TREATMENT PLANT OPERATOR
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DEDICATED TO MUNICIPAL WASTEWATER PROFESSIO
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DECEMBER 2013

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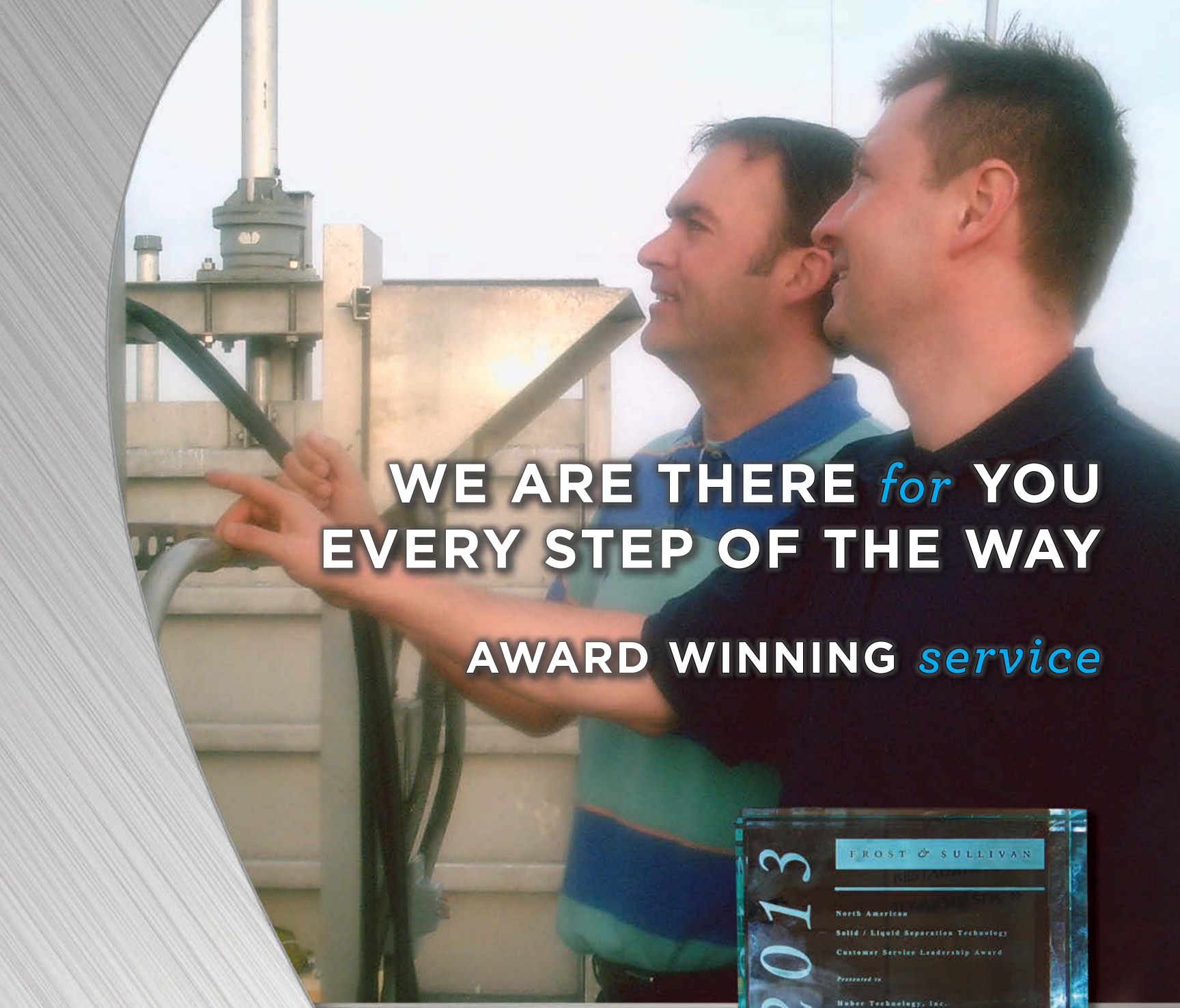
The egg-shaped digester at the Grandville (Mich.) Clean Water Treatment Plant allows better circulation of biosolids, enabling improved treatment and reducing maintenance. It also gives the plant the capability to make use of biogas. Todd Wibright is plant superintendent. (Photography by T.J. Hamilton)



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Beating Test Anxiety

FOR THOSE IN THE CLEAN-WATER BUSINESS, EXAMS DON'T END WITH HIGH SCHOOL OR COLLEGE. DO YOU STILL GET NERVOUS WHEN SITTING DOWN WITH THAT LICENSING TEST?

By Ted J. Rulseh, Editor

I have this dream often — I am told it's common. I wake up in my college dorm room. It's final exam week. I have to take a couple of exams, but I remember that I haven't attended the classes or cracked the textbooks for several weeks. What am I going to do?

Now, I have no reason to worry about tests — I don't have to take them anymore. Anyway, in real life, I wasn't all that anxious about them. But in the clean-water profession, exams are part of life. At least they are if you want to move up to higher levels of licensing or get certified in new areas.

And some people simply struggle with tests. To them, the thought of sitting for an exam is as frightening, and as paralyzing, as some people's fear of speaking in public. There are people in this world (and in the clean-water business) who are highly intelligent yet can be derailed by poor performance on exams, just because they're nervous.

EXCELLENT REMEDY

One of the best antidotes to test anxiety is confidence, and you develop that by, to put it simply, knowing your stuff. I remember when I took my Graduate Record Exam (GRE) after college. The results of that test would say a great deal about whether I could get into the graduate school of my choice, so there was quite a bit of pressure.

So, I picked up a book designed to help prepare for the GRE. It was full of questions — math and verbal — much like those I would encounter on the actual test. I went through dozens and dozens of them. So when test day came, my brain was wired for the kinds of riddles, curveballs and tricks the test writers would send my way. And I did well.

With that in mind, TPO this month offers our first Exam Tutor column. The aim each time is to take an exam topic that trainers say bedevils clean-water operators, explain it in detail and then include a few sample questions of the kind found on licensing exams.

A FEW TIPS

Of course, a few magazine columns alone won't cure test anxiety. So here are five tips for beating the nerves, drawn from experience and various sources on the Internet.

1. Don't cram. Once, a few days before a long bicycle ride, my riding buddy told me, "Don't bother trying to get in shape now. The condition you're in today is what you'll have to work with." It's more or less the same with testing. You can't pack your head with information the night before and expect to ace the test. By far your best preparation is good study habits. Learn the material step by step, learn it well and you'll be ready.

You can't pack your head with information the night before and expect to ace the test. By far your best preparation is good study habits. Learn the material step by step, learn it well and you'll be ready.

2. Take care of yourself. Don't party the night before. Get a full night's sleep. Have a good breakfast. Be well hydrated. Nothing will shatter your concentration like hunger, sleepiness, a caffeine buzz or a self-inflicted headache.

3. Turn anxiety to your advantage. Properly channeled, stress can be a form of positive energy. A college counselor once told me before a job interview to welcome nervousness because, "If you're not nervous, you're not up." The energy that comes from well-directed nervousness is a reason some top athletes perform best under pressure.

4. Breathe. Once in the exam room, take some slow, deep breaths. Rapid breathing will kick up your heart rate and set your brain racing off. Slowing your breathing will slow down your pulse and help you keep your brain focused.

5. Think good thoughts. Henry Ford said: "Whether you think you can't or think you can — you're right." And then these poetic words attributed to author Napoleon Hill:

Life's battles don't always go
To the stronger or faster man,
But sooner or later the man who wins
Is the one who thinks he can.

WHAT TOPICS TROUBLE YOU?

Now that you know a bit more about how to prepare for testing, have a look at our Exam Tutor column. What do you think of it? Might more such columns help you? What are some topics where you could use a little extra help?

Share your ideas by sending an email to editor@tpomag.com. I promise to respond, and we'll use your comments in creating future articles for Exam Tutor. For now, best of luck with your next exam. **tpo**

IDEA OF THE MONTH:

Of Hand Soap and SSOs

By Ted J. Rulseh

Soaps in multiple shapes and colors help raise awareness of the need to avoid pouring oil and grease down drains.

Rob McElroy doesn't believe a clean-water agency should keep a low profile. "We don't want to go into a prevent defense like every NFL team, which then goes on to lose in the last two minutes," says McElroy, general manager of Daphne (Ala.) Utilities.

His public outreach programs include — of all things — handing out cakes of soap at public gatherings. Believe it or not, the soap helps energize a household grease recycling program that has reduced sanitary sewer overflows by 70 percent since 2006.

McElroy's approach to SSO prevention is similar to fire departments' approach to fire prevention: Make people aware of the issues and encourage them to do small things at home for their own and the public's benefit. The program supports the two key aims of the Fire Chief Project:

- Raise clean-water operators to the stature of the fire chief
- Make kids grow up wanting to be clean-water operators

MAKING THE CONNECTION

The soap give-away has its roots in a biodiesel project. As McElroy explains, Daphne Utilities had been under a consent decree from Alabama Department of Environmental Management to reduce sewer spills.

Daphne, a city of 25,000, has about 100 restaurants and 11,000 homes. A grease ordinance keeps the restaurants in compliance; grease blockages in the sewer lines — the main source of spills — were caused mainly by homeowners dumping used cooking oil and grease down the drain.

The utility started its grease recycling program in 2005, giving people sealable gallon jugs to collect grease and setting up drop-off stations around town. At first the oil was sent to a renderer, but then Kevin Bryant, wastewater treatment plant manager, suggested using it to make biodiesel fuel. McElroy ran with the idea, and eventually the utility was producing about 400 gallons of biodiesel per month.

A byproduct of the fuel-making process is glycerin (a sugar alcohol), which at first was simply poured into the digesters as "candy for the bugs," says McElroy. "Then one day my wife said, 'I used to make soap with glycerin and lye like my great-great-great-grandmother used to make and it is really popular these days. Have you ever thought of making soap with your glycerin?'

COMPELLING STORY

"I thought that was a cool idea, so we started making little glycerin soaps. We color them, put perfume in them and mold them into animal shapes, stars, hearts and fish. We give them out in schools and say, 'Now go home and tell mom when she's frying that chicken, don't pour that oil down the sink. Bring it to Daphne Utilities. They can make gas and soap out of it.' It's the coolest little program, and it just grabs the attention of everybody.

"I've never gone to a street festival or fair and had my wife grab my hand and say 'Honey, look, it's the man who runs the sewer system — I've always wanted to talk to him!' But I can set up a folding table anywhere, dump a bunch of these soaps out, and almost immediately have a line of people coming up and saying, 'What's that? You make soap out of what? Can I recycle my oil too?' And I say, 'Yes you can — let me help you get started.'

"We can tell customers a compelling story that energizes them into doing small things at home that help our system, rather than doing the convenient, easy thing that hurts our system."

Not long ago, a parent asked whether soap made from a recycle stream that includes peanut oil might trigger her son's peanut allergy. Unable to get a definitive "no" answer from experts he called, McElroy decided to use that soap only for in-plant purposes. Now the utility uses commercial-grade glycerin to make the soap for the public.

"We explain that when they're using this soap, it's a reminder of our biodiesel project and the soap we make from that glycerin byproduct," he says. "We still make it, we still use it. We're just choosing to do the safe thing with the public."

The program has also generated international attention and the utility has helped utilities in more than a dozen states and several other countries including Australia, England and Japan to get started on their own efforts. "As cool as the oil recycling and the biodiesel is, the first call we get is always from someone who saw the soap," McElroy says. "I guess that's the whole point, isn't it?"

For more on the Fire Chief Project, visit the blog at www.tpomag.com. **tpo**

LEFT: The soaps are a big hit at public exhibits. RIGHT: Daphne Utilities staff members with soaps: from left, Jennifer Taylor, customer service representative/receptionist; Janice Daniel, senior customer service representative; and Kathe Quaites, billing coordinator.

PHOTOS COURTESY OF DAPHNE UTILITIES

About Building a Bridge

In response to your October column ("Building a Bridge," Let's Be Clear), I have been in the wastewater/water field for over 30 years. While I can't share an experience that involved employing a former inmate, I can comment as the father of one.

It is not just our industry that needs to pay attention to this issue, but the workplace in general. There are many young men (and women) just like my son who are incarcerated for nonviolent crimes, primarily due to a substance addiction in one form or another, and who are facing very limited employment prospects upon their release.

There need to be more opportunities for these young people to become productive members of society, including in our industry, after they have "paid their debt." If not, many will fall back into their old lives and end up back in prison. Granted, with the economy in its current condition, there are many folks looking for work who don't have criminal records. But if you can employ a former inmate who happens to be a trained operator, why not take a chance? Better they be paying taxes than supported by them.

Dane Martindell
Facilities Manager
Western Monmouth Utilities Authority
Manalapan, N.J.

Why Mess With Names?

You publish a great magazine, but I have an issue with calling us "clean water" people. It is as if we were ashamed of what we do and need to change our name. I can tell you, our staff is proud to be operating a "wastewater treatment" plant and to work for a "sewer district." The local water district operates the "clean water" plant.

It's as bad as the Water Environment Federation, which has decided that we now operate "water resource recovery facilities." You can put whatever spin you want on it, but it still comes down to wastewater. No matter what name you change it to, the new name will eventually become synonymous with "poop" and then carry its own negative impression.

As a society we went to "mentally challenged" from the old "you-know-what." But pretty soon, "mentally challenged" will become a negative term in its own right, and they will have to come up with another. Why? Because a rose by any other name is still a rose. A wastewater treatment plant and operator, by any other name, is still a wastewater treatment plant and operator.

Call it what it is, and make the profession proud. We will be regarded as professionals by projecting a professional image in the way we conduct ourselves and do our work. If we look and act as professionals, the world will have no choice but to look at us and treat us as professionals. A new name does not automatically confer respect. We have to earn it.

There is a reason why I wear a dress shirt, tie, dress pants, and dress shoes to work. The image I project is the image the public then confers back on my organization and its staff.

Thank you,

Leonard Blanchette
General Manager
Brunswick Sewer District
Brunswick, Maine

Efficient by Design

A NEW SBR PLANT IN AN IOWA COMMUNITY INCLUDES A WIDE RANGE OF ENERGY-EFFICIENCY FEATURES, INCLUDING GEOTHERMAL HEATING

By Doug Day

Team members at the Washington plant are, from left, Fred Doggett, plant superintendent; and Jason Whisler and Danny Martin, operators.

When the mid-1950s wastewater treatment plant became too small to meet demand, the community of Washington, Iowa, decided to build new and look for as many operational efficiencies as possible to help hold down operating costs. The new $15 million plant went online in August 2012 to serve the 7,200 residents.

A 6.4 mgd sequencing batch reactor (SBR) facility with UV disinfection and 17 million gallons of flow equalization replaced the old 2 mgd single-stage trickling filter plant. The modern plant performs better while saving energy and money.

ALL AUTOMATED

"Everything is run off the SCADA system," says Fred Doggett, plant superintendent. Besides providing process controls, it monitors equipment's energy use, and that helps preventive maintenance. If a piece of equipment suddenly starts using more energy, that may indicate a developing problem, which operators can then correct before a failure happens.

"We have variable-frequency drives [VFDs] and a geothermal system with in-floor radiant heat," says Doggett. "An energy recovery ventilator for the lab building, maintenance shop and administration building recovers heat from air as it is discharged to heat fresh air that is coming in. All the buildings have occupancy sensors to control energy efficient T-8 fluorescent lighting."

There are two channels of UV disinfection; one is normally enough. The UV intensity is controlled by the SCADA system to match flows.

PHOTOS COURTESY OF FOX ENGINEERING ASSOCIATES

A gas-fueled makeup air unit in the headworks building has variable-speed fans for efficient performance. Due to the high rate of air exchanges needed to meet the NFPA 820 code, the geothermal system would not keep up with building heating needs.

The plant also uses insulation, low-E windows and window film to increase efficiency. The project, designed by FOX Engineering Associates, Shive-Hattery and Riesberg Engineering, earned a 2013 Excellence in Energy Efficiency honor from Alliant Energy, the local electric utility, for demonstrating leadership and for an estimated savings of 4.7 million kWh annually. "We traveled to several plants to look at equipment during the planning process," says Doggett.

READY FOR GROWTH

Rob Baker, project manager with Fox Engineering, adds, "The city wanted to accommodate future industrial growth. The plant can take quite a bit of variable industrial loading in terms of organics, nitrogen and ammonia. About 45 percent of the total maximum monthly design loading is set aside for industrial loading."

The plant has 17 million gallons of flow equalization, versus 2 million gallons at the old plant. It also has new screening, grit removal and raw wastewater pumping to the four SBR basins. Each basin is 150 feet long and 38 feet wide and up to 20 feet deep and holds up to 855,000 gallons.

"The 150 hp main blowers for the SBR are the largest motors in the plant and big energy users," notes Baker. "The VFDs can be turned down when the plant isn't receiving the full design loading. Having more than one SBR, we can shut down one for a while if there isn't enough flow and loading."

That happened shortly after the plant went online. "It just wasn't getting the loading to grow the bacteria," says Baker. "Two reactors were shut down and the other two operated at lower speeds to be able to achieve a mixed liquor suspended solids level that we were targeting." When flows increased in spring, sludge from the two reactors that had been running seeded the two previously idle reactors.

DO CONTROL

Dissolved oxygen sensors in the SBRs reduce blower use. "They maintain a minimum oxygen level so the blowers can be shut off when not needed during the react cycle," says Baker. "Aeration is done just before the settle and decant phases to elevate and maintain the DO." All blowers in the new plant are from Aerzen USA, while aeration and decanting equipment is from Sanitaire, a Xylem Brand.

After the effluent is decanted from the SBRs, it passes through a vertical ultraviolet disinfection system (Ozonia). "Most of the time

ATTACKING I&I

Besides having an old facility, Fred Doggett, plant superintendent, once had to cope with large inflows during rain events because of a serious I&I issue. The sequencing batch reactor design, with ample flow equalization, fit the community's need to accommodate growth and will handle high wet-weather flows while the city goes after I&I problems.

