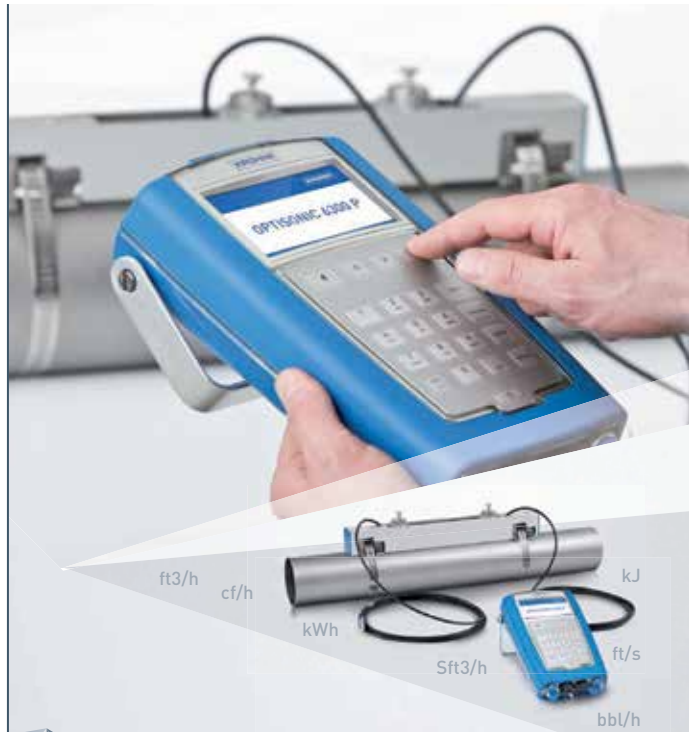
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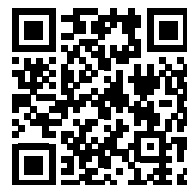
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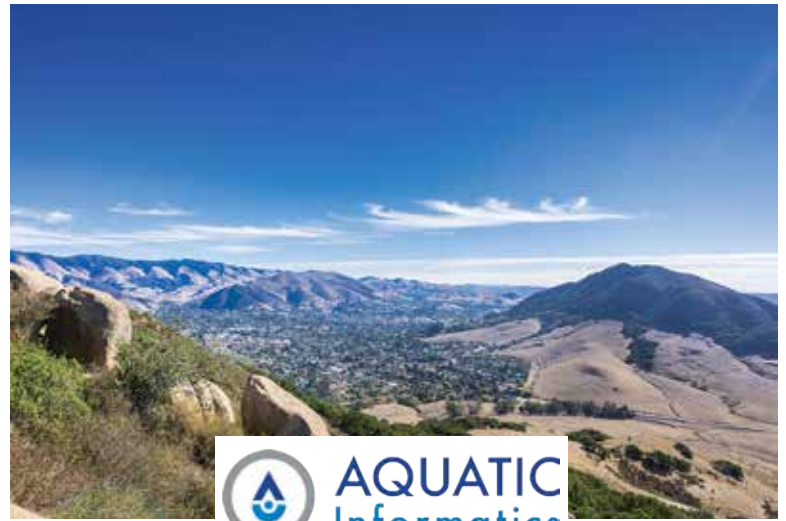
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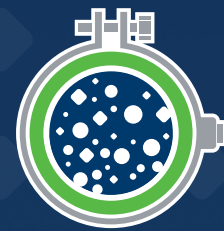
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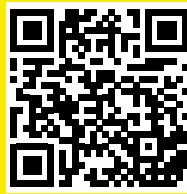
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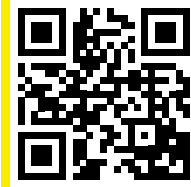
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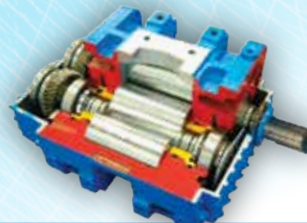
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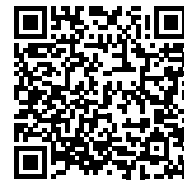
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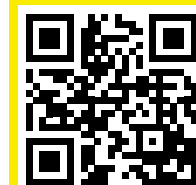
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Greg Golz joins DSI/Dynamatic as industrial sales specialist

DSI/Dynamatic welcomed Greg Golz as a new industrial sales specialist. Golz has more than 15 years' experience in outside and inside sales plus account management. He also has experience in technical support, purchasing and inventory management from several manufacturers and distributors in southeastern Wisconsin.