"There was a huge flow event in spring 2013 when they needed all of the 6.4 mgd capacity," says Rob Baker, project manager for FOX Engineering Associates, one of the design firms for Washington's new treatment plant. "Even with that event, there were minimal issues with sanitary sewer overflows, so that was a major step forward for the community."

The I&I problem is being attacked in the city's five-year capital improvement plan. Several storm drains connected to the sanitary sewers have already been found and corrected.

"As part of the new plant, there was also a sewer project in which the largest sewers coming to the plant were improved with a larger carrying capacity and elimination of a pump station," says Baker.

The new plant was the first step in the overall improvement plan; about 100,000 feet of main were televised and cleaned in summer 2013.

"They tackled the end of the system first and now they're working their way up the lines to find and correct the I&I problems," says Baker.

only one bank is operating," says Baker. "The UV system uses more power as the flow increases, and then a second unit comes online if needed. That way it doesn't use any more power than it has to."

Helping to reduce energy needs are 18 Allen-Bradley VFDs on the raw wastewater pumps, equalization basin pumps, SBR blowers, SBR decanters, and digester blowers. Three covered digesters with medium-bubble diffusers normally operate in series but can operate in parallel. Just as in the SBRs, DO in the digesters is monitored so that aeration blowers only run as needed.

Blowers and piping for three digesters are assisted by dissolved oxygen monitoring to optimize aeration and energy usage.

MUCH TO LEARN

The biosolids are dewatered to about 2 percent solids and pumped to a storage tank for eventual land application to area farms in spring and fall. "We may go to spreading just once per year, since we have a 1-million-gallon biosolids storage tank," adds Doggett.

A new plant with different technology presented a steep learning curve for Doggett and operators Jason Whisler and Danny Martin. "We had nothing like this," says Doggett. "We had no SCADA, just a few electrical boxes. For pumping biosolids, we had to manually start the pump and control the valves."

New plant construction took about 15 months. Training lasted for about two months, and all three operators have upgraded their state certifications. Doggett was struck by the complexity: "I've never been around this kind of construction; the amount of concrete, rebar, wiring and all the automation that goes into a new plant." **tpo**

Kijafa Lee, wet process plant manager (left), and Ray Yarbrough, biosolids plant manager, with the biological nutrient removal system at the Central Water Reclamation Facility (WesTech Engineering).

Step by Step

A FIVE-STAGE PROCESS WITH AUTOMATED DISSOLVED OXYGEN CONTROL PROVIDES A RELIABLE, EFFICIENT AND HIGHLY COMPLIANT SOLUTION FOR A NEW FLORIDA RECLAMATION PLANT

By Scottie Dayton

When designing the 22.5 mgd Central Water Reclamation Facility in Cantonment, Fla., Baskerville-Donovan engineers specified oxidation ditches. The technology was familiar because the 8.2 mgd (design) Bayou Marcus sister facility had a four-stage biological nutrient removal (BNR) system.

WesTech Engineering won the bid for the project, which replaced the outdated and undersized Main Street Wastewater Plant. The firm supplied four five-stage 7.2 mgd OxyStream treatment trains and clarifier optimization packages. "We added the fifth stage — the reaeration zone — to help polish the water," says lead operator and plant manager Kijafa Lee. "It adds a little more dissolved oxygen to the waste activated sludge to prevent anaerobic conditions that could release phosphorus in the secondary clarifiers."

The facility began operation in August 2010. It uses 0.7 mgd of reclaimed water for washdown and feeds 3 to 6.5 mgd to Gulf Power and 6.3 mgd of reclaimed water to International Paper Co. for industrial purposes.

ADVANCED NUTRIENT REMOVAL

The gravity-flow plant averages 14 mgd in winter and 16 mgd in summer, and it produces 15 tons of dry biosolids per day. Influent passes through two 40 mgd Step Screens (Huber Technology) and four Grit King tangential vortex grit chambers (Hydro International) before entering stage one of the reactor.

The anaerobic zone mixes influent with return activated sludge, allowing the mixed liquor to ferment. The process also promotes increased phosphorus uptake in the aerobic channels. In the second stage, a gate allows the nitrate recycle stream to combine with the mixed liquor in the pre-anoxic denitrification zone.

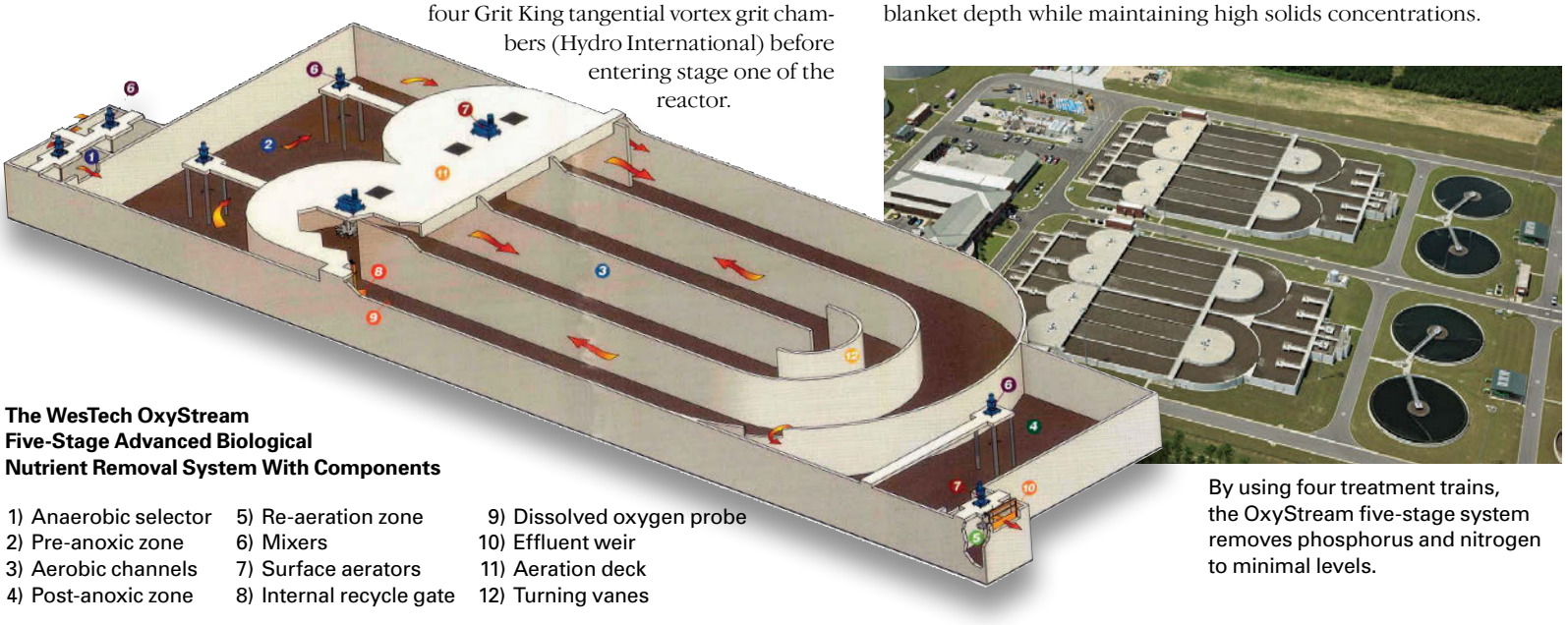
As the mixture enters stage three, slow-speed LANDY-7 surface aerators (WesTech Engineering) in the aerobic channels provide 3.8 pounds of oxygen per horsepower-hour to ensure complete oxidation of BOD and ammonia. Turning vanes (curved walls) at the ends of the channels minimize hydraulic losses, increase velocity and prevent solids from settling.

Liquid flowing from the channels enters stage four, the post-anoxic zone, where endogenous respiration removes remaining nitrate. From stage five, the reaeration zone, effluent enters the 125-foot-diameter clarifiers, each with an energy-dissipating inlet, flocculating feedwell, spiral rake blades and a sludge withdrawal ring that reduces blanket depth while maintaining high solids concentrations.

Share Your Idea

TPO welcomes news about interesting methods or uses of technology at your facility for future articles in the How We Do It column.

Send your ideas to editor@tpomag.com or call 715/277-4094.



The WesTech OxyStream Five-Stage Advanced Biological Nutrient Removal System With Components

1) Anaerobic selector
2) Pre-anoxic zone
3) Aerobic channels
4) Post-anoxic zone
5) Re-aeration zone
6) Mixers
7) Surface aerators
8) Internal recycle gate
9) Dissolved oxygen probe
10) Effluent weir
11) Aeration deck
12) Turning vanes

By using four treatment trains, the OxyStream five-stage system removes phosphorus and nitrogen to minimal levels.

The impeller's design on a low-speed LANDY-7 surface aerator (WesTech Engineering) increases oxygen transfer efficiency and reduces axial and radial loads.

Water leaving the clarifiers flows through Rotamat ultra-fine rotary drum screens (Huber) and the chlorine system (Miox Corp) before being piped through 30-inch ductile iron mains to the industrial partners. Excess water is stored in a 60-acre, 70-million-gallon reservoir or sent to one of two spray fill irrigation zones.

The reactor's control system uses probes that automatically adjust aerator power input to dissolved oxygen demand and optimizes performance by increasing or restricting aeration in specific zones. A programmable logic controller monitors all the equipment, and a touchscreen interface enables operators to make adjustments easily.

WE MAKE IT, THEY TAKE IT

Reclaimed effluent must meet stringent permit limits. Even water affected during instrument recalibration for chlorine residual or pH is rejected. Two electronic valves automatically reject less than 1 million gallons if the chlorine residual drops below 1.2 ppm, turbidity spikes to 2.5 ppm or the pH drops below 6.0. Rejected effluent is tested in-house for suitability before operators return it to the process.

When the industrial partners exceed their normal water usage, the facility draws from two 2-million-gallon effluent storage tanks and one 4.7-million-gallon tank to meet demand. "If a hurricane left us without power, all the flow goes to two 11.25 mgd reject tanks," says Lee. "Once power is restored, we can send water from the tanks back into the process." Generators power the chlorine system during electrical outages.

The plant faced its first major weather challenge in June 2012, when 6.2 inches of rain fell over a weekend, sending more than 40 mgd to the headworks. "The nutrient values didn't change, and other than increasing chlorine feed, the operators saw nothing that would affect the process," says Lee. "The BNR performed very well."

EFFICIENT OPERATION

The plant permit limits are 5 mg/L CBOD, 5 mg/L TSS, 3 mg/L total nitrogen and 1 mg/L phosphorous. Effluent averages 2.3 mg/L CBOD, 0.68 mg/L TSS, 1.38 mg/L total nitrogen and 0.19 mg/L phosphorous.

"Originally, we weren't sure how much alum to inject because the feed is proportioned to flow," says Lee. "We're at 4.1 gph now. The DO set points vary from 1.5 ppm in fall to 2.0 ppm in summer."

At the Main Street plant, everything was pumped, making it expensive to operate. At the new facility, gravity flow and flow-proportional dosing greatly reduce energy usage, as do variable-frequency drives on the two aerators and four motors. "We thought about using just three treatment trains in fall and winter, but it takes five or six days to bring one online," says Lee. "That luxury isn't available when we're dealing with heavy rains or late-season hurricanes, so we run all four."

The only issues on the system involved fiber and rag fragments from the grinder pumps in three lift stations slipping past the sides of the step screens and piling up on the mixing impellers. "That caused false alarms," says utility operations plant manager Ray Yarbrough. "We'd turn off the mixers, run the impellers backward to dislodge the material, then reset the units." Stiffening the sides of the screens helped trap fragments and has reduced resets to a minimum.

"It's a simple-to-operate, very forgiving system with lots of redundancy and capacity," says Lee. "We like it." **tpo**

TRY, TRY AGAIN

PETE LARAMIE SHOWS 'TRUE GRIT' AT THE FAIR HAVEN TREATMENT PLANT, FINE-TUNING DENITRIFICATION TO PRODUCE TOP-QUALITY WATER

By Jack Powell

"DETERMINATION GIVES YOU THE RESOLVE TO KEEP GOING in spite of the roadblocks that lie before you." Author Denis Waitely could have been talking about Pete Laramie, chief operator at the Fair Haven (Vt.) Wastewater Treatment Plant.

Laramie has shown persistence throughout his 28-year career in water, 20 at the Fair Haven plant at the southwestern "hook" of the Green Mountain State. He and his staff have worked tirelessly to optimize biological phosphorous and nitrogen removal, trim energy and chemical costs, and reduce nutrient loadings discharged to the Castleton River and, ultimately, Lake Champlain.

In the process, Laramie, a fourth generation Fair Haven native, earned the 2012 Regional Wastewater Treatment Plant Operator Excellence Award from the U.S. EPA. The awards program recognizes those who have provided invaluable public service managing and operating treatment facilities throughout New England.

The plant also won the 2012 Excellence in the Wake of Irene Award from the Green Mountain Water Environment Association (GMWEA) for its response to Hurricane Irene, which devastated parts of Vermont and the East Coast in 2011.

While acknowledging his gratitude with the EPA and the Vermont Department of Environmental Protection for nominating him, Laramie credited his team: Pete Root, assistant chief operator/maintenance supervisor; Jim Heller, operator; and Paul Olander, consultant, who supported the team's denitritification efforts. Such credit sharing is typical of Laramie, whose career has taken more than few twists and turns.

Pete Laramie, chief operator at the Fair Haven Wastewater Treatment Plant. (Photography by Jason McKibben)

OVERCOMING CHALLENGES

"I started working at the Fair Haven water plant back in 1985," Laramie says. "I'd gotten out of the Air Force the fall before and never had a job anything like it. I was chief operator there until mid-1987." After a short break with the town, he went to work as its zoning administrator, then served as administrative assistant and later superintendent for the Water and Sewer Department. In 1993, when the chief operator at the wastewater plant left, he told the town manager he wanted the job. "I've been there ever since."

Over the years, he has expanded his skills and earned a Grade 3 Domestic Wastewater Plant Operator license. What drew him to wastewater treatment was its unpredictability: There's no way to know when it will rain, if the temperature will turn cold or hot, or if someone will dump something bad into the sewers. "Every time you think you've got it licked, something comes up that you don't know about. That keeps you on your toes."

He has met his share of challenges at Fair Haven, built in 1969 and designed at 0.50 mgd. They include:

- A major upgrade in 1989 that added six Aire-O2 aspirator aerators (Aeration Industries) on the bridge mounts of the racetrack oxidation ditch, along with a cyclone grit separator and comminutor (solids reduction device).
- A 2000 upgrade for phosphorous removal, which included selector tanks and chemical addition to help reduce phosphorus and add alkalinity to stabilize pH levels.

Laramie takes abundant pride in the plant's effluent quality, a sample of which is shown here.

"Every time you think you've got it licked, something comes up that you don't know about. That keeps you on your toes."

PETE LARAMIE

profile

Peter Laramie, Fair Haven (Vt.) Wastewater Treatment Plant

POSITION:	**Chief Operator**
EXPERIENCE:	**28 years in water industry**
DUTIES:	**Heads a team of 3; oversees process control and plant operation**
EDUCATION:	**Graduate of Fair Haven Union High School; one year at University of Vermont, one year at Castleton State College (Vt.)**
LICENSES:	**Grade 3 domestic wastewater operator**
GOALS:	**Serve the community, continue to refine the denitrification process**
WEBSITE:	**www.fairhavenvt.org**
GPS COORDINATES:	**Latitude: 43°59'5.09" N; Longitude: 73°27'0.85" W**

Pete Laramie is a fourth-generation Fair Haven native and an award-winning clean-water professional.

DENITRIFICATION 101

Pete Laramie's success at the Fair Haven Wastewater Treatment Plant raises two questions: What exactly is denitrification? What are the benefits?

Denitrification is a microbially facilitated process of nitrate reduction, essentially converting the nitrates to nitrogen gas. Denitrifying breaks down the nitrates found in wastewater. With nitrates gone, the microbes can do a better job of biological nutrient removal.

In addition, removing nitrates enhanced phosphorous removal, helping the Fair Haven plant meet its state-required 0.8 mg/L limit. Moreover, the Fair Haven team found that with denitrification they could save on chemicals and electricity and maintain excellent quality water.

Examples: Alum use now stands at 3 to 10 gpd, down from 20 gpd. Soda ash, once used at a rate of 43 dry pounds per day ($3,600 per year) has been eliminated. Aeration hours are down 40 hours, from 100 hours per day, most of those hours at reduced motor speeds. Clearly, denitrification has been worth the effort.

- Inclusion of timers in 2006 on the oxidation canal's six 15 hp aerator motors, set to cycle every three hours in winter and every 90 minutes in summer.
- The addition in 2007 of variable-frequency drives to work with the timers. By matching motor speed to oxygen needs, the drives maintain a dissolved oxygen level of 2 mg/L and reduce energy consumption.
- Purchase in 2009 of a new aerator (Environmental Equipment Engineering), LDO meter and variable-frequency drive to convert the final selector tank to a pre-aeration tank.

Even with the upgrades, the Fair Haven plant consists of a basic ball rock and grit-removal system, with an average flow of 0.20 mgd. Influent flows into a selector tank, and then goes into the oxidation ditch. From there, the flow moves to two secondary clarifiers (Lakeside Equipment) before reaching a chlorine contact chamber where operators chlorinate and dechlorinate and send the treated water to the Castleton River.

TACKLING DENITRIFICATION

Laramie's biggest challenge came in summer of 2006, when he found the plant's oxidation canal pH was too acidic and the process of adding bag after bag of soda ash had become too costly. That's when he, Root and Heller teamed with Olander, then a State of Vermont Engineer, to solve the problem. They balanced pH levels and eliminated soda ash costs while reducing electricity costs by nearly 20 percent.

"Paul suggested denitrifying because when you denitrify, you return up to half of the alkalinity back to the system," Laramie says. "Our plant nitrified all year round. The only problem is that sometimes the operators would eliminate too many 'bugs' and the plant would get caught with partial nitrification. When that happened, our nitrite numbers would go way up and suck up the chlorine, so we wouldn't have the E. coli kill we needed. That caused more problems."

The answer? Turn off the aerators for a time — an hour on and an hour off throughout the day. Finding the right times required a good deal of experimentation, not to mention Laramie's tenaciousness.

"Pete's focus was awesome," says Olander, who has been doing operator training and providing technical assistance around Vermont for eight years. "He's always been a great operator, but with the denitrification project, he really came to the fore. Going out and trying to change the process wasn't easy. Fair Haven has the six aerators, which he put on timers. He was out there every day doing tests and adjusting the timers and trying to zero in on his optimal aeration schedule. Every time he made a change, he'd watch what happened, then make another change and watch that. He kept after it until he got it right."

Root, a Grade 1 operator, has similar admiration for Laramie, his colleague for 20 years. "Pete has concentrated on denitrification, process control and nutrient removal, and they've worked well for us," Root says. "He's done an excellent job, and that has been recognized throughout the state. Pete has tried new ideas, and they've been successful. Our water quality is exemplary: we have anywhere from 98 to 100 percent removal."

TWEAKING THE PROCESS

Laramie's denitrifying regimen has yielded impressive results:

- $3,600 savings per year by eliminating soda ash to keep pH levels up, plus a reduction in alum used for phosphorous removal.
- $9,000 initial annual electrical savings from cycling the aerators, using the VFDs and eliminating mixers for the soda ash. Seven years later, the plant is still saving $6,000 to $7,000 a year over what it had been spending — money that now goes for new equipment and plant improvements.
- Substantial improvement in nitrate reduction. Before denitrification, nitrate numbers for effluent were 40 to 50 mg/L, but once the plant began denitrifying, that dropped to 1 to 3 mg/L and often went below 1 mg/L.
- A dramatic reduction in phosphorous. Fair Haven is permitted for 0.8 mg/L, which means it is allowed to discharge 912 pounds per year. In 2012, the plant discharged less than 100 pounds.
- Strong BOD and TSS improvement. The plant is required to remove 85

"[Pete] has done an excellent job, and that has been recognized throughout the state. Pete has tried new ideas and they've been successful. Our water quality is exemplary."

PETE ROOT

percent of influent BOD and 85 percent of TSS. An April 2013 report showed 98.6 percent removal for BOD and 98.7 percent for TSS.

Curt Spalding, administrator of EPA's New England regional office, cited Laramie for doing "an outstanding job over the years in maintaining and operating the facility." In a news release, he called professionals like Laramie "essential to keeping our environment healthy by protecting water quality."

Although grateful for the recognition, Laramie sees himself as a facilitator: "Some folks call me the plant supervisor, but I am the chief operator. I'm not the boss. I'm responsible for what the plant turns out, and I do a lot of hands-on stuff. Besides, everybody knows his job. Pete's our mechanical specialist, working on pumps and motors, while Jim, who works at the Public Works Department half the time, is responsible for our lab work."

FILLED WITH ACTIVITY

A typical day for Laramie starts at 5 a.m. with "morning checks," making sure the aerators, mixers, clarifiers and other pieces of equipment are running properly, and that hypochlorite, bisulfite and alum are pumping correctly. Then he or a colleague check dissolved oxygen reading, check the amount of chemicals used overnight and check the motors' hour meters.

After that, he takes an effluent sample and reviews ammonia, nitrite and nitrate levels. Then it's a drive to check the five pump stations the plant team maintains. After that, he's back for daily testing, and from that point on it's routine work, unless someone finds that a piece of equipment needs attention. He leaves for the day at 2:30 p.m.

For Laramie, it's another day doing a job he enjoys greatly. A graduate of Fair Haven Union High School, he spent a year at the University of Vermont and one at Castleton State College before joining the Air Force. Today, he lives with his wife and older son, 23, who has a full-time job in the area. Their younger son is in the Marine Corps.

GETTING IT RIGHT

Justifiably proud of the Fair Haven plant's performance, Laramie is still a realist when it comes to future upgrades, even though the last major one was nearly 25 years ago.

"Right now, I'm on my eighth town manager," he explains. "I've had a good working relationship with all of them, but budgets are always tight. When our new town manager came in, I wrote a report saying that our plant is aging, the equipment is old and we needed to start hiring new people and think about upgrades. With the economy being what it is, that's probably not going to happen any time soon."

Root, a 25-year plant veteran, is equally philosophical. His reasoning: The team keeps everything running well, considering that the equipment is nearing the quarter-century mark, and other plants need upgrades more than Fair Haven.

Laramie won't give up: "I plan to be here another eight years. I've been tinkering with the denitrification process all these years, and I'm determined to get it right." **tpo**

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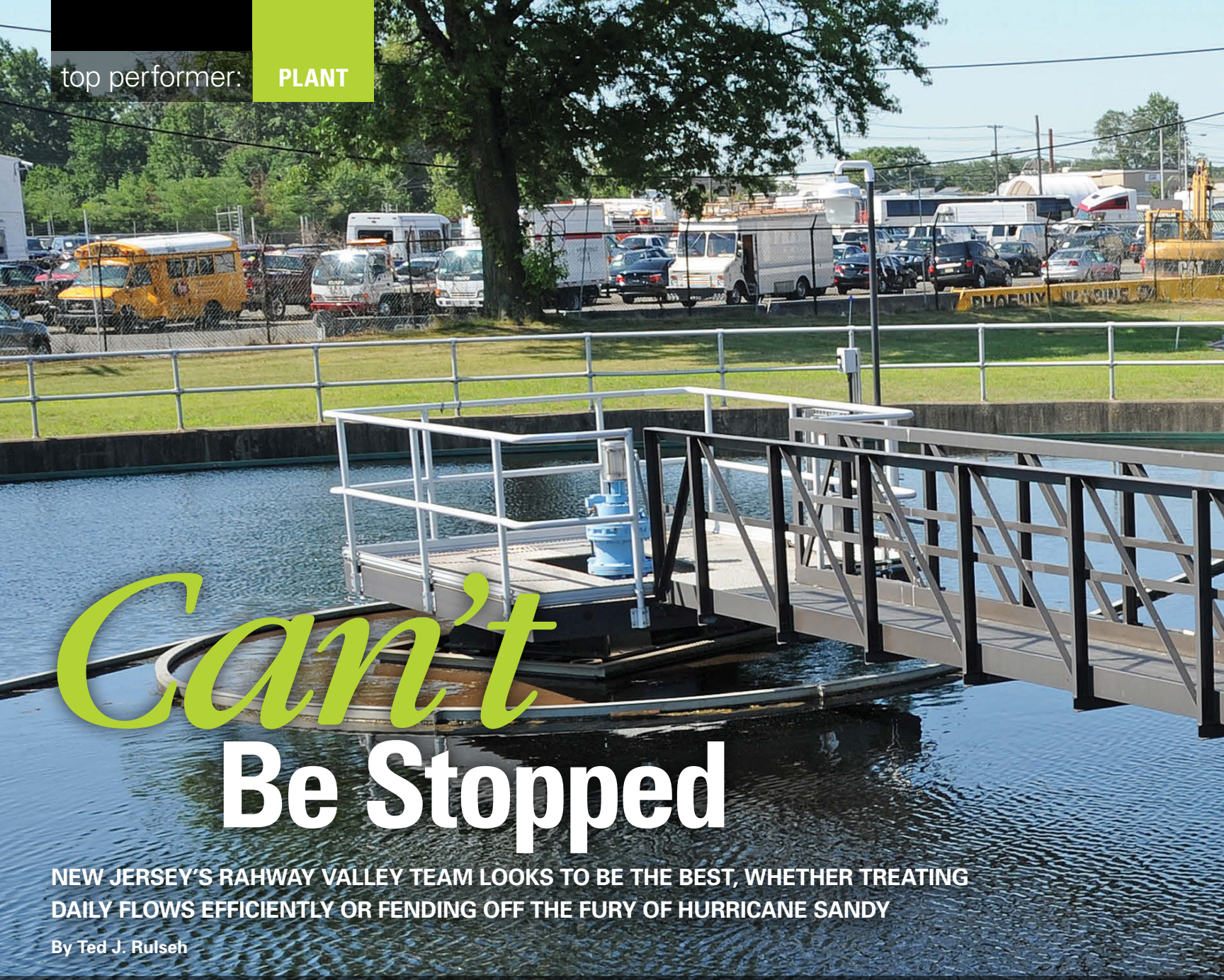


Can't Be Stopped

NEW JERSEY'S RAHWAY VALLEY TEAM LOOKS TO BE THE BEST, WHETHER TREATING DAILY FLOWS EFFICIENTLY OR FENDING OFF THE FURY OF HURRICANE SANDY

By Ted J. Rulseh

THE RAHWAY VALLEY SEWERAGE AUTHORITY commissioners took a beating from the public when they approved a $170 million clean-water plant upgrade, finished in 2009. As it turned out, that up grade and expansion saved residents and the environment a great deal of grief when Superstorm Sandy came calling on Oct. 29, 2012.

The Rahway Valley plant team fought off the storm and operated through it without interruption and without releasing any untreated water, while neighboring plants were swamped by the tidal surge and discharged billions of gallons of raw (diluted) sewage.

All told, they ran the facility for 17 days solely on in-plant engine power, operating in "island mode," disconnected from the electric grid. To Jim Meehan, executive director, and the operations team, it was another example of doing what it takes to fulfill the authority's mission: To be "the best, most efficiently run sewerage authority, in full compliance with all regulations, in the State of New Jersey."

In the past few years, the team has worked diligently to drive down costs. They reduced the annual operations budget by a million dollars, to $12 million, by trimming staff from 61 to 51 through position elimination and attrition, by renegotiating the electric power contract and by general belt-tightening. "It's a sign of the times," says Meehan. "That's what the public demanded and that's what we gave them."

START TO FINISH

Meehan and staff are proud to operate one of New Jersey's few tertiary treatment plants, with a 40 mgd design flow, 105 mgd peak flow and 30 mgd average daily flow, discharging to the Arthur Kill, which adjoins the Rahway River. "We want people to understand that for the price they pay, we're putting out nearly drinking water," Meehan says. "We're actually cleaning the river every day we discharge into it."

The original plant was built in 1938 and upgraded in 1978. The upgrade completed in 2009 was a complete process overhaul that took seven years. It included a new headworks facility with coarse and fine automated bar screens (Infilco Degremont) and aerated grit chambers (Walker Process Equipment).

A new primary clarifier was added (there are now four) and the existing primaries were upgraded (Siemens Water Technologies). Similarly, two new Hi-Tech secondary clarifiers (Kusters Water) were added (there are now six) and the existing secondaries were upgraded.

An aeration system upgrade replaced two old gas-engine-driven blow-

Operators at the Rahway Valley Sewerage Authority kept their plant working during Superstorm Sandy. Naim Franklin is shown in more tranquil times measuring the sludge blanket in a final clarifier. (Photography by Jeffrey Herring)

profile Rahway Valley Sewerage Authority, Rahway, N.J.

BUILT:	1938; upgrades 1978, 2009
POPULATION SERVED:	250,000
SERVICE AREA:	48 square miles
FLOWS:	40 mgd design, 30 mgd average
TREATMENT LEVEL:	Tertiary
TREATMENT PROCESS:	Activated sludge, gravity sand filters
RECEIVING STREAM:	Arthur Kill
BIOSOLIDS:	Anaerobic digestion, landfill cover
ANNUAL BUDGET:	$12 million (excluding debt service)
WEBSITE:	www.rahwayvalleysa.com
GPS COORDINATES:	Latitude: 40°36′00.56″ N; Longitude: 74°15′30.28″ W

ers with three 700 hp electric centrifugal blowers (Roots/GE), and replaced ceramic dome diffusers with fine-bubble membrane diffusers (Sanitaire).

Tertiary treatment was added in the form of six gravity sand filters (Infilco Degremont). A UV disinfection system (Wedeco) with 936 lamps replaced a sodium hypochlorite system. In addition, the waste and return activated sludge systems were updated with new piping, tanks and pumps. All new motors are premium-efficiency models with variable-frequency drives; all major equipment has soft start capability.

EFFICIENT OPERATIONS

Five dry pit submersible pumps (Flygt, a Xylem brand), each rated for 27.5 mgd, lift the incoming wastewater into the process. While effluent normally leaves by gravity, four screw pumps (Lakeside Equipment Corp.) are needed to discharge the water during abnormally high tides.

Biosolids are anaerobically digested, dewatered to 23 to 25 percent solids in a centrifuge (two 180 gpm Centrisys Corporation units and one 300 gpm unit) and beneficially used as landfill cover. Biogas produced at 200,000 cubic feet per day fuels boilers that heat the digesters, other processes and plant buildings, saving roughly $400,000 per year on natural gas. Biogas can also fuel a cogeneration system that includes four 1.5 MW engine-generators (Caterpillar). A pair of 2 MW diesel engines (Mitsubishi) with Baldor (Generac) generators provide emergency power.

Bob Valent, plant superintendent, says the team's general approach to the plant is to operate "in the most efficient, lowest-cost and most effective way possible. One of our big points of emphasis is to watch the cost of utilities." That includes running the blowers judiciously — just enough to keep adequate dissolved oxygen levels in the aeration basins.

"We manually take DO levels in the tanks three times a week, and we adjust accordingly," Valent says. "Our DO demand is relatively flat, and since we're not doing biological nitrogen removal, we don't require highly sophisticated DO control." The staff also keeps a tight rein on light-

ABOVE: Operator Don McCoy monitors the sand filter tertiary treatment (Infilco Degremont). LEFT: Operator Sterling Payano mans the effluent screw pumps (Lakeside Equipment Corp.).

ing costs, helped by LED lighting as well as photocells and motion sensors that make sure lights are on only when needed.

TEAM APPROACH

In his executive director role, which he assumed in 2010, Meehan fosters a collaborative management. Key members of the leadership team, in addition to Valent (with 27 years of service to the authority), are Andy Sasso, operations supervisor (30 years); John Buonocore, staff engineer (four years); Joanne Grimes, office administrator and qualified purchasing agent (28 years); Dan Ward, maintenance manager (10 years); Tony Gencarelli, regulatory compliance manager and engineer (11 years); and Bob Safchinsky, maintenance supervisor (18 years).

"I grab this whole staff and bring them into most of our meetings," says Meehan. "I encourage them to speak out. Especially if they think it's something I don't want to hear, I ask them to speak their mind. We really do have a true team approach." Others directly involved in plant operations and maintenance are:

- **Industrial and municipal monitoring:** Edward Kochick, supervisor.
- **Health and safety:** Janice Teixeira, coordinator.
- **Shift supervisors:** Edward Faryna, Mahendra Surujnath, Darren Schippe and David Patrick.
- **Operators:** Arcangel Bosque, Don McCoy, Heraldo Privado, Sterling Payano, Christopher Brinker, Doug Reno, Patrick Kellaway, Paul Dymyd, Craig Bender, Kevin Tierney and Naim Franklin.
- **Biosolids operators:** Javier Baez, John Vantuh and Marlon Privado.
- **Electricians:** Robert Remite, Peter Mladenovic and Jack Desimone.
- **Maintenance:** Scott Mackin, Harry Dones, Jim Thor and Stephen Moreira.
- **Utility workers:** George Cheskowich, Thomas Watters, Marcos Melendez, William Higgins, Mario Pasqualicchio and Richard Guerra.
- **Laboratory:** Jean Manigold, manager; Thomas Macaluso, supervisor; Sarah Keysper, chemist/lead analyst; Riley Blake and William Yachera, analysts.

Rahway Valley Sewerage Authority
PERMIT AND PERFORMANCE (October 2012)

	INFLUENT	EFFLUENT	PERMIT
CBOD	Report monthly avg.	3.6 mg/L	25 mg/L monthly 40 mg/L weekly
TSS	N/A	9.0 mg/L	30 mg/L monthly 45 mg/L weekly
pH	Report min./max.	6.9 mg/L	6.0-9.0
Fecal coliform	N/A	3.4 CFU/100 ml	200 monthly 400 weekly

UP TO THE TASK

Never were the team's collective skills and the new plant's capabilities more important than when Sandy blew ashore in New Jersey.

One saving grace was a change made in the plant's elevation during the 2009 upgrade. Valent observes, "The elevations in the plant had to be raised for hydraulic purposes. The whole front end of the plant was lifted in order to get the grit chambers to work correctly, and from there it was a cascading effect, to get the water to flow through the rest of the plant by gravity. About 40 percent of the outside perimeter was raised by 10 feet just by pushing the land up higher on the side of the plant that runs along the Rahway River."

Meehan notes that the tidal surge from Sandy came within a foot of entering the plant processes and knocking out service: "That 10-foot raise in elevation during the upgrade is what saved us." That and the upgraded wet-weather capacity, which allowed the plant to handle a peak flow rate of 125 mgd for 12 hours or so during the height of the storm.

"We didn't have a lot of rain associated with the event," says Valent. "It was more the effect of the tidal surge. The collection systems of the towns we serve were flooded, and they were pumping plenty of rain water. We have an emergency relief line in the plant, but unfortunately the level of the river rose higher than the weir gate on that line, and we took in river water for a substantial amount of time.

"On our permit we're rated at a peak flow of 105 mgd, which means we have to run four of our main influent pumps. We normally reserve the fifth pump for use in case one of the others is out of service for repair. During Sandy, we turned that fifth pump on."

The plant has two diesel-fueled engines (Mitsubishi) with Baldor (Generac) generators. Rob Remite, electrician, is shown performing maintenance.