Greg Golz

Chris Hubbard promoted to PWTech vice president

Process Wastewater Technologies has promoted Chris Hubbard to the position of vice president. In his new capacity, Hubbard will work to expand the PWTech product portfolio and market presence in the U.S. and Canada as well as help streamline internal operations to improve customer service and support. Since joining PWTech in 2022, Hubbard has served as the joint business development manager and regional sales manager, helping guide the company through transitions in the wastewater treatment industry precipitated by tightening environmental regulations and a greater emphasis on efficiency. Throughout his tenure, Hubbard played a major role in increasing market prevalence of the Volute dewatering press, an optimized screw press that achieves both thickening and dewatering in a single compact solution, lowering dewatering operational costs.



Chris Hubbard

Centrisys/CNP opens new Engineering Innovation Lab

Centrisys/CNP announced the grand opening of its new state-of-the-art Engineering Innovation Lab. The facility is designed to enhance collaboration, streamline problem-solving and foster innovation across all engineering departments. The lab serves as a space for knowledge transfer and as a training ground for the next generation of engineers, helping to secure the company's future in an industry where experienced professionals are approaching retirement. The lab will cater to all engineering service needs, including product development, service, repair, and reverse engineering, facilitated through a collaborative approach.

Amphenol acquires AIRMAR Technology Corp.

AIRMAR Technology Corp. was purchased by Amphenol Corp., headquartered in Wallingford, Connecticut. Airmar is now part of the Amphenol Interconnect and Sensor Systems Division, joining several other sensor and interconnect businesses, and will continue to retain its headquarters location in Milford, New Hampshire. Since 1982, Airmar has developed and manufactured transducers for a diverse range of applications, including air-ranging industrial transducers, underwater scientific and survey transducers, weather sensing instruments and an extensive line of marine transducers. The company consists of Airmar Technology, Marport, MSI Transducers and Gemeco.

Finish Thompson announces personnel changes

Finish Thompson announced two key personnel changes to its sales force: Will Weathers was named the newly created national accounts manager position, and Tom Drury will serve as southeast regional sales manager. Weathers has been a sales leader at Finish Thompson since 2011, during which time he grew his region over 500%. Drury will serve as regional manager of FTI's growing southeast region. Previously with Harrington Industrial Plastics, Drury also worked in the aquatics supply industry at both Pentair and Global Aquaculture Supply.

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NETZSCH building new production plant in Brazil

NETZSCH Pumps & Systems is building a new production plant at its Brazilian manufacturing site to supply the global NOTOS multiple screw pumps market. The new plant will take over the entire global production of sanitary and industrial multiple screw pumps and allow for the expansion of the company's manufacturing of other product lines. The new 36,000-square-foot industrial building has 5,000 square feet of office space.

Cemen Tech appoints Ashley Lathrum as director of marketing

Cemen Tech has appointed Ashley Lathrum as its director of marketing. In this role, Lathrum will oversee Cemen Tech's global marketing strategy and execution across all segments. With a degree in organizational and business communications from the University of Northern Iowa, Lathrum brings over 10 years' B2B marketing experience to Cemen Tech, most recently from John Deere Power Systems. **tpo**



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OZ Lifting Products stainless series