GENERATORS TO THE RESCUE

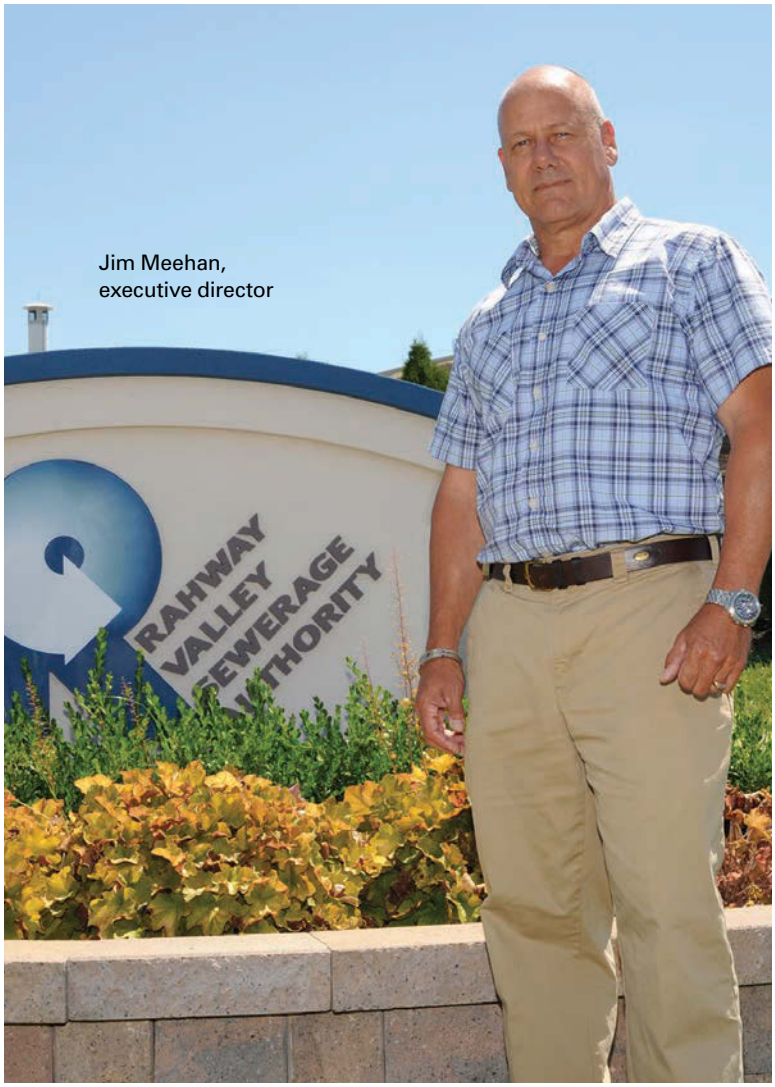
The ultimate weapon against the storm, though, was the backup generation equipment.

On Sunday, Oct. 28, knowing the 1.5 MW gas engines needed a boost from the utility grid to start up; the team activated two of them.

"We've had incidents in the past where during storm events, if we're running in parallel with the utility, we get dirty power," says Buonocore. "For example, we're a three-phase plant, so if the utility loses one phase and we have to run on two, that can damage some of our equipment. We're better off completely isolating ourselves from the utility and just operating on our own power.

"We started two of the cogen engines, synchronized them with the utility and ran in parallel for a few hours. Once they were stable, we got permission from Jim and Bob to open the breaker on the utility side. At that point we were operating in the true island mode. We went on that way for about three days. All during the peak of the storm, we were on our own engine power."

A near disaster hit on Wednesday morning, after the storm had passed and flows had returned to near normal, but while the utility power was still out. A process air blower tripped offline, causing a power surge that triggered a protective device, shutting the gas engines down.



Jim Meehan, executive director

"We want people to understand that for the price they pay, we're putting out nearly drinking water. We're actually cleaning the river every day we discharge into it."

JIM MEEHAN

"Our diesel backup generators kicked in, and we ran that way for about 36 hours, until we had mechanical problems with the both of them," recalls Buonocore. "On one engine, the cooling system developed a leak, and on the other a fan belt broke. We got it working again, but we were in trouble, with no power grid to go to."

There was no capability in the system to use diesel power, in place of the utility, to restart the gas engines — but that's where experience and teamwork paid off. "Dan Ward, John Buonocore and our three electricians [Desimone, Mladenovic, and Remite] got together and came up with a way to 'fool' the programmable logic controllers on the cogen system into using the diesel power to jump-start those engines," says Meehan.

"We called it a modified black start. Dan came in and said, 'Jim, we think we have a way to get the cogen back on. Do you trust us enough to try it?' Bob and I looked at each other and said, 'Yes, go ahead.' They pulled it off. They got the cogen units going again. We stayed for two more weeks on island mode because the grid power, although it did come back on after five days, was still very dirty. It would have knocked us on and off, which could have damaged our equipment."

THE BOTTOM LINE

By keeping the power on, the Rahway Valley team was able to treat its entire flow even at the highest peak. "Neighboring authorities were putting about half a billion gallons of untreated waste into the receiving waters daily until they got back online," says Meehan. "We processed every gallon that came through here."

The plant ran 55 mgd through primary, secondary and tertiary treatment. The balance was primary treated and blended with the fully treated flow; the entire amount went through UV disinfection before discharge. "The only permit violations we had were small fecal coliform excursions for a couple of days after the storm," says Meehan.

Not content just to keep their own plant running, Rahway team members lent a hand to others. Rahway provided lab services for neighboring authorities' lab technicians who were displaced, and for several weeks they did all permit-required sampling and testing for the Linden Roselle Sewerage Authority, whose lab was disabled. Rahway also accepted hundreds of truckloads of landfill leachate and industrial vegetable washing waste for the Passaic Valley Sewerage Commission after its facility was disabled.

Throughout the crisis, the Rahway team performed admirably. "We had people who didn't go home for four or five days," says Meehan. "They would

Team members at the RVSA include, from left, Javier Baez, biosolids operator; and Stephen Moreira and Jim Thor, maintenance.

The team also includes Tom Macaluso, lab supervisor; and Jean Manigold, lab manager.

HONORED FOR EXCELLENCE UNDER PRESSURE

The Rahway Valley Sewerage Authority earned six awards from New Jersey's Association of Environmental Authorities for performance during and after Hurricane Sandy. Individual Wave Achievement Awards went to the five team members who took heroic steps to keep the plant's generators running in the days after the storm. They are Dan Ward, maintenance manager; John Buonocore, staff engineer; and electricians Jack Desimone, Rob Remite and Peter Mladenovic. The RVSA itself received a Mutual Aid Wave Achievement Award for the assistance it lent to other authorities to help them recover from the storm.

"We had people who didn't go home for four or five days. They would grab a nap and go back to work again."

JIM MEEHAN

grab a nap and go back to work again." Operations, electricians, mechanics and utility workers stayed at it around the clock. Most employees had lost power at home, and many brought their frozen food to the plant. Valent and others cooked meals and kept everyone well fed.

The team proceeded with full support from the Board of Commissioners. They gave regular updates to Richard LoForte, then board chairman, and he and other commissioners checked in often.

Damage to the Rahway plant was minor: an air conditioning unit blown off the roof of the administration building, HVAC ducts damaged on top of the cogeneration building, and the roof blown off a small sampling shack. "That was the extent of our physical damage, less than $50,000," says Meehan.

Once clear of the storm and recovery, the Rahway team went back to business as usual. Valent says, "We have no capital upgrades planned, but we're going to continue finding ways to optimize efficiency and cut our budget. We will continue to optimize and streamline operations anywhere we can." tpo

RVSA staff members include, front, Jim Meehan, executive director; second row, from left, John Buonocore, staff engineer and Bob Valent, superintendent; third row, Dan Ward, maintenance manager; fourth row, Andy Sasso, operations manager; Anthony Gencarelli, regulatory compliance manager; Joanne Grimes, office administrator; and Bob Safchinsky, maintenance coordinator.

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A Good Egg

A NEW DIGESTER, MORE BIOGAS AND A BETTER BIOSOLIDS PROCESS MEAN GREATER EFFICIENCY AND SIGNIFICANT SAVINGS IN GRANDVILLE, MICH.

By Doug Day

A panoramic view of the Grandville Clean Water Treatment Plant. (Photography by T.J. Hamilton)

THE MICHIGAN MUNICIPAL LEAGUE CITES "INNOVATIVE wastewater treatment technology" for its 2012 Community Excellence Award presented to the Grandville Clean Water Treatment Plant. Planning for the $23 million expansion and upgrade project began in 2006 after several years of the plant exceeding its former capacity of 4.4 mgd.

"The plant was hydraulically overloaded," says Todd Wibright, plant superintendent. "We were running consistently at over 100 percent capacity." An egg-shaped anaerobic digester was the most novel addition to the plant and is

> "The egg-shaped digester has a slightly higher capital cost, but the costs over the 20-year life cycle are less than with a conventional digester."
>
> **TODD WIBRIGHT**

the first of its kind in Michigan. The other major addition was a biogas-fueled combined heat and power system.

Designed by Moore & Bruggink Consulting Engineers of Grand Rapids, the project included $4.5 million in renovations, along with $17.5 million for

Scott Kunst, residuals manager, checks pipes in the gallery of the egg-shaped anaerobic digester (CB& I). The digester holds a million gallons and processes about 60,000 gallons daily.

a plant expansion to increase capacity to 10 mgd. Moore and Bruggink also won the Eminent Conceptor Award for the project, the highest engineering honor presented by the American Council of Engineering Companies of Michigan.

Construction started in fall 2010, and the new plant was online about six months ahead of schedule in fall 2012. Along with the egg-shaped digester and biogas system, the project included:

- New digester building
- Two mechanically cleaned screens and buildings
- Four raw sewage pumps
- Grit chamber and building
- Four primary settling tanks
- Five aeration tanks
- Two final clarifiers
- A second UV disinfection system
- Three blowers
- Five return sludge pumps

A new 7,500-square-foot building houses a state-of-the-art laboratory. Offices for the 13 staff members who used to be spread across the property have been moved to the new building, along with locker rooms, a break room and laundry. The building also has a training room that is available for public use.

profile Grandville (Mich.) Clean Water Treatment Plant

POPULATION SERVED:	70,000
FLOWS:	10 mgd (design), 6 mgd (average)
TREATMENT PROCESS:	Activated sludge
BIOSOLIDS PROCESS:	Anaerobic digestion
BIOSOLIDS VOLUME:	1,000 dry tons/year
BIOSOLIDS USE:	Land application
WEBSITE:	www.cityofgrandville.com
GPS COORDINATES	Latitude 42°54'29" N; Longitude 85°46'47" W

ABOVE: Operators Scott Yonkers (left) and Bill Poelma replace modules in the plant's UV disinfection system. LEFT: The Grandville plant has seen substantial upgrades since 2006.

"We infrequently have to use our boiler, which can also be fueled by either biogas or natural gas. We're also using that water in a loop system for in-floor heating that provides all the heat for the new lab and operations building."

TODD WIBRIGHT

DIGESTER CUTS MAINTENANCE

The Grandville plant serves about 70,000 residents in the cities of Grandville and Hudsonville and the townships of Georgetown and Jamestown. Average flow to the activated sludge process is 6 mgd.

CB&I built the plant's 1-million-gallon egg-shaped anaerobic digester to replace a conventional anaerobic digester. Its egg-like shape makes it easier to operate, according to Wibright: "We pump raw and waste activated sludge to the digester and then to the thickening process where we dewater it."

The egg-shaped design allows better circulation of the biosolids, enabling improved treatment and reducing less maintenance. It also gives the plant the capability to make use of biogas.

"We were looking at various options for what to do with our biosolids and the plant footprint," says Wibright. "We also compared digester configurations. The egg-shaped digester has a slightly higher capital cost, but the

Staff members at the Grandville treatment plant include, front row, from left, Todd Wibright, plant manager; Bill Poelma, operator; Brian Vu, lab and operations supervisor; Scott Yonkers and Tom Syswerda, operators; back row, Chris Guile and Mike Thomas, operators; Andrew Kietzman, maintenance supervisor; and Scott Kunst, residuals manager. Not pictured: Dan Boss, Jason Pullen, Tim Takens and Fred Taylor, operators.

costs over the 20-year life cycle are less than with a conventional digester. There is no need to take it down and clean it. There is space at the top and bottom that allows for complete mixing, so deposits don't settle out."

SHAPE MATTERS

The digester went online in spring 2012, and Wibright says it has run automatically ever since. The digester is filled to within about 10 feet of the top most of the time. "We can set the pumping and recirculation parameters to break down any foam or floating solids," he says. "You can set it and forget it."

Made of 1.25-inch thick steel, the 75-foot-high tank ranges from 12 to 63 feet in diameter and fit within the plant's limited footprint. The digester was assembled in place by welding together steel plates manufactured offsite. Wibright was a bit concerned about the height because the original design was 95 feet high. "They were able to bring that down by bowing out the middle a little," he says. The height is also reduced by having 25 feet of it below ground level, inside a concrete retaining vessel. The digester is insulated with a foam exterior, although some models use aluminum cladding.

The digester is kept in mesophilic phase at 98 degrees, providing volatile solids reduction of more than 60 percent with a 20-day retention time. The biosolids are then pumped to a day-storage tank before going to the thickening process.

With the new digester, the plant will produce a lower volume of biosolids (about 1,000 dry tons per year), and the new solids handling equipment achieves significantly more dewatering — from what used to be a 2 percent solids product to 6 percent. The equipment includes a sieve drum concentrator (Charter Machine Co.) and a rotary press (Fournier Industries). "The biosolids are stored as a liquid in a 2.5-million-gallon tank and trucked to agricultural sites for land application," says Wibright.

WELL-ACCEPTED IN MICHIGAN

Biosolids from the Grandville Clean Water Treatment Plant are used as a beneficial soil supplement for about 30 farms with 20 miles of the newly expanded facility. While those farmers are saving money on fertilizer, they don't pay for the plant's product.

"At this point, we are giving it away," says Todd Wibright, plant superintendent. "There doesn't seem to be a method that works to get farmers to pay for the product."

The main reason is that the Michigan Department of Environmental Quality encourages land application; there are so many other sources of biosolids in the area that farmers have no reason to pay for it. The plant upgrade and expansion in Grandville reduces the volume of biosolids and will help save money. Land application is contracted to Synagro at a cost of about 3 cents per gallon.

"It's a less expensive option than going to a landfill," says Wibright. He estimates the tipping fee would be $20 per ton.

At present, the biosolids are Class B, but the egg-shaped digester allows treatment to Class A with the addition of just one tank for preheating the material before it enters the digester, along with the addition of some heat exchangers. Wibright says there are no plans to do that now because there is no demand for a Class A product.

(Continued on page 33)

Clean-Water Plant Goes Sci-Fi

A GOVERNMENT PLOT, A MYSTERIOUS CREATURE AND A GROUP OF OPERATORS TRAPPED AT A TREATMENT PLANT CREATE THE SETTING FOR A NEW HORROR NOVEL

By Briana Jones

Author Dodge Winston has written what is probably the only science fiction novel set in a clean-water facility. A self-published book, *The Wastewater Plant,* combines Winston's passion for the industry with his experiences at multiple advanced activated sludge plants. "I meshed that all together to come up with the characters," Winston says.

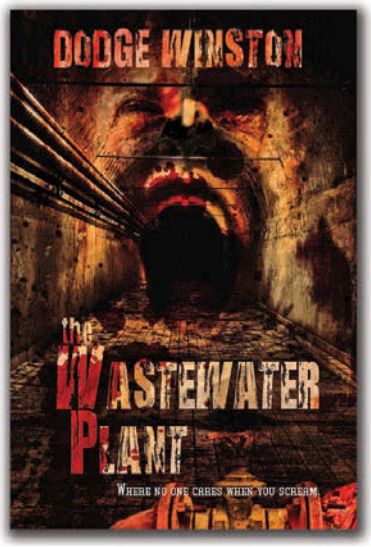
In the field for 10 years, Winston is plant operator at a facility in San Francisco Bay Area. "I've let a couple operators where I work read the book, and it's been pretty positive," he says. "One person wasn't happy about it, but it's a fiction horror novel."

"I want operators to get a fun ride out of the book. It's something they can really identify with. The book portrays wastewater not just in a technical way, but in a fun way."

DODGE WINSTON

The plot follows operator-in-training Scott as he starts a job at a treatment plant on an island. The first twist comes as a 100-year flood begins and the day and night crews are stuck together at the plant, surrounded by marshland and swamps. Scott realizes that the operators' relationships and work politics add an entire facet to the job. "He sees that maybe the plant is a little more intense than he ever expected," Winston says. The second plot twist is a creature stirred up from the marsh by the action of water from the rainstorm.

An undercover Black Ops mission operated by the government also throws the operators for a loop. "A government agency knows about the creature through old Indian folklore," Winston explains. "Their idea is to control the weather to create the perfect storm where this creature wakes up, and that's exactly what happens. Since the only thing on the island is the treatment plant, the creature sets its sights on the island and the plant."



Author Dodge Winston got the idea for his book while chatting with operators about reality shows.

Operators are forced to deal with the creature but have no idea the government is behind it all. "While they're defending themselves and trying to protect themselves and just make it until daylight, the government is watching this all happen, and they have other things in mind," Winston says. "One thing leads to another, and it's not pretty."

Winston says joking around with operators about reality shows like "Deadliest Catch" and "Yukon Men" prompted him to write the book: "When you work the graveyard shift, a wastewater plant can be eerie and creepy. I thought it was the perfect venue for a horror/sci-fi novel."

While Winston wrote the book for the general public, plant operators are sure to enjoy the lighthearted side, too: "I want operators to get a fun ride out of the book. It's something they can really identify with. The book portrays wastewater not just in a technical way, but in a fun way. Wastewater can be something more than just wastewater. You can write horrific, action-packed books about it using snippets of the plant staff's character traits.

"It should be recognized as one of the great industries that serves the environment and humanity. I want readers to get that it's an important industry and that it's worth talking about." The book is available through Amazon.com and BarnesandNoble.com as an eBook or paperback. For more information or to contact Winston, visit www.dodgewinston.com. tpo

(Continued from page 31)

Awards on display in the lobby at the Grandville Clean Water Treatment Plant.

"We can set the pumping and recirculation parameters to break down any foam or floating solids. You can set it and forget it."

TODD WIBRIGHT

BIOGAS SAVES MONEY

The facility includes an energy management system (HESCO Sustainable Energy) that consists of:

- An engine-generator set.
- Biogas fuel conditioning and cleaning system and fuel piping.
- Engine coolant heat recovery.
- A dual-fuel boiler.
- A hot-water distribution system.
- A control system that directs hot water to points in the process where it is needed and supplements biogas with natural gas when necessary.

As part of the renovation, an old unheated digester with a floating cover was converted to a 25,000-cubic-foot DuoSphere biogas storage tank (WesTech Engineering) to ensure a steady supply of fuel during times of low biogas production.

With more than 100,000 cubic feet of gas per day from the digester, the plant can generate about 280 kW. On natural gas, it can generate 360 kW; it can operate on blended fuels if need be and can switch between fuels automatically — which it tends to do about once a day, according to Wibright. The electricity powers a Turblex blower for the aeration system along with the mixing pumps and other pumps in the digester building.

The heat recovery system "produces water hot enough to circulate through the digester to keep it self-sustaining," Wibright says. "We infrequently have to use our boiler, which can also be fueled by either biogas or natural gas. We're also using that water in a loop system for in-floor heating that provides all the heat for the new lab and operations building." Because of the heat recovery, the new building has just a small furnace for supplemental heat instead of a boiler.

The energy system will result in savings of $142,000 a year in electricity and natural gas at current rates. The cogeneration portion of the project is expected to have a payback of less than eight years, says Wibright: "We're using less electricity now at 10 mgd than we did at 4.4 mgd."

That's just one example of what the Michigan Municipal League meant by "innovative wastewater treatment technology." **tpo**

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To Work by Watercraft

THE TREATMENT PLANT IN LOWELL, MICH., SURVIVED A FLOOD INTACT. THE EXPERIENCE TAUGHT THE OPERATIONS TEAM VALUABLE LESSONS ABOUT PLANNING FOR EMERGENCIES

By Ted J. Rulseh

PHOTOGRAPHY: BEN KAEB; PILOT: SPENCER PLATTNER

ABOVE: The rising water surrounded the Lowell treatment plant but did not flood the facility or disrupt operations. LEFT: Brian VanderMeulen (left) and Mark Mundt.

Taking a boat to work may sound like fun. Mark Mundt will tell you it was — the first time. During four days last April, Mundt ferried himself and colleague Brian VanderMeulen in a fishing boat across the flooded Grand River to the Lowell (Mich.) Wastewater Treatment Plant (operated by United Water).

They spent several days dealing with flood waters brought on by historic rainfall — 11 inches total during April and 9.5 inches from April 7-16. The rains brought the Grand River in Lowell to record levels: It crested 4.02 feet above flood stage.

Mundt, as project manager, oversaw execution of the emergency plan for the oxidation ditch treatment plant (1.4 mgd design, 4.0 mgd peak). He and VanderMeulen, operations specialist, then fine-tuned the plan for the future based on what they learned.

Lowell, population 4,000, lies about 15 miles east of Grand Rapids at the confluence of the Grand River (the largest river in Michigan) and the Flat River (the treatment plant's receiving stream).

Mundt, a 36-year industry veteran who has managed the Lowell plant for 24 years, holds a Class A Wastewater License (highest) and several water licenses. He was named 2013 Operations Professional of the Year by the Michigan Water Environment Association. Mundt talked about his experience with the flood and its aftermath in an interview with *Treatment Plant Operator.*

> "We had more or less a generic emergency plan that we wrote ourselves, and it did have a flood section. But unless you are really good at doing what-if scenarios, your plan is going to be incomplete."
> **MARK MUNDT**

tpo: Please describe the events that led up to the flooding in Lowell.

Mundt: We were hit with a one-two punch. First, we received 6 inches of rain in seven days, so that everything was saturated. When another 3 1/2 inches came two days later, there was no place for it to go except to the nearest waterway, and work its way to the Grand River. On its way to Lake Michigan, it passed through Lowell.

tpo: What warning did you have that there would be extreme flood conditions?

Mundt: There are two types of flooding. Flash flooding comes when you get a ton of rain and immediately everything fills up — there's an immediate reaction to the storm. In our case, we had a few days' warning.

Our plant staff reports rainfall to the National Oceanographic and Atmospheric Administration and the National Weather Service, and we manually take river level readings and input them to the NWS website. These river readings and forecasts are used to make a computer model of the elevations the river is expected to reach. So we knew as soon as we put the information in, and they updated the model, that in about three days the river would be at a record flood stage. It wasn't just because we got 3.5 inches of rain in Lowell, but because the whole area got 3.5 inches of rain.

tpo: Did you have an emergency plan in place?

Mundt: We did. We had more or less a generic emergency plan that we wrote ourselves, and it did have a flood section. But unless you are really good at doing what-if scenarios, your plan is going to be incomplete. We did learn quite a few things to add to our plan to help make us better next time.

tpo: When you learned the flood was coming, what did you do to prepare?

Mundt: Once we saw that the river was predicted to crest at record levels, we notified the Department of Public Works and advised them to rent several portable pumps so that we could avoid collection system backups. We told the Police Department and city manager what was expected, and we called the Michigan Department of Environmental Quality to advise them that we would probably be bypassing on the collection system. We also

sealed openings at the main lift station that we expected to be under water.

We arranged for transportation to the plant in my boat, filled out a safe work plan for boating, had extra fuel for our emergency generator delivered to the plant, and forwarded NWS links to our home computers so we wouldn't need to go to the plant to enter river readings and see elevation predictions.

tpo: Did the flooding directly affect the treatment plant?

Mundt: When we checked our elevation and compared that to the NWS forecast, we knew we would be high and dry, but we also knew there would be a lot of water in the collection system, and the biggest threat was the impact of basement flooding in the community. That's why my first call was to the DPW to get pumps lined up. In events like this, those items disappear very quickly from rental agencies. Even as quickly as we reacted, we got some of the last ones available.

tpo: How and where were the pumps deployed?

Mundt: We deployed three pumps as close as we could to the main lift station, which we knew would be in the floodwaters. We had to stay far enough away so that the pumps wouldn't be sitting in flooded areas. The pumps pulled water out of the sanitary sewers and sent it into storm sewer drains or pumped it into ditches. When we let the DEQ know that was going to happen, they were very understanding. They knew it was a historic rain for the area, and many plants had similar issues, although nobody else flooded quite as much as we did.

tpo: How much water had to be bypassed?

Mundt: We estimate that we bypassed just short of 20 million gallons. The plant itself put through about 81 million gallons for the month, which was a record. The water we bypassed was very dilute. SSO reporting requires that we notify the health department, which decides whether we need to do sampling. The city did sample the river above and below the discharges, and the *E. coli* tests indicated that it was still within swimming quality standards.

tpo: How long did the high water persist?

Mundt: The driveway to the plant was under about five feet of water at one point. At first we used a dump truck to drive through about 18 inches of water. When the water kept rising, we switched to my jon boat for four days. After that we went back to the dump truck for a day, and from then on we were able to drive to the plant in our own vehicles. In three weeks, we were mowing grass that had been under five feet of water.

tpo: Why was there a need for extra generator fuel?

Mundt: We only keep about 250 gallons of diesel fuel on site. We weren't sure how long the flood would last and whether we would lose power at some point. Our worst-case scenario was that we would need 1,000 gallons, in case we lost power for up to a week.

tpo: Was the plant fully functional during the event?

Mundt: We had no mechanical issues, and we were very happy about that. We do a lot of preventive maintenance here. We use a computerized maintenance management system; we follow it to a tee, and it seems to pay off. We do about 35 preventive work orders a week.

tpo: Did it take any extraordinary measures to keep the plant running?

Mundt: None except for watching to make sure everything was running the way it was supposed to, and it was. In times like that, you hold your breath and hope nothing breaks. We actually went a little over our peak design flow of 4 mgd. We had no bypasses at the plant. We did start to lose some floc, but we stayed in compliance with our NPDES permit.

tpo: Overall, what was the impact of the flooding on the wastewater system and the Lowell community?

Mundt: Besides our record for monthly plant flow, we set records for daily flow at 4.13 million gallons and average daily flow for a month at 2.7 million gallons. The bypass pumping was effective in preventing basement backups, although three basements did experience overflows. Numerous other homes were flooded from the rising river. The flood brought out the best from citizens of the Lowell area. Countless volunteers helped in many ways, including sandbagging, donating food and clothing and staffing shelters.

tpo: What lessons could other plant operating teams learn from your experience?

Mundt: If you don't have an emergency plan, get one. Make it a real document — don't just do a perfunctory job and check a box that says, "Yes, we have a plan." When doing tabletop exercises, really take the time to think it through. What if the water gets to this elevation? Where are our exposures and weakest links? Do we need to get extra chemicals on site? How long could we be stranded and unable to bring in supplies? Do we need to have staff on site 24 hours a day? Do we need to bring in food supplies for them? How will we maintain communications?

> "If you don't have an emergency plan, get one. Make it a real document — don't just do a perfunctory job and check a box that says, 'Yes, we have a plan.'"
> **MARK MUNDT**

tpo: Where can plants look for guidance on emergency planning?

Mundt: I would suggest talking to neighboring facilities, and perhaps talking to your local emergency planning coordinator. I believe the U.S. EPA and the Water Environment Federation also have resources available.

tpo: What specifically did you learn that helped you improve your plan?

Mundt: Our biggest eye-opener was that the electrical switchgear is not at very high elevation. We're working with the power company to get them to raise it, or eliminate it and wire us directly from a different feed. It doesn't make any sense that the plant could be high and dry, and yet we lose power because the switchgear has to be shut off.

We're going to move our portable generator out of the plant — it's used for emergency power at our lift stations and the drinking water booster pump stations. If we had needed it during the flood, we wouldn't have been able to get it off the island the plant became. We're going to have a portable fuel tank placed on site next time and have arranged with a local fuel oil company to have that tank available.

Other things we wrote into the plan are things we actually did — we just want them in writing to make sure we remember next time. They include making the necessary notifications, arranging for a boat, having the DPW secure at least three 1,000 gpm portable pumps, checking chemical inventory and ordering as needed, and working with a team approach.

tpo: What do you mean by working with a team approach?

Mundt: We felt that especially with boating across the water, it was not good to have that be a one-person operation. There was a powerful current all the way around the plant. The flood that covered the driveway took place Friday, Saturday, Sunday and Monday. Brian and I both worked that whole time. Typically we would have been off Saturday and Sunday because we have a part-time operator who comes in on weekends. It just made sense to have two of us on site in case something bad happened.

tpo: How would you sum up your experience with this flood?

Mundt: Taking a boat to work was quite unique and fun — the first time. After that it became just another chore. The flood was something to go through once. If it never happens again, that will be fine. As crazy as the weather has been the last few years, I'm not sure it won't happen again. **tpo**

What Exactly Is pH?

HERE'S A LOOK AT WHAT ACIDITY AND ALKALINITY MEAN AT THE MOLECULAR LEVEL AND HOW PH IS MEASURED, PLUS A FEW SAMPLE EXAM QUESTIONS COVERING THE TOPIC

By Ron Trygar, CET

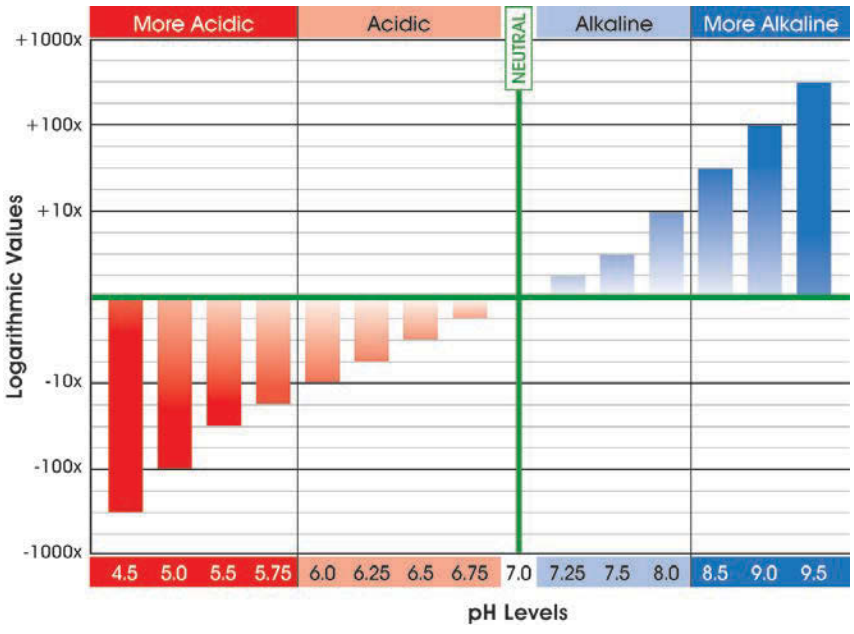
When operators are asked to define pH, many struggle to describe what it is and how it is measured. Let's look at those matters — and explore how questions about pH might be worded on a wastewater licensing exam.

The technical definition of pH is: the logarithm of the reciprocal of the hydrogen ion activity in a given solution. So, you're probably asking: *What the heck does that mean?* If we look at what pH represents, we find that it is the measurement of how acidic or alkaline (basic) a solution is. If we grab a sample of treatment plant influent or effluent and measure the pH, what we're really measuring is the balance of the amount of acid and base chemicals in that water.

pH BASICS

Some fundamental facts about pH:

- pH is measured on a scale of 0 to 14.
- pH is the measurement of the activity of free hydrogen (H^+, acid) and hydroxyl (OH^-, base) ions in a solution.



pH is measured on a logarithmic scale from 0 to 14. Each whole number on the scale represents a tenfold difference. Acids turn litmus paper red; bases turn litmus paper blue.

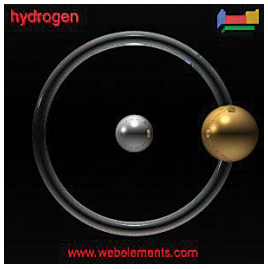


FIGURE 1: A schematic representation of the electron shell structure of hydrogen (not what the hydrogen atom actually looks like).

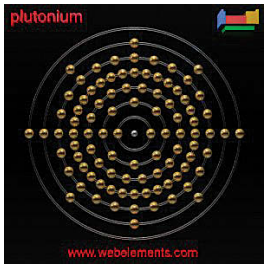


FIGURE 2: A schematic representation of the electron shell structure of plutonium.

- pH 7.0 is considered neutral, or balanced; it has the same amount of acid and base ions.
- pH below 7.0 is considered acidic.
- pH above 7.0 is considered alkaline (or basic).
- pH is commonly used to describe the activity of the hydrogen ion. An ion is a charged atom or molecule. An atom of hydrogen is made of one proton and one electron (Figure 1), and donates (or shares) its electron easily. Because an atom of hydrogen can share its electron with other elements easily, hydrogen can bond with atoms of other elements, forming what is known as an ionic bond.

UNDERSTANDING ATOMS

All atoms have positively charged protons and negatively charged electrons. Most atoms also have neutrons, which are not charged (neutral). Hydrogen in its purest form has one electron and one proton. However, if a neutron happens to be present in the atom's nucleus, or center, we call that an isotope of hydrogen. The elements deuterium (one neutron) and tritium (two neutrons) are isotopes of hydrogen. Neutrons give an atom weight but do not alter its ionic charge.

One more thing about atoms before we discuss the formation of compounds, like water. Atoms have electrons whirling around their nucleus, which contains protons and usually neutrons. The electrons are arranged in shells, a term used to describe the orbits of electrons around the nucleus. Compare an atom to our solar system for a minute: The sun is analogous to the nucleus of an atom where protons and neutrons are found, the planets revolving around the sun are analogous to electrons.

Check Your pH Knowledge

1. **An operator has calibrated the pH meter with pH 7 and pH 4 buffer standards. The effluent pH value is 7.9. What should the operator do?**
   a. Report the effluent pH value as 7.9.
   b. Recalibrate the meter with the proper buffers, then reread the effluent sample.
   c. Recalibrate the meter using the pH 10 buffer only, then reread the effluent sample.
   d. Abandon the electrode method in favor of the more accurate litmus paper method.

2. **Which of these pH readings indicates a wastewater where there are more free hydrogen ions than hydroxyl ions?**
   a. 6
   b. 7
   c. 8
   d. 12

3. **The addition of acetic acid will have what effect on a liquid's pH value?**
   a. The pH will increase.
   b. The pH remains stable.
   c. The pH will decrease.
   d. This chemical has no effect on pH.

4. **An operator uses an additional 7.85 pH standard to verify the accuracy of the meter/probe unit. In 9 out of 10 readings, the meter reads 8.01. What does this tell us about the meter/probe unit?**
   a. The meter shows repeatability, but not accuracy.
   b. The meter shows accuracy, but not repeatability.
   c. The meter is both accurate and repeatable.
   d. The readings are inconclusive and should be ignored.

5. **A pH reading of 11 is how many times more alkaline than a pH of 8?**
   a. 3 times greater.
   b. 10 times greater.
   c. 100 times greater.
   d. 1,000 times greater.

Answers: 1 – b; 2 – a; 3 – c; 4 – a; 5 – d

Atomic theory tells us that the innermost shell nearest the nucleus can contain no more than two electrons. The next shell can hold up to eight electrons. The third shell from the center can hold up to 18, and the fourth and fifth 32 each. The sixth can hold up to eight or 18, and the seventh (and last) shell either two or 18. An atom of plutonium (Figure 2), which has 94 protons (thus an atomic number of 94), has electrons all the way out into the seventh shell.

FORMING MOLECULES

Now, about those ionic bonds. A good example is water, made of one oxygen atom and two hydrogen atoms (H_2O). A hydrogen atom has one electron but has room in its shell for two. An atom of oxygen has eight electrons. Its innermost shell is satisfied with two, but the second contains only six, leaving room for two more.