OZ Lifting Products' stainless steel range includes chain hoists, lever hoists, trolleys and beam clamps all designed for use in corrosive environments. The centerpiece of the line is the stainless steel chain hoist, which is lightweight — meaning minimal effort is required to lift loads — yet durable enough for industry's most demanding applications. The hoists feature fully enclosed gearing; a fully machined lift wheel; a weather-proof holding brake; roller bearings on all gears and shafts; and forged stainless steel hooks with safety latches. Chain hoists, like the trolleys, are available in 1/2-, 1- and 2-ton capacities. The stainless push beam trolley fits most I, S and W beams and has precision ball-bearing trolley wheels. The beam clamps are available in 1- and 2-ton capacities. All products in the line are made from 304 stainless steel and come with individual test certificates and serial numbers.

800-749-1064;
www.ozliftingproducts.com



Torrey Pines Scientific EchoTherm SC20 and SC25 dry baths

Torrey Pines Scientific has introduced two new EchoTherm models. The SC20 is a simple digital unit while the SC25 is a fully programmable unit with a five-program memory. Both have a temperature range from -4 degrees to 212 degrees F and incorporate a variable speed orbital shaker for mixing and controlling the temperature of samples simultaneously. Both units have a 30-day countdown timer with alarm and

product spotlight wastewater

Aerobic treatment system provides stable operation in small footprint

By Craig Mandli

Stable operation and flexible process options are important factors in choosing an aerobic wastewater treatment system. The **Model R OXIGEST** from **Smith & Loveless** fills those needs as it can be tailored to meet the specific requirements of municipal wastewater treatment.

Its capital and operational cost-saving tank arrangement comprising integral biological treatment zones eliminate expensive pumps and yard piping while minimizing installation expenses, land usage and construction time. In addition, the system is smartly automated and conveniently accessible, and is flexible enough to meet current and future municipal project effluent requirements.

"Its concentric tank design minimizes capital costs like installation, land usage and construction time," says William Flores, vice president of Smith & Loveless' Municipal Division. "These field-erected steel treatment plants install more quickly and cost-effectively through quality-controlled manufacturing and time-efficient onsite plant erection."

An inner secondary clarifier is surrounded by an outer ring of biological treatment, optional flow equalization and sludge storage zones, yielding a smaller total footprint because the need for multiple separate concrete tanks and related yard piping and conduit are eliminated. Smith & Loveless integrates smart automation for process operation, and the system's instrumentation is conveniently accessible, making operation and maintenance simple. Moreover, according to Flores, long-term maintenance and associated



Model R OXIGEST from Smith & Loveless

life cycle costs are less than half compared to conventional concrete plants.

"The concentric tankage and flexible process options — including MBR filtration — make it capable to meet a variety of domestic treatment needs in a single compact package, making it ideal for smaller to medium-sized municipalities, private developments, federal and military facilities, and commercial operations," says Flores. "For large metropolitan regions that desire to scalp wastewater streams to reuse water for parks and public golf courses, it offers a space-efficient footprint for volumes greater than 100,000 gpd."

Flores says that the system's relatively simple installation is one of its biggest strengths among customers. "Many tell us they appreciate the complete project support and value-added services, including the initial process sizing recommendation when needed, as well as the CAD/3D concept drawings, process and flow diagrams, field erection services, start-up services and on-site operations training," he says. **800-898-9122; www.smithandloveless.com**

auto-off, data logger and RS232 I/O port for data logging or controlling the units from a computer. Both models are Peltier-driven, with control to 34 degrees F, shaking range from 200 to 1,000 rpm and have a backlit two-line alphanumeric display.

866-573-9104;
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Vogelsang HiCone pumps

The HiCone progressive cavity pump from Vogelsang enables precise adjustments and was designed

to maintain consistent conveying capacity and pressure resistance. The HiCone pump is suitable for applications in environmental wastewater applications as well as most industrial settings. The conical shape of the rotor and stator enables consistent sealing line compression through the pump life cycle. While static, the rotor and stator are positioned relative to each other to minimize compression between the two, requiring a smaller motor to start the pump as compared to a conventional progressive cavity pump. This greatly reduces the start-up torque of the pump, which in turn improves energy efficiency. The pump can be flexibly readjusted to suit a broad

range of pumping tasks and operating parameters, providing solutions for demanding applications.