Oxygen, therefore, is happy to share its outer electron shell with hydrogen, and when two hydrogen atoms are present, they are satisfied because the vacant spaces are now full with electrons. The compound is said to be stable. If a compound has one more electron than protons, the compound is negatively charged. If there is one more proton present than electrons, the compound is positively charged.

Many operators are familiar with polymer, a coagulant used in biosolids processing and as an aid to settling. Polymers are charged chemical compounds: a cationic polymer is positively charged, an anionic polymer is negatively charged and a nonionic polymer is neutral.

The free hydrogen ion is positively charged (H^+). The compound known as hydroxyl, made up of one hydrogen and one oxygen atom, is negatively charged, since it has one extra electron. When H^+ is joined to a water molecule (H_2O), the resulting compound is hydronium (H_3O^+). It is the hydronium ion that gives acids their lower pH values and imparts sour taste to acidic liquids.

A base (or alkali) substance is one that will accept protons, thereby neutralizing the acid. An example of an alkali is hydroxyl (OH^-), which when combined with the acidic hydronium ion (H_3O^+) neutralizes, forming two molecules of water: $OH^- + H_3O^+ \rightarrow 2H_2O$.

Raw wastewater generally has a pH near neutral (7.0), although it may vary between 6 and 8. If significant hydrogen sulfide (H_2S) is present in the collection system and the wastewater is odorous, then the pH may be lower than 6 because the amount of hydrogen dissolved in the water (as H_2S) has increased, causing a shift in the balance of hydronium and hydroxyl ions.

MEASURING pH

pH can be measured three ways: the electrode method, the colorimetric method and the hydrion paper method. The electrode, the most common and probably the most accurate, uses a probe and meter. The meter measures the slight voltage differences between a reference electrode and a measuring electrode. This voltage, in millivolts (mV), is converted to a pH reading.

The colorimetric method includes indicator reagents like bromthymol blue and phenol red to produce color in the solution — red for acid and blue for base. The liquid's color and intensity are then compared against a set of color standards. The hydrion method uses a special test paper (litmus paper) dipped into the solution. The color produced on the paper is then compared against color standards. Typically, acids turn litmus paper red and bases turn it blue.

The electrode method is accurate if the meter is calibrated properly and the sample is fresh. Most meters can be standardized with three calibration standard pH buffers. Common pH buffers are pH 4, 7 and 10. When standardized with these buffers, the meter is considered accurate across a wide range of pH values.

The pH 7 buffer gives the meter a reference point to "know" what a balanced solution is; the pH 4 and 10 buffers give the meter "target" acid and alkaline values to hit. The meter's ability to hit the target buffer value is called accuracy and is referred to as the meter's slope.

A new pH electrode in fresh pH buffers is normally very accurate across this slope and can hit the target pH value very closely, whereas an old probe might miss the mark, giving the pH slope a low percentage slope reading. A new pH meter and probe assembly that is very accurate might have a slope percentage of 98 percent, while an old probe might have a slope value of less than 60 percent.

For instance, when calibrating a pH meter, an operator may find that the meter and probe unit accept the pH 7.0 buffer calibration value, but that when the probe is placed into a pH 4 or pH 10 buffer, the meter reads significantly lower or higher than the buffer's stated

(Continued on page 39)

PHOTOS COURTESY OF COWSKIN CREEK WATER QUALITY RECLAMATION FACILITY

Hook and Line

ANGLERS FIND A GREAT SPOT ON A KANSAS PLANT'S EFFLUENT RECEIVING RESERVOIRS, PART OF A 148-ACRE WILDLIFE HABITAT AND PUBLIC USE DEVELOPMENT

By Jeff Smith

The Cowskin Creek Water Quality Reclamation Facility was built to handle explosive growth in northwest Wichita, Kan., during the mid-1990s. Since then it has become a favored destination for sport fishermen, bird watchers and other outdoor enthusiasts.

"Some of the regular fishermen tell us not to tell anyone about our ponds because it's a great place and they don't want anyone else to know about it," says Rebecca Lewis, plant superintendent. The ponds are 6- and 10-acre effluent receiving reservoirs for the activated sludge treatment plant (2 mgd design/1.0 mgd average). They are also the hub of a popular public use area on the 148-acre site.

ABOVE: Clockwise, from left, the Kansas Department of Wildlife and Parks staff stocks catfish in ponds at the Cowskin Creek facility; the plant office building includes a water feature at point of effluent discharge into a pond; an aerial view of plant; and local youngster happily shows his catch.

WELL STOCKED

More than two miles of 5-foot wide concrete walking trails follow the contour of the ponds and meander near wetlands that serve as an alternate effluent discharge reservoir. Normal evaporation maintains the ponds at acceptable levels, even during rainy periods. Signage, information kiosks and benches at rest areas are not installed yet, but are part of the long-range plan for the trail system.

> "The Cowskin Creek facility represents the outcome of true public engagement. It's a state-of-the-art facility that provides exceptional quality wastewater treatment and a natural recreation area for everyone."
>
> **DON HENRY**

In collaboration with the City of Wichita, the Kansas Department of Wildlife and Parks (KDWP) keeps the ponds stocked each year with largemouth bass, sunfish and channel catfish. Gentle slopes and easy access make the ponds a favorite fishing hole for anglers of all ages, says Lewis.

KDWP was recognized for its Community Fisheries Assistance Program, which works to improve fishing opportunities at community-owned lakes. In 2009, the department received the Outstanding Sport Fish Restoration Program Project of the Year award from the American Fisheries Society.

GREAT FOR KIDS

"Those ponds are one of my favorite places to recommend," says KDWP fisheries biologist Jessica Mounts. "The shoreline access is kid-friendly all the way around both ponds." The plant maintenance staff cares for the ponds and keeps the grass mowed around the public use area. Many citizens who use the site regularly also volunteer to keep the grounds neat. "It's a great asset to the community, and they want to keep it that way," says Lewis.

It wasn't always a popular spot. During construction planning, citizens at town meetings objected to the additional flow from the plant into Cowskin Creek, the planned outfall point, which already had seen flooding during heavy rains.

No one wanted the plant built, Lewis says. So the ponds were created, along with 38 acres of constructed wetlands, which rarely receive effluent.

(Continued from page 37)

value, or the meter gives an error code or the pH calibration is not accepted. Most pH probes will last about a year to 18 months, after which they tend to lose accuracy and must be replaced.

If performing a two-point calibration, users should be sure to bracket the expected pH reading with the proper buffers. For example, if the normal reading in plant effluent is 7.5, the meter should be calibrated with at least a pH 7 and a pH 10 buffer. If the reading turns out to be pH 6.8, the meter should be recalibrated with pH 7 and pH 4 buffers.

Other pH buffers can be purchased to use with your meter. Some folks use an additional standard buffer (like pH 6.76) to check the meter for accuracy along with the calibration buffers. Using an additional pH buffer, other than the calibration buffers, gives the user confidence in the meter's accuracy.

CONTROLLING QUALITY

Quality assurance/quality control (QA/QC) is important when measuring pH (or any reportable value). QA/QC is all about accuracy and repeatability. Imagine you have an archery target and a quiver of 10 arrows. If all 10 arrows hit the bullseye, you are very accurate and repeatable. If most of the arrows miss the bullseye and are all over the map, you are neither accurate nor repeatable. If the majority of the arrows miss the bullseye, but are grouped in one area of the target, you are not accurate, but you are repeatable.

The difference between each pH unit is a tenfold value. That is, a pH 9 is ten times higher in hydroxyl ions (more alkaline) than at a pH 8. By extension, a pH of 13 is 100,000 times more alkaline than pH 8. Conversely, a pH reading of 4 would be 100 times more acidic than pH 6.

These periodic "Exam Tutor" articles are designed to help operators pursuing higher levels of licensing prepare to sit for exams. Articles will be written by operator trainers. Sample questions are not the same as those that appear on any specific exam — they simply represent the kinds of questions that may appear on an exam under the specific topic. If you would like to see this column cover a topic you find especially challenging, send a note to editor@tpomag.com.

Operators who ask why they can't just calibrate a pH meter with the pH 4 and pH 10 buffers don't realize how large the difference between these readings really is. This is why it is important to use a pH 7 buffer in the calibration procedure. The meter needs a reference to know where the balance point is.

When faced with questions on an exam, many operators forget what they know about pH. The accompanying sidebar lists some questions about pH that are similar to actual questions I have seen on state licensing exams.

ABOUT THE AUTHOR

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www.webelements.com

Basic Chemistry for Water and Wastewater Operators; D. Singh Sarai, PhD. AWWA, 2005. tpo

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Only in unusually high rainfalls does discharge flow reach Cowskin Creek. A water feature in front of the plant was built with large limestone blocks that aerate the effluent as it is discharged and cascades into the ponds. "We think it's a showcase," says Lewis.

Don Henry, assistant director of Public Works and Utilities, who manages the city's stormwater, wastewater and water treatment facilities, observes, "The Cowskin Creek facility represents the outcome of true public engagement. It's a state-of-the-art facility that provides exceptional quality wastewater treatment and a natural recreation area for everyone."

Share Your Ideas

***TPO* welcomes news** about interesting features of your facility's grounds, signage or buildings for future articles in the PlantScapes column. Send your ideas to editor@tpomag.com or call 715/277-4094.

WILDLIFE MAGNET

Plovers, herons, egrets and cranes and many other migratory birds populate the ponds and wetlands. Native species like whitetail deer, opossum, raccoon and wild turkey find suitable habitat year-round. And some species, like the threatened and endangered least tern and eastern spotted skunk find critical habitat on the grounds.

School groups and members of the general public take tours of the facility. Besides learning about the plant's wastewater processes, attendees learn how the ponds and wetlands work and the delicate balance between form and function.

On one recent weekend, more than 300 motorcyclists visited the site as a prescribed stop on a ride. "It's a good way to get the message out, and we talked to them a little bit about water quality," says Lewis.

Henry states, "It is truly a win-win and something the entire community can be proud of." tpo

PHOTOGRAPHY BY RANDY BRAILEY

Energy Management is an ongoing process. Monitoring energy consumption is important to lowering energy bills.

Johnson County (Kan.) has set priorities for energy efficiency and energy bills. Recent green infrastructure projects at the Douglas L. Smith Middle Basin Wastewater Treatment Plant provide an estimated $250,000 in annual savings.

Getting a Handle on Energy

THERE'S A SIMPLE PROCESS FOR CUTTING YOUR TREATMENT PLANT'S ENERGY USAGE: BENCHMARK, AUDIT, IMPLEMENT AND MONITOR

By Jennifer Gunby

The U.S. EPA estimates 30 to 40 percent of a municipality's energy consumption is for treating water and wastewater. That's a total of $4 billion annually nationwide. The U.S. Department of Energy (DOE), meanwhile, states that electricity represents about 75 percent of the cost of municipal water processing and distribution.

How does a utility manage energy usage to reduce consumption at the wastewater treatment plant without sacrificing water quality or adding time-consuming steps for staff? The first step is benchmarking — establishing total consumption and comparing it to similar facilities.

Second is an energy audit. This is a study that quantifies the energy consumption of your individual systems, identifies the energy conservation measures (ECMs) you could take to reduce consumption, and estimates the cost to implement the ECMs. The final step is the one least followed through: implementation.

BENCHMARKING

Benchmarking lets you compare your treatment plant to others and monitor your progress on energy savings year to year. ENERGY STAR Portfolio Manager, a voluntary program created by the EPA, provides guidance and a free online benchmarking tool to help you track energy use and costs. There's even an ENERGY STAR program specific for wastewater treatment plants and drinking water systems that will help you to compare your plant with your peers.

The more detailed your information, the more productive your benchmarking will be. While you can often complete benchmarking for little or no cost, the addition of submetering can increase accuracy.

ENERGY AUDIT

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) provides a standardized procedure for energy audits that includes guidelines for different levels of audits. These levels range from a walk-through audit to a detailed survey and analysis audit.

The higher-level, detailed audits provide an in-depth analysis, creating recommendations with a more refined cost/benefit analysis. Recommended ECMs can generally be categorized as retrofits or behavior changes. Retrofits such as high-efficiency lighting and variable-frequency drives can have fast payback. Others, such as digester gas recovery and fine-bubble aeration, require longer-term investments and can be included in your plant's capital improvement plans.

Behavior changes can include specific actions within the plant, such as implementing an energy management plan or shutting down computers at night. They can also be policy-related: requiring equipment for a life cycle cost rather than first cost when it is being replaced, and negotiating a rate structure with the local utility that includes voluntary peak load shedding.

Knowing how much energy your plant uses and how to reduce consumption only gets you so far. To save energy and money, you need to implement the changes.

IMPLEMENTATION

Knowing how much energy your plant uses and how to reduce consumption only gets you so far. To save energy and money, you need to implement the changes. Every excuse has been used: Budget approval is a hassle, hiring contractors is time-consuming, the savings won't come back to your department, it's too hard to change people's behaviors. But efforts to change and investments in more efficient equipment are the only route to savings.

For example, Johnson County (Kan.) Wastewater (JCW) implemented a cogeneration system at its Douglas L. Smith Middle Basin Wastewater Treatment Plant in 2011. "This system converts methane gas produced by the anaerobic digesters to electricity to be used by the treatment plant," says Susan Pekarek, chief engineer for JCW. "This has resulted in an annual savings of about $250,000 by producing power to be used on site."

FOLLOW A PROCESS

While no two energy efficiency projects are the same, there is a basic process common to many successful projects. To help see your energy audit through to implementation, the DOE offers a guide under its Industrial Technologies Program (ITP): *Guiding Principles for Successfully Implementing Industrial Energy Assessment Recommendations.* While targeted to industrial manufacturers, the process and advice are essentially the same for wastewater treatment plants.

After implementation, it is important to monitor your results: Energy efficiency is an ongoing process. Plants should track and compare the energy consumption to look for anomalies and additional opportunities to save energy. The best single number to watch is kilowatt-hours (kWh) per mgd treated.

Reducing energy consumption is the best first step and can be followed by a plan to reduce greenhouse gas emissions. The process is the same: benchmark, audit, implement and monitor. Reductions can be accomplished through additional retrofits, changes in behavior and on-site renewable energy generation.

ABOUT THE AUTHOR

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Energy Management and Sustainability

By Craig Mandli

Wastewater operators can employ efficient components to drive down system energy costs. Here are some of the latest asset management products, drives, heat exchangers and recovery systems, efficiently-designed motors, pumps, blowers and mixers, and renewable energy systems that plants are utilizing to help manage energy consumption.

Asset Management

LIQUID MEMBRANE SEALING SYSTEM

ENESEAL HR liquid membrane from ENECON Corporation

ENESEAL HR single-component, water-based, ceramic-filled liquid membrane from ENECON Corporation cures to a durable, seamless, flexible skin that refracts and reflects heat to save energy while resisting moisture. It is suitable for insulation including plastics, concrete, brick, block, slate, tiles, wood, metal, bitumen, glass and tar/asphalts. It is applied by brush, roller or spray. Clean up requires only soap and water. **888/436-3266; www.enecon.com.**

Lab and robotics enclosures from HEMCO Corporatio

LAB ENCLOSURE

Lab and robotics enclosures from HEMCO Corporation isolate liquid-handling workstations, HPLC equipment, sample weighing, high-throughput screening, powders handling and other lab processes by providing exhaust air systems or HEPA-filtered clean workstations. They are built to protect personnel from hazardous fumes and processes from contamination. **800/779-4362; www.hemcocorp.com.**

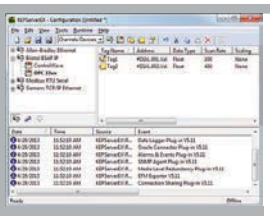
BLOWER CONTROLLER

Sigma Air Manager (SAM) 3D blower controller from Kaeser Compressors

The Sigma Air Manager (SAM) 3D blower controller from Kaeser Compressors combines industrial computer and Internet technology to improve operations with stable pressure and low energy costs. It adjusts airflow to maintain desired dissolved oxygen levels and minimize energy consumption. Alternating base- and peak-load blowers balance service hours and improve reliability. It includes an integral Web server for remote viewing of system activity. An optional Sigma Air ControlPlus stores system data for reporting, system audits, control optimization and long-term trend analysis. **877/586-2691; www.kaeser.com.**

COMMUNICATIONS PLATFORM

KEPServerEX from Kepware Technologies manages communication through a platform that supports an array of proprietary communication protocols, APIs, automation system interfaces and open standards such as OPC and SNMP. The single-server platform supports more than 150 drivers, providing more than 250 unique protocols, allowing consolidation of data from various sources to ensure data consistency and reliability, reduce network traffic and provide an efficient platform for automation communications. **207/775-1660; www.kepware.com.**



KEPServerEX from Kepware Technologies

AUTOMOTIVE-GRADE PAINT SYSTEM

POWER ARMOR paint system from KOHLER Power Systems

The 10-step automotive-grade POWER ARMOR paint system from KOHLER Power Systems improves finish durability of generator tanks and enclosures. It combines a cleaning and conversion process to prepare metal parts for adhesion, along with an epoxy electrocoat and powder topcoat for advanced corrosion resistance, abrasion protection and color retention. Excess powder is recycled for waste reduction. The system is free of heavy metals and leaves a textured industrial finish that surpasses 3,000-hour salt spray corrosion tests. **800/544-2444; www.kohlerpower.com.**

Met-Pro Global Pump Solutions online calculator

PUMP LIFE CYCLE COST CALCULATOR

The Met-Pro Global Pump Solutions online calculator lets operators quickly estimate total life cycle cost for one or more pumps. Users input data including initial pump costs, installation costs and annual recurring costs. The calculator accounts for energy costs in the state and generates an analysis. **215/723-8155; www.mp-gps.com.**