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Fluoramics sprayable HinderRUST protector

Fluoramic's new sprayable version of HinderRUST cable and metal rust protector offers ease of applica-

tion. It can be sprayed through off-the-shelf chemical-approved squirt bottles or garden sprayers. Hinder-Rust offers both short-term and long-term penetrating protection against flash rust, pitting and corrosion, and does not evaporate away. It is removable through normal finishing procedures such as power washing, or cleaning with acids and chemicals. The sprayable HinderRUST can also be used as a lubricant during nut/bolt and final product assembly to prevent rust, metal seizures and galling. **800-922-0075; www.fluoramics.com**



Emerson Fisher easy-Drive 200R electric actuator

Emerson has introduced the Fisher easy-Drive 200R electric actuator for use on Fisher butterfly and ball valves. The 200R calibrates itself when a user clicks one button using the easy-Drive Configurator Software, provided free of charge with the actuator. The actuator operates in temperatures as low as -40 degrees F, eliminating the need for a space heater in all but the most extreme temperature applications. It offers real-time monitoring of position, movements, cycles, travel time to position and power loss available via a Modbus RTU serial interface. **800-972-2726; www.emerson.com**



Smith & Loveless PISTA VIO grit removal chamber

The PISTA VIO (variable inlet outlet) grit removal chamber from Smith & Loveless features a versatile chamber design that brings grit removal performance to tight spaces with unique layout requirements. The innovative design of the PISTA VIO provides the ability to arrange

the inlet and outlet channels at any angle up to the full 360 degrees of the chamber. The chamber achieves 95% grit removal efficiency of particles down to 100 microns in size, across all flow conditions. Its flow maximizer baffle and tunnel system create an effective vortex flow pattern, while the effluent flume counteracts the weir effect, significantly reducing grit bypass. With a 5:1 turn-down capability, the PISTA VIO delivers exceptional performance and reliability during low-flow, average daily and peak flow conditions without derating. **800-898-9122; www.smithandloveless.com**



Watson-Marlow Qdos H-FLO chemical metering pump

Watson-Marlow Fluid Technology Solutions has launched the Qdos H-FLO chemical metering and dosing pump, designed specifically for higher flow rates up to 158 gph. Qdos H-FLO is designed for higher flow rates with a variety of pump heads and a range of different tube materials to ensure chemical compatibility with the process fluid. The pump offers pressure capability up to 102 psi. Qdos H-FLO is supported with an optional pressure sensing kit that provides real-time pressure monitoring, which ensures process security and improves safety. **800-282-8823; www.wmfts.com**



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effluent flows and in surface water storage systems, including ponds, lakes, reservoirs, canals and streams. The analyzers feature an advanced ion-selective electrode sensor, which is designed for multiple parameter nutrient nitrogen water quality measurements. This versatile double-duty ISE sensor seamlessly connects with either ECD's intelligent T80 transmitter or LQ800 multi-channel transmitter to provide a total system solution for highly effective and economical nutrient management. The HYDRA-DS feature auto-compensation circuitry for interfering ions and temperature compensation, rugged PVC construction with easily replaceable electrodes and a built-in spray cleaner that minimizes expensive technician maintenance for a lowest total cost of ownership. **800-729-1333; www.ecdi.com**



Pentair solids handling pumps with advanced hydraulics

Pentair released its new line of next-generation submersible solids handling pumps. Featuring a hydraulic design built to protect wastewater systems from the clogging challenges presented by modern flushables, this new range of pumps provides superior clog resistance while reducing energy consumption and the need for regular maintenance. Designed to prevent clogs,

these pumps feature a semi-open impeller and cutter plate combination that provides superior clog resistance. An all-new hydraulic design requires less horsepower to meet specific duty points. Built with servicing in mind, the pumps require no regular maintenance. The pumps come in multiple sizes ranging from 10 to 40 hp and 3-, 4- or 6-inch discharge configurations.