ENERGY MANAGEMENT SOFTWARE

StruxureWare for Water software from Schneider Electric

StruxureWare for Water software from Schneider Electric includes an easily configurable dashboard that allows ad hoc reporting and analysis. Operators use several tools that aggregate energy and related data into a single platform for analysis of energy savings. The power monitoring functions deliver data as actionable information through a customizable, user-friendly interface accessible from computers and hand-held devices on the network. The functionality can be scaled from small to large systems. **770/329-3878; www.schneider-electric-water.com.**

POWER FACTOR CORRECTION BANK

kVAR StacoVAR Mini power factor correction bank from Staco Energy Products

The kVAR StacoVAR Mini wall-mountable automatic power factor correction bank from Staco Energy Products maintains the desired power factor through a microprocessor-based controller that adjusts to system load conditions. Models are available from 11.5 to 28 kvar at 208 volts, 15 to 37.5 kvar at 240 volts, and 28 to 75 kvar at 480 volts. The compact design includes capacitors, reactors, contactors and fuses. It includes environmentally friendly, self-healing metalized polypropylene film dry-type capacitors, each in an aluminum cylindrical housing and with an overpressure device and discharge-resistor safety system. **866/261-1191;www.staco energy.com.**

Drives

INVERTER DRIVE BEARING PROTECTION RINGS

AEGIS bearing protection rings from Electro Static Technology

Maintenance-free AEGIS bearing protection rings from Electro Static Technology make energy savings and bearings sustainable by diverting damaging currents safely to ground. Vertical hollow-shaft pump motors can be protected by installing a ring next to the motor's guide (lower) bearing and carefully applying ceramic insulation to the carrier that holds the thrust (upper) bearing in place at the motor's drive end. **866/738-1857; www.est-aegis.com.**

VARIABLE-FREQUENCY DRIVE CONTROL PANEL

The OLS Series control panel from Orenco Controls contains integrated variable-frequency drives (VFDs) that can optimize system operation and reduce energy usage up to 40 to 50 percent. The VFDs also prolong pump and system life by reducing hard starts and water hammer. Multiple drives can be configured through one simple human-machine interface. Each panel and its enclosure can be designed and built specifically for application and set-up needs. The outdoor-rated panel, housed in a weatherproof enclosure, also offers circuit protection, heat dissipation systems (fan or A/C), phase and voltage protection and level controls. **877/257-8712; www.orencocontrols.com.**

OLS Series control panel from Orenco Controls

INTEGRATED VECTOR DRIVE

The integrated vector drive from seepex, Inc. has a digital display for metering and general transfer progressive cavity pumps. It integrates the pumps with a single reduction gearbox, a four-pole TEFC inverter-rated electric induction motor and a vector-type variable-frequency drive in a NEMA 4 enclosure. The vector capability has an internal sensorless feedback system for accurate speed control and stability. The pump and drive combination can cover a performance band of 0.08 to 60 gph and pressures up to 260 psi. **937/864-7150; www.seepex.com.**

Integrated vector drive from seepex, Inc.

MEDIUM-VOLTAGE AC DRIVE

The MV1000 medium-voltage AC drive from Yaskawa America combines compact modular design, high efficiency and low harmonics. Its Smart Harmonics technology reduces input total harmonic distortion to less than 2.5 percent without filters, exceeding the requirements of IEEE519-1992 by almost 50 percent. It also provides galvanic isolation between power input and output. It uses two 5-volt step bridges per phase to generate 17-level line-to-line voltage output delivered to the motor. Several motor control modes are available to fit a wide range of applications. It also features a compact modular design that facilitates transportation, installation, and maintenance. It is available in 2.4- and 4.16-kV models in four different frame sizes. **800/927-5292; www.yaskawa.com.**

MV1000 AC drive from Yaskawa America

Heat Exchangers/ Recovery Systems

SLUDGE SPIRAL HEAT EXCHANGER

Sludge Spiral Heat Exchangers from Alfa Laval

Sludge Spiral Heat Exchangers from Alfa Laval cost-effectively keep digesters warm, preheat sludge before dewatering and pasteurize sludge. They are compact and self-cleaning and have high heat transfer efficiency and low pumping power consumption. **866/253-2528; www.alfalaval.us/wastewater.**

HX heat exchanger system from DDI Heat Exchangers

HEAT EXCHANGE SYSTEM

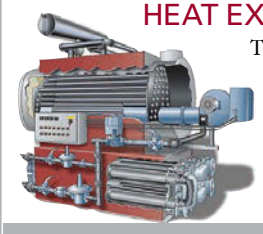
The HX heat exchanger system from DDI Heat Exchangers can connect to sewage lines and integrate into a building's heating and ventilation system to recover heat and cooling energy from sewage. It is easy to access, low in maintenance and reliable. It can be easily integrated with existing wastewater infrastructures. **514/696-7961; www.ddi-heatexchangers.com.**

BIOSOLIDS THERMAL HYDROLYSIS SYSTEM

EXELYS-DLD thermal hydrolysis system from Kruger USA

The EXELYS-DLD biosolids thermal hydrolysis system from Kruger USA, used in the company's DLD (Digestion-Lysis-Digestion) configuration, optimizes energy production and solids reduction. The DLD configuration combines double digestion separated by the system. Sludge is fed to the first digester, which can operate in a mesophilic or thermophilic state. The easily degradable solids are converted to biogas. The material is then dewatered and fed to the continuous thermal hydrolysis system. The heat is recovered for steam generation and heating of the first digester. The hydrolysed material is then digested in the second (mesophilic) digester, where all solubilized solids are converted to biogas. **919/677-8310; www.krugerusa.com.**

COMBINATION BOILER/ HEAT EXCHANGER



Boiler/heat exchanger from Walker Process Equipment

The combination boiler/heat exchanger from Walker Process Equipment is a tube-in-tube heat exchanger on a base with a hot-water boiler. It integrates with water piping, fuel lines, instruments and a complete electrical control system. The dry-back, double-pass boiler is heated with a forced-draft burner. The exchanger has a sludge/water counter-flow arrangement that maximizes heat transfer. The boiler maintains 180 degrees F water temperature, assuring optimal boiler exhaust temperature as heat is transferred from the burner flame to the boiler water. **630/892-7921; www.walker-process.com.**

(continued)

High Efficiency Motors/ Pumps/Blowers/Mixers

AERATOR AND MIXER MOTOR

Endura Series motors from Aqua-Aerobic Systems

Endura Series high- and premium-efficiency motors from Aqua-Aerobic Systems suit Aqua-Jet surface aerators and AquaDDM direct-drive mixers. They are available in a variety of power ratings and operate under severe conditions. They require no greasing and limited maintenance. **800/940-5008; www.aqua-aerobic.com.**

ZS Blowers from Atlas Copco

ENERGY-EFFICIENT BLOWER

ZS Blowers from Atlas Copco use energy efficient screw technology. They offer oil-free air TÜV-certified according to ISO 8573-1 CLASS 0 (2010). **866/546-3588; www.efficiencyblowers.com.**

MAGNETIC DRIVE PUMP

DB Series magnetic drive pumps from Finish Thompson

DB Series sealless magnetic drive pumps from Finish Thompson use neodymium magnetic technology for corrosive-duty applications. The plastic mag-drive pump is up to 70 percent efficient. **814/455-4478; www.finishthompson.com.**

Hoffman Revolution from Hoffman & Lamson, Gardner Denver Products

HIGH-SPEED CENTRIFUGAL BLOWER

The Hoffman Revolution from Hoffman & Lamson, Gardner Denver Products, delivers up to 45 percent energy savings, provides high reliability with little maintenance, and is factory prewired and tested in an ergonomic sound enclosure for plug-and-play operation. A small footprint reduces installation costs. It has a 1-meter certified sound rating below 80 dBa, a self-contained cooling system, air-filtration elements, high-efficiency impeller, magnetic smart bearings and blow-off valve assembly. **866/238-6393; www.hoffmanandlamson.com.**

ENERGY-EFFICIENT SUBMERSIBLE MIXER

Submersible mixers from KSB

Submersible mixers from KSB offer robust design and power savings. They have a tandem mechanical sealing arrangement and a lip seal that seals the shaft. A leak-proof cable entry keeps water from wicking inside the motor. **804/222-1818; www.ksbusa.com.**

THRUST PUMP MOTOR

Motors from Nidec Motor Corporation

Vertical normal thrust (HP shaft) enclosed fan-cooled (TEFC) catalog motors from Nidec Motor Corporation have NEMA premium-efficiency levels, 50 Hz/60 Hz capability, cast-iron bearing caps and shaft slingers on both ends for IP54 protection. Designed for pump OEMs and aftermarket replacement, they are designed for centrifugal, turbine, sump and process pumps. P-Base and C-Face catalog motors are available from 1 through 200 hp at 3,600 and 1,800 rpm speeds. Modifications include models for hostile duty, inverter duty, D-flange, special shafts (JM/JP), special voltages and high altitude or ambient. **888/637-7333; www.usmotors.com.**

Hydromatic HPE Series solids-handling pump from Pentair / Myers

SOLIDS-HANDLING PUMP

The Hydromatic HPE Series premium-efficient solids-handling pump from Pentair / Myers is available up to 200 hp and is engineered for low life cycle costs and long life. It uses a premium-efficient, oil-filled motor that saves energy and has low operating temperatures and permanently lubricated bearings for long life. Features include a switchable seal for easy change, optional quick-disconnect cord, optional shaft-grounding ring for use with VFDs, a bronze sleeve bearing that eliminates the labyrinth ring and a seal-leak detector. **888/416-9513; www.hydromatichpe.com.**

CENTRIFUGAL BLOWER

RB 4000 centrifugal blower from Republic Blower Systems

The RB 4000 centrifugal blower from Republic Blower Systems combines powerful air movement, robust control and easy maintenance. It reaches high pressure using low horsepower, saving energy. It can be used for concrete slurry containment and grinding systems, in landfill gas recovery and in aeration systems. It generates a high-velocity stream of air that can be easily controlled by adjusting the aluminum or stainless steel air knife attachment, depending on the application. The permanently grease-packed ceramic-hybrid ball bearings require no maintenance, while the bearing assembly is easy to access. **800/847-0380; www.republicsales.com.**

Disc aerators from Siemens Water Technologies

DISC AERATOR

Disc aerators from Siemens Water Technologies provide high mechanical efficiency, simple operation and lower energy and maintenance costs. The durable plastic design is lightweight and compatible with existing structures and needs no baffles or mixing equipment for oxygen transfer. They suit single- and multichannel ditches. Upgrades to disc aeration can support simultaneous nitrification/denitrification. **866/926-8420; www.water.siemens.com.**

DIRECTIONAL FLOATING MIXER

9000 Series MAXFLO directional floating mixer from S&N Airoflo

The 9000 Series MAXFLO directional floating mixer from S&N Airoflo saves energy by operating at low speeds and low horsepower, while providing high pumping rates and directional flow. It offers direct pumping rates of 10,000 to 20,000 gpm with 5 or 10 hp units and can add anoxic mixing for denitrification in oxidation

ditches and other activated-sludge processes. It enhances the performance of floating aerators and lagoons by reducing algae growth, odor, short-circuiting, and sludge and debris buildup. The low-speed impeller works well with rags and debris. Maintenance points are above the water line. **877/247-6356; www.airoflo.com.**

BYPASS/WASTEWATER PUMP

Enviroprime System pump series from Thompson Pump

The Enviroprime System pump series from Thompson Pump provides automatic priming with no spilling of pump fluids during initial priming and continued priming throughout operation. They are suited sewer bypasses and wastewater and are available in sizes from 2 to 18 inches with capacities up to 11,000 gpm and heads to 430 feet. The handle solids up to 4 inches. **800/767-7310; www.thompsonpump.com.**

MULTISTAGE CENTRIFUGAL BLOWER SYSTEM

Centrifugal blower systems from Universal Blower Pac

Multistage centrifugal blower systems from Universal Blower Pac are optimized for energy efficiency. They use DC motors with variable-speed controllers and Hibon-Ingersoll Rand Performer/High Performance Series multistage centrifugal blowers. They include total process control and acoustical enclosures. The optimized systems can be combined with EE-PAC high-efficiency screw blower systems for widely fluctuating process demands. Models deliver airflows to 34,000 cfm and a pressure rise of 16 psig. **317/773-7256; www.universalblowerpac.com.**

CHEMICAL METERING PUMP

Qdos 30 chemical metering pump from Watson-Marlow Pumps Group

The Qdos 30 chemical metering pump from Watson-Marlow Pumps Group delivers 5,000 to 1 flow from 0.002 to 8.0 gph at 100 psi, while integrating through IP66 manual, analog and PROFIBUS control options. With ReNu pumphead technology, it is fully sealed to safely handle caustic, abrasive, viscous, shear-sensitive and gaseous fluids and slurries. Control features include fluid level monitoring, fluid recovery, line priming and intuitive flow calibration. A sealed design and fluid recovery eliminate waste and protect operators. A menu-driven interface with a 3.5-inch TFT color display provides high-visibility status indication. **800/282-8823; www.wmpg.com.**

SEVERE-DUTY ELECTRIC MOTOR

W22 electric motor from WEG Electric Corp.

The W22 electric motor from WEG Electric Corp. is designed for performance and energy savings. It has an optimized cooling system, large and accessible terminal box, a bearing seal system and low vibration. **800/275-4934; www.weg.net/us.**

Stratos GIGA from WILO USA

INLINE CENTRIFUGAL PUMP

The Stratos GIGA from WILO USA is a high-efficiency, single-stage inline centrifugal pump that features an inline circulator, allowing it to fit in tight spaces. It has an efficient EC motor that is designed for use in hot-water heating systems, air conditioning, closed cooling circuits and industrial circulation systems. Features include heads to 167 inches and flows to 275 gpm, integrated electronic power adjustment, red button technology and display, and availability in glanded construction, mechanical shaft seal and flanged connections. It received an honorable mention in the 2013 AHR Expo Innovation Awards. **866/945-6872; www.wilo-usa.com.**

Renewable Energy Systems

SLUDGE AND WASTE DIGESTION SYSTEM

Aecomix system from Nijhuis Water Technology

The Aecomix system from Nijhuis Water Technology digests organic wastes into biogas and digestate, producing carbon-neutral energy. The system can include raw material storage and preparation, such as sterilization, pasteurization and maceration; balancing and mixing of the raw materials; biogas conditioning; digested solids separation and processing; and digestate treatment. **312/300-4101; www.nijhuis-water.com.**

BIOGAS CONDITIONING SYSTEM

BioCNG conditioning system from Unison Solutions

The BioCNG conditioning system from Unison Solutions converts biogas to fuel for compressed natural gas (CNG) vehicles. Biogas is piped to the gas-conditioning system from an anaerobic digester. Hydrogen sulfide, moisture, siloxanes, volatile organic compounds and carbon dioxide are removed. The fuel is then routed to a CNG fueling station and compressed for use in vehicles. Systems can produce up to 1,100 gallons of gasoline equivalent (GGE) per day at a production cost of 65 cents to $1.15 per GGE with potential for renewable fuel credits. **563/585-0967; www.unisonsolutions.com.** tpo

By Craig Mandli

Control system automatically monitors phosphorus levels

Problem

Operators at the Beaver Dam (Wis.) Wastewater Treatment Plant had to feed enough ferric chloride to handle phosphorus spikes. To meet a 1.0 mg/L total phosphorus limit, they had to be careful not to overfeed, increasing sludge production and wasting chemical. The operators constantly monitored the phosphorus levels.

Solution

The **RTC-P Chemical Phosphorus Control System from Hach Company** now automatically optimized ferric feed, delivering the exact amount of precipitant needed to maintain an orthophosphate setpoint. By measuring effluent flow and orthophosphate in real time, the controller uses programmed algorithms to adjust the dose ahead of the clarifiers as the phosphorus load changes.

RESULT

Previously, the staff maintained an average ferric chloride dose of 12.5 gph. After the installation, the average feed was 5.55 gph, a savings of 56 percent. The savings paid for the system in less than 12 months. The staff no longer has to monitor phosphorus levels. **800/227-4224; www.hach.com.**

Double-tube heat exchangers rectify blocking issues

Problem

Severn Trent Water continuously dealt with spiral heat exchanger blocks, resulting in low efficiency and high maintenance costs. The problem led to replacement of the exchangers on the digesters. Replacement units had to fit the space available. Both sides of the replacement exchangers had to produce pressures to suit existing equipment, and the design needed to have minimal impact on existing site pipe work. The exchangers had to resist clogging with raggy sludge and meet thermal requirements efficiently, reliably and with minimal maintenance.

Solution

HRS Heat Exchangers recommended DTI Series industrial double-tube heat exchangers, a tube-in-tube design with tubes sized to allow large particles and raggy sludge to pass through. The internal tube is corrugated, creates turbulence that improves heat transfer coefficient and reduces the risk of fouling.

RESULT

The heat exchangers brought an end to the blocking problems and increased digester efficiency. **623/915-4328; www.hrs-heatexchangers.com.**

Self-cleaning filter enables treatment plant to utilize nonpotable water

Problem

The Throop Wastewater Treatment Plant at the Lackawanna River Basin Sewer Authority in northern Pennsylvania went through a series of upgrades in 2012 that called for increased use of nonpotable water. It became important to ensure that the water did not contain particles that would clog equipment.

Solution

Design engineers selected the **Forsta Self Cleaning Filter,** sized to treat effluent for use throughout the plant. The A6-LP180I model offers 3 square feet of screen area, uses a 1-inch flush valve, has a cleaning duration of 15 to 20 seconds and requires 13 gallons of water per cleaning cycle. The filter came with a stainless steel 250-micron wedge-wire screen to handle the fibrous particles that originate intermittently from the source water.

RESULT

The filter was set to clean on a timer at 30-minute intervals or when a preset differential pressure was reached. This happens rarely, indicating that the filter was properly designed and sized. **888/936-7782; www.forstafilters.com.**

Cogen plant uses methane from wastewater plant

Problem

The La Salina Wastewater Treatment Plant processes about 20 percent of sewage from the City of Oceanside, Calif. The methane produced in the process was being flared off, placing the city at risk of violating Southern California's strict air-quality standards. The city also faced steadily rising electricity costs.