763-656-5589;
www.pentair.com tpo



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product spotlight *water*

Large-size check valves a fit for water industry

By Craig Mandli

Wafer check valves are essential devices employed in regulating and controlling the flow of water within water and wastewater treatment plants. Their simple yet effective design allows for quick and precise adjustments, making them ideal for managing the diverse and dynamic conditions encountered in treatment processes.

Hayward Flow Control recently announced the addition of large **10- and 12-inch sizes** to its **WCV Series Full Pattern Wafer check valve line**. The large diameter WCV Series features a thermoplastic injection molded construction with a revolutionary angle seat and disc design. Integral bolt eyes and hand grip are molded into the body for ease of installation and safety. The unique seat and disc design allows for high flow capacities exceeding other thermoplastic wafer checks, and equal to or better than most metal wafer checks, according to Dave Stewart, director, business development and international sales for Hayward Flow Control. The full pattern design also eliminates the need for spacers or specialty flanges allowing for easy installation.

"The WCV Series is designed for multiple market segments, including aquariums, aquaculture, waterparks, municipal water and wastewater, clean water technology, as well as chemical handling," he says. "Basically, they would fit any applications where corrosion and chemical resistance or sensitive media is an issue."



10- and 12-inch sized WCV Series Full Pattern Wafer from Hayward Flow Control

The 10- and 12-inch valves are available in PVC and CPVC materials. Both sizes have maximum pressure rating of 150 psi nonshock at 70 degrees F and fit ANSI 150 Class flanges. The 10-inch size DN250 valves will also fit PN10 flanges.

"PVC and CPVC materials provide excellent chemical and corrosion resistance," says Stewart. "We then offer the o-ring seals in EPDM and FPM materials as such to meet the chemical resistance required."

Other key features include a one-piece disc and shaft design, O-ring disc seal, 316 stainless steel or Hastelloy springs, FPM or EPDM O-ring face seals, lower closing pressure than swing check valves, no exposed fasteners or retainer clips, the ability to install in a vertical or horizontal position, and ease of repair.

"When we first developed the design for the 2- through 8-inch sizes, we did customer surveys to end users, engineering firms and maintenance staff as part of our voice of the customer research," says Stewart. "The goal was to have the best flow rate in the industry and compete against more expensive swing check valves, which it has done very well."

888-429-4635; www.haywardflowcontrols.com

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Christen Wood
 Operations Administrator
 Upper Tuscarawas Wastewater Treatment Plant, Akron, Ohio



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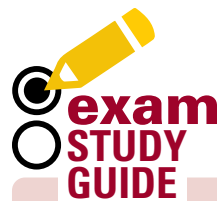
Presenter:

Mark Drake
 Digital Services Manager



Mark has worked in the wastewater
 industry for 25 years, including his
 last 14 at Veolia. His experiences
 include process design, start-up and
 troubleshooting of wastewater
 facilities, product and project
 management and in his current role,
 Mark is responsible for Veolia Water
 Technologies’ Hubgrade line of
 digital services for the water industry
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BLOWERS

Sutorbilt Legend 5LV PD Blower, Low-Pressure, Gas Model, Vertical. \$4,335.95 NEW. 4"NPT inlet/outlet, 1.125" shaft, 225 lbs. Includes universal mounting feet. Ships motor freight. **800-548-1234 (mention 11038)**. Full details: usabook.com/11038 (T05)

ROOTS Universal RAI Blower. \$5,499.47 NEW. Size 76, 4" NPT, 1.562" shaft. Oil lube on gear end, grease lube on drive end. Ships motor freight. **800-548-1234 (mention 49091)**. Full details: usabook.com/49091 (T05)

Republic Regenerative Blower Package w/ Enclosure, KPHRC1000. \$6,144.95 NEW. 3PH, 220/440V, 15hp. 2.5" inlet/outlet, 40A @220V, 353 CFM, 248 in-H₂O pressure. Ships motor freight. **800-548-1234 (mention 23470)**. Full details: usabook.com/23470 (T05)

2-1/2" Grundomat Boring Tool 65P (Tool Only), GP0650030. \$4,969.95 NEW. 2.5"Dia x 52"L. 25CFM. 460 strokes/min. **800-548-1234 (mention 37065)**. Full details: usabook.com/37065 (T05)

JETTERS

General Sewer Jetter/Pressure Washer, JM-3055-A. \$5,454.00 NEW. 480 cc motor/engine; triplex pump (3000 psi, 5.5 gpm); 3/8" x 250'L hose; pneumatic tires. JN-80 nozzle set. Ships motor freight. **800-548-1234 (mention 68899)**. Full details: usabook.com/68899 (T05)

MISC

Corepoint Glass Door Refrigerator, NSWDR231WWG/O. \$5,368.00 NEW. 23 cu ft, 115VAC, 60Hz. 1.0 to 10.0°C, ±0.1°. 26.88"W x 82.5"H x 34.75"D overall. 5 shelves. Ships motor freight. **800-548-1234 (mention 90268)**. Full details: usabook.com/90268 (T05)

Actuated AWWA Flanged Butterfly Valve. \$5,358.95 NEW. 10" FLG x FLG. 8"OL, 12 bolts, 200 psi. Ductile iron. 110VAC actuator. AWWA C504 certified. **800-548-1234 (mention 36161)**. Ships motor freight. Full details: usabook.com/36161 (T05)

Generac Mobile Trailer-Mounted Generator, MMG25IF4-STD3. \$19,999.95 NEW. 100-gal diesel fuel tank, 42.9-hr runtime, 23/29 kW/kVA standby, 35/81A @ 480/208V. Ships from Waukegan, IL or pick up. **800-548-1234 (mention 57790)**. Full details: usabook.com/57790 (T05)

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WASTEWATER

By Rick Lallish

When operating a membrane bioreactor (MBR), what is the difference between fouling and clogging when troubleshooting the process?

- A. There is no difference between the two problems
- B. Fouling is the condition of inhibited bio-growth on the membrane; clogging is the opposite.
- C. Fouling is inhibited permeation of water through the MBR membrane; clogging is found in the clarifier
- D. Fouling is excessive bio-growth on the membranes; clogging is inorganic material on the membranes.

ANSWER: D. MBRs are very effective forms of wastewater treatment. There are two major problems in operating them: fouling and clogging. Fouling occurs when the membranes become coated with organic growth and the permeate is inhibited or cannot pass through the membrane. Fouling is typically removed using a chemical cleaner. Clogging consists of organic debris (rags, hair, trash) that entangles in the membranes and has to be physically removed periodically; otherwise the membranes will be damaged or destroyed. More information may be found in the WEF textbook: *Wastewater Treatment Fundamentals III: Advanced Treatment*, Chapter 6.

DRINKING WATER

By Drew Hoelscher

What solution weighs 10.8 pounds per gallon?

- A. 48% Al₂(SO₄)₃ with a specific gravity of 1.3
- B. 12.5% NaOCl with a specific gravity of 1.22
- C. 20% HCl with with a specific gravity of 1.08
- D. 40% NaMnO₄ with a specific gravity of 1.39

ANSWER: A. Understanding the relative density of a solution is beneficial for chemical feed applications. The density of a chemical solution is a measure compared to the density of water. These measurements can fluctuate due to temperature and atmospheric pressure, so an operator should consider this when comparing a field measurement to a Safety Data Sheet. Specific gravity is often measured using a hydrometer, which can be converted to pounds per gallon by multiplying the specific gravity reading by 8.34.

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



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people/awards

The **Burrillville Wastewater Treatment Plant** received the U.S. EPA 2023 Regional Wastewater Treatment Plant Operation and Maintenance Excellence Award for Rhode Island.

Ozzie Johnson, water and wastewater operator in Tulsa, Oklahoma, received the City Star Award of Safety Excellence from Mayor G.T. Bynum. The city said that while working on a water leak, Johnson noticed a person caught on the railroad tracks while a train was approaching and acted quickly to help the person off the tracks.

The **Ashland (Kentucky) Water Treatment Plant** received a 2023 Certificate of Excellence in Water Quality from the State Area Wide Optimization Program. The plant was listed in the top 1% for best water quality in the state.

Lake Havasu City achieved the Voluntary Environmental Stewardship Program Bronze Level at its Island Wastewater Treatment Plant, awarded by the Arizona Department of Environmental Quality.

Gerald Faulkner, water treatment plant operations supervisor in Kannapolis, received the 2023 A-Surface Operator of the Year award from the North Carolina Waterworks Operators Association.

John Kothenbeutel, public works director in Sartell, Minnesota, retired 30 years to the day after he was hired in 1994.

The **Mission Springs Water District** received awards for Small Plant of the Year and Community Engagement and Outreach Project of the Year from the California Water Environment Association and its Colorado River Basin Section. **Joey McElrone** was named 2023 Collection System Person of the Year.

Rosemary Menard, water director in Santa Cruz, California, retired after a 43-year career in local government and water utilities. She had served as water director since 2014.

Janna Orkney, an 18-year member of the Triunfo Water and Sanitation board of directors, resigned from the eastern Ventura County (California) agency.

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events

May 1-3

Pacific Northwest AWWA Section Annual Conference, Spokane, Washington. Visit www.pnws-awwa.org.

May 5-7

Ontario Water For The Future Conference and Trade Show, Niagara Falls Convention Centre. Visit www.awwa.org.

May 6-8

Ohio Rural Water Association 2024 Annual Training Conference, Embassy Suites, Dublin. Visit www.ohioruralwater.org.

May 6-8

2024 American Public Works Association Oklahoma/Oklahoma Water Environment Association Joint Technical Conference & Trade Show, Renaissance Tulsa Hotel and Convention Center. Visit www.owea.org.

May 6-10

New Jersey WEA Annual John J. (Jack) Lagrosa Conference and Exposition, Harrah's Atlantic City. Visit www.njwea.org.

May 7-9

Alaska AWWA Section Annual Conference, William A. Egan Civic & Convention Center, Anchorage. Visit www.awwma.org.

May 8

Part 1: AWWA Distribution Systems Unregulated Inorganics and Why You Should Monitor Them webinar. Visit www.awwa.org.

May 8-9

Vermont Rural Water Association Annual Conference, Lake Morey Resort, Fairlee. Visit www.vtruralwater.org.

May 8-9

Annual U.S. Water Treatment Conference, Doubletree by Hilton Orlando Downtown, Florida. Visit www.lmnpower.com.

May 13-15

Pennsylvania AWWA Section Annual Conference, Lancaster Marriott. Visit www.paawwa.org.

May 13-16

BIOGAS AMERICAS 2024, Savannah Convention Center, Georgia. Visit www.biogasamericas.com.

May 15

Part 2: AWWA Distribution Systems Unregulated Inorganics and Why You Should Monitor Them webinar. Visit www.awwa.org.

May 19-22

West Virginia AWWA Section Annual Conference, Daniels. Visit www.wvawwa.com.

May 20-22

New York Rural Water Association Technical Training Workshop & Exhibition, The Turning Stone Resort & Conference Center, Verona. Visit www.nyruralwater.org.

May 22

AWWA Regional Water Distribution Models - What, Why, and How? webinar. Visit www.awwa.org.

May 22-24

Connecticut AWWA Section Annual Conference, Manchester Village, Vermont. Visit www.awwa.org.

May 28-31

2024 Mississippi Rural Water Association Annual Management & Technical Conference & Exhibition, MS Coast Coliseum & Convention Center, Biloxi. Visit www.msrrwa.org.



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