Solution

City officials turned to **CHP Clean Energy** to build, own and operate a 150 kW digester-gas-fired cogeneration plant at no cost or risk to the city. Rather than waste methane, the process uses it to generate electricity and reduce reliance on natural gas. The fuel-conditioning system from **BioSpark** reduces engine maintenance and increases output.

RESULT

The system reduced energy costs by $625,000 over the initial contract period. **508/934-6904; www.chpcleanenergy.com.**

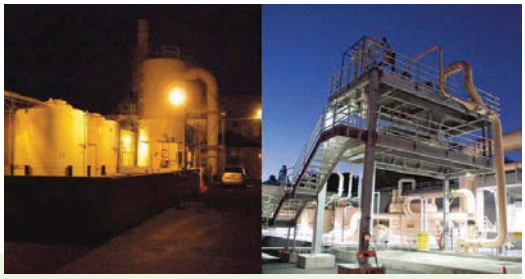
LED lighting helps wastewater facility improve visibility, reduce energy consumption

Problem

The wastewater treatment facility in Santa Cruz, Calif., processes 10 mgd on average. With hundreds of fixtures to light its exterior 12 hours a day, the facility used high-pressure sodium and mercury vapor fixtures. The poor-quality light hindered visibility and reduced the image clarity for the closed-circuit security system. The fixtures needed constant changes of bulbs and ballasts, which led to costly hazardous material disposal.

Solution

The facility chose **Dialight** to replace 82 fixtures in its solids dewatering building, pre-aeration building and trickling filters with **DuroSite LED fixtures.** The entire change-out took five days — 30 to 60 minutes per fixture. The lighting was outfitted with photocells and timers, taking advantage of the instant-on capabilities.



RESULT

The facility reduced lighting energy usage by more than 50 percent, significantly lowered its CO_2 emissions and dramatically improved visibility, enhancing security. With each fixture expected to last up to 10 years, the retrofit has reduced lighting maintenance. With a rebate through a utility incentive program, the project will pay for itself in three years. **732/919-3119; www.dialight.com.**

Efficient blowers increase aeration and save electric costs

Problem

The wastewater treatment plant located in Meriden, Conn., was outdated, with its last update in the early 1980s. A major facility upgrade was needed to make sure operating efficiencies and effluent quality remained at the highest levels possible. The goal was to find more efficient blowers to upgrade the aeration system.

Solution

Three **turbocompressors from Sulzer Pumps** were chosen to increase the efficiency of the aeration system: two ABS turbocompressors HST 40 (one operating and one as backup), and one ABS turbocompressor HST 2500. Life cycle cost analysis had determined that over an estimated 20-year product life, these would save the plant over $1 million.

RESULT

As well as radically decreasing noise levels, the ABS turbocompressors paid for themselves in six months. With their precise variable-speed operation, this plant has actually increased aeration activity by 25 percent, while using 20 percent less electricity. In addition, the plant has saved a great deal on maintenance, which now involves only an annual air filter change and replacement of the cooling fans every five to six years. **800/525-7790; www.sulzer.com.** *(continued)*

Solids-handling pump warns of seal issues

Problem

The Village of Bradford, Ohio, had a duplex lift station with 6-inch discharge pumps rated for 700 gpm at 66 feet. The pumps were failing from mechanical seal leaks. Jay Roberts, primary operator, needed a pump that would warn of impending seal problems, be faster and less expensive to repair and resist clogging.

Solution

Crane Pumps & Systems provided a 4SHMD solids-handling pump with a 25 hp motor, a slide rail adapter that fits the current base elbow assembly and a MiniCAS replacement relay. The device connected to the existing control panel and warns of seal issues with an alarm connection to the SCADA system.

RESULT

The village has had no mechanical seal failures or clogging since the pump was installed in June 2010. **937/615-3544; www.cranepumps.com.**

Chopper pump eliminates build up of fat and wipes

Problem

Thames Water was experiencing stormwater-handling problems at its East Hyde sewage treatment works near Luton, just north of London. Pump blockages were caused by buildup of wet wipes and food fat.

Solution

Operators installed a 6-inch **MPTK-I 150 series chopper pump from Landia.** The 30 kW, 1,500 rpm pump is suited for the wastewater and sludge with coarse solids.

RESULT

The plant has had no more blockages. Guide traces in the pump's MPTK casing ensure that no dry matter particles are caught. Thames Water has since purchased two more Landia units. **919/466-0603; www.landiainc.com.**

Wastewater treatment plant puts water harvesting to good use

Problem

The wastewater treatment plant in Romeoville, Ill., used large volumes of potable water for operations. To reduce potable water usage, operators decided to reuse final effluent for a variety of functions.

Solution

Based upon design suggestions by **Metropolitan Industries,** the plant was upgraded to include a packaged plant water system. Final effluent is pressurized, distributed to various locations and used to wash raw sludge screens, rinse grit-collectors, wash down the sidewalls of excess-flow storage ponds and feed plant hydrants for general washdown.

RESULT

The upgrade has already saved considerable potable water and will reduce freshwater demands on the growing Chicago suburb for many years. **815/886-9200; www.metropolitanind.com.**

Wind turbines provide power for 'off-grid' farms' water and wastewater systems

Problem

Several off-grid farmers near North Kohala, Hawaii, needed a clean, low-cost alternative to diesel fuel to generate electricity for water and wastewater pumping.

Solution

The owners installed a microgrid that includes a **Northern Power 100 wind turbine** with sophisticated voltage controls and no inrush current. The system includes a battery bank and solar panels. It can pump more than 30 million gallons annually.

RESULT

The system has proven successful in irrigating 400 acres of agricultural land supporting 14 farms and agricultural businesses. **877/906-6784; www.northernpower.com.**

Management system solves pump run-time issues

Problem

The City of Winter Park, Fla., was experiencing excessive pump run times and unacceptable pressures because of multiple lift stations pumping into a single force main.

Solution

The city implemented **Symphony - Harmonious Pump and Flow Management from Data Flow Systems.** It coordinates systemwide operation of lift stations to reduce force main pressures and equalize flow. It corrects the random operation of stations and synchronizes pumping on a minute-by-minute basis.

RESULT

The city saw diminished pump run times, lower maintenance and energy costs, fewer service calls and longer pump life. The system also resolved daily peak flow and pressure spikes. Research continues to improve the pumping algorithm. Initially, the system reduced average run-time reductions by 24 percent and energy costs by 39 percent. Recent run times are reduced 34 percent and energy costs 42 percent. **321/259-5009; www.dataflowsys.com.**

Data-entry system saves on manpower

Problem

The wastewater treatment facility in Lafayette, Colo., was doubling its data collection work. The daily manual inspections were being done on paper in the field, after which data was entered to the computer.

Solution

The plant turned to **FlexSystems** to automate the process. Operators using the FlexOps system carry PDAs to capture the data and drive standard operating procedures. The touch-screen PDA is used to scan barcodes at inspection points and pieces of equipment. The software then leads the operator through the inspection with a simple question-and-answer format. Logic flow functionality guides operators through troubleshooting or repairs.

RESULT

Data entered on the PDAs is automatically pulled into customizable reports emailed to management. Reports include time and date stamps for all actions and exception reports that include all nondefault responses entered. The system saves labor and shows reliable and legally defensible reports for state and EPA compliance. **303/684-8303; www.flexops.net.**

Sewer district values familiarity in plunger pump replacement

Problem

In 1963, The Greater Chillicothe (Ill.) Sewer District purchased two Komline-Sanderson Model KSS-9-1 simplex 9-inch plunger pumps to transfer primary sludge to its anaerobic digester. The district decided to replace one of the 50-year-old pumps during a project to replace a digester cover.

Solution

Because of experience with the pumps and two additional **K-S Model KS-11-1 plunger pumps** purchased in 1993, the district, through Baxter & Woodman, specified the same **Komline-Sanderson** pump. The pumps transfer 90 gpm of primary sludge at 3 to 5 percent solids to an anaerobic digester at discharge pressures of 30 feet TDH for about 30 minutes a day.

RESULT

The pumps have worked well. "These pumps are indestructible," said David Day, plant superintendent. **800/225-5457; www.komline.com.** tpo

See Both Sides

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1. IN-SITU ENVIRONMENTAL MONITORING APP

The smarTROLL multiparameter handheld and iSitu smartphone application from In-Situ are designed for environmental monitoring, including water-quality spot checks and surface-water monitoring. No training is required to use the probe or intuitive smartphone application. Technicians can read results for 14 water quality parameters. The iSitu app is designed to run on an iPhone, iPod touch or iPad. The smarTROLL system includes probe, smart sensors and battery clip-on battery pack with Bluetooth wireless technology. **800/446-7488; www.in-situ.com.**

2. BLUE-WHITE INJECTION-MOLDED PVDF DIAPHRAGM

Single-layer, injection-molded PVDF (polyvinylidene difluoride) diaphragms from Blue-White Industries are designed for Chem-Pro Series C2 and C3 metering pumps. The single-piece diaphragms won't delaminate, reducing field maintenance and downtime due to failure. Made of PVDF, chemical compatibility issues of wetted parts also are reduced. Available in three sizes, the diaphragms retrofit into ProSeries Chem-Pro pumps for in-field upgrades. **714/893-8529; www.blue-white.com.**

3. DANFOSS TEMPERATURE SENSOR

The MBT 5560 temperature sensor with built-in transmitter from Danfoss Industrial Automation is designed for use in harsh industrial environments. The sensor is available with a 33 mm (1.29 inches) extension to measure temperatures up to 200 degrees C (392 F) without damage to electronics. Features include acid-resistant stainless steel enclosure, 4-20 mA or Ratiometric output 50, 100, 150, 200 and 250 mm insertion lengths. **410/931-8250; www.danfoss.us/ia.**

4. PRECISION DIGITAL MODBUS SCANNERS

The Snooper line of Modbus scanners from Precision Digital Corp. include the ProVu PD6080 series of 1/8 DIN digital panel meters and the ProtEX-MAX PD8-6080 series of explosion-proof scanners. The scanners can be set up as Modbus RTU masters, slaves or snoopers, monitoring multiple Modbus devices for up to 16 process variables, including level, interface level, density and temperature. The ProVu PD6080 series Super Snoopers are NEMA 4X DIN panel indicators. The PD6080 and PD6081 include dual analog inputs and an RS-485 serial communications module for the integration of existing 4-20 mA transmitters and Modbus devices on the same display. **800/343-1001; www.predig.com.**

5. MEAN GREEN INDUSTRIAL-STRENGTH DEGREASER

Mean Green Industrial Strength Cleaner & Degreaser from CR Brands is a blend of biodegradable detergents formulated for challenging fleet and equipment washing applications. The cleaner removes dirt, tar and road grime from vehicles and trailers and can be used for spot removal on carpets, seats and dashboards. It also degreases equipment, concrete and asphalt. It can be used with pressure washers and cleans with no environmentally harmful solvents. **www.meangreendegreaser.com/industrial-strength.**

6. CW INDUSTRIES ROTARY ENCODER

The 16-position rotary encoder from CW Industries has a 4-channel hex output and is customized to fit into an existing panel opening as small as 12 mm (0.47 inches). Designs feature enclosed construction to prevent EMI (electromagnetic interference) and are sealed to protect against the environment. **215/355-7080; www.cwind.com.**

7. AALBORG MULTI-TURN VALVE

The ACRX V multi-turn valve from AALBORG, part of the ACRX acrylic flowmeter line, eliminates the need for external valves. It can be installed at the inlet (bottom) of the meter or at the outlet (top) for vacuum service. Features include one interchangeable direct reading scale for air, water, argon, oxygen, carbon dioxide, nitrogen, helium or hydrogen. The dual score displays flow rates in metric and English units. Optional scales can be developed for diverse flow conditions to facilitate OEM applications. All models have a 316 stainless steel float and guide, 1/2-inch female NPT connections, maximum temperature of 130 degree F (54 C) and maximum pressure of 100 psi. **845/770-3000; www.aalborg.com.**

8. DIALIGHT LED LINEAR FIXTURE

The SafeSite LED linear fixture from Dialight is designed for Class I, Division 2 hazardous applications. The fixture is intended to replace traditional fluorescent and HID (high-intensity discharge) lighting. Delivering 106 lumens per watt, the fixture is available in 2-foot (33 watt) and 4-foot (66 watt) models and stands less than an inch tall. **732/919-3119; www.dialight.com.**

9. XYLEM WEDECO QUADRON UV SYSTEMS

WEDECO Quadron medium pressure ultraviolet water treatment systems from Xylem are designed for drinking water disinfection and wastewater reuse applications. The 600 and 1,200 units manage flows to 8.6 and 13.3 mgd. Multiray UV lamps provide 8,000 hours of life, even in dimmed mode. **704/409-9700; www.wedeco.com/us.**

10. CHEMINEER STATIC MIXER FOR TURBULENT FLOW

The Kenics UltraTab static mixer from Chemineer is designed for turbulent flow applications where a high degree of mixing is required in a compact space. Features include integral wall injector upstream of the mixing element, low pressure drop, compact design and short mixing length. Sizes range from 2 to 60 inches. The mixer is available with NPT or flanged injectors that can be made from carbon steel, stainless steel, coated carbon/316SS, FRP and high-alloy metals. Housing options include between flange tab and spool piece designs. **800/643-0641; www.chemineer.com.**

11. WORLD WATER WORKS DAF SYSTEM

The www/RESOURCE dissolved air flotation (DAF) system from World Water Works handles flows from 5 to 8,000 gpm and minimizes the need for chemical coagulants and flocculants. Made of durable polypropylene, the system can perform over a range of temperature and pH (2-13). The DAG (dissolved air generator) generates 5-12 micron bubbles for the removal of fine insoluble materials and near 100 percent saturation efficiency at low energy consumption. **800/607-7973; www.worldwaterworks.com.**

12. HAYWARD PLEATED FILTER CARTRIDGES

Pleated filter cartridges from Hayward Flow Control are available in polypropylene or cellulose media for use in Hayward's CFLV and MFLV cartridge adapter kits. Available micron ratings include nominal 1, 5, 10 and 30 in 10-, 16-, 20- and 30-inch lengths. All cartridges have DOE Plastisol PVC endcaps for maximum sealing. **888/429-4635; www.hayward flowcontrol.com.**

(continued)

product spotlight

Interface measurement system provides continuous sludge readings

By Ed Wodalski

The **Sludge Finder 2** sludge interface monitor from **Pulsar Process Measurement** features a self-cleaning Viper transducer that continuously bounces sonar signals off interface layers in primary or secondary settlement tanks and sequencing batch reactor (SBR) systems, providing a profile of sludge levels, including RAS (return activated sludge) and floc particles. The monitor can track two different echoes with one transducer and output two 4-20mA signals. A second transducer can be added for two channel ability. Radio telemetry (1.86 miles maximum range) is available.

The monitor includes a microprocessor and multifunction display that shows blanket level, echo profile, alarm points, tank depth and multiple tank status. A dropdown menu provides quick setup.

"If you have a 10-foot deep settlement tank or clarifier, and 9 feet of it is solid dense sludge, you might have this huge tank but you only have a foot of dirty water that you can put in and cycle, which is not very efficient," says Jeff Roberts, president, Pulsar Process Measurement. "Our sensor picks up the falling sludge interface and not just the dense interfaces that are collecting on the bottom over long periods of time. We have the ability to set the unit up to read the hard interface and the light floc interface sitting atop the dense sludge."

An alternative to manual measurements using gap switches or vacuum probes, the automated meter provides constant sludge readings.

"What an operator gets is repeatability," Roberts says. "There also are no contamination issues where the guys have to glove-up (when using a manual probe)."

Sludge Finder 2 from Pulsar Process Measurement

The wall-mounted monitor measures 9.25 by 7.24 by 4.72 inches and weighs 3.3 pounds. Made of flame-resistant polycarbonate, it has an operating range of -13 degrees to 131 degrees F.

A wiper blade sweeps the transducer face, helping clear algae or bacterial growth and gas bubbles that can affect performance.

"What happens in clarifiers is as the biological process proceeds, gas is released," Roberts says. "Tiny gas bubbles filter to top of the surface. The transducer is sitting there and gas bubbles can collect on the face and get to the point where it's not touching the liquid because it's in a gas pocket, which will prevent us from reading the sludge interface."

The step-motor wiper also discourages hair and debris buildup.

The transducer can be positioned up to 650 feet (200 meters) from the control unit and has a measurement range of approximately 0.98 to 33 feet (0.3 to 10 meters).

Wetted parts are chemical resistant (Valox 357, 315 stainless steel and PVC-R2). The monitor has a backlit LCD with bar graph display, full calibration menu and hot key functions. **850/279-4882; www.pulsar-pm.com.**

13. HACH HAND-HELD COLORIMETER

The DR 900 hand-held colorimeter from Hach Co. is designed for testing water in harsh and challenging field environments. Waterproof, dustproof, drop tested and shock resistant, the colorimeter has a backlit display option for low light conditions. It can store 500 tests and comes with a USB port for data transfer to a PC or laptop. **800/227-4224; www.hach.com.**

14. MAGNATROL BRONZE SOLENOID VALVE

Type A and AR bronze solenoid valves from Magnatrol Valve Corp. are designed for water and wastewater applications. Available for pipe sizes from 1/2 to 3 inches, the valves feature cast bronze, globe pattern valve bodies with NPT ends and packless construction with continuous duty coils for all voltages. The valves require no differential pressure to open and can be serviced while in the pipeline. **973/427-4341; www.magnatrol.com.**

15. STAHLIN DIAMONDSHIELD NONMETALLIC ENCLOSURES

DiamondShield series nonmetallic enclosures from Stahlin are designed for high-end electronics and harsh corrosive environments, both indoors and outdoors. Available in more than 150 configurations, sizes range from 6 by 6 to 20 by 16 inches. Features include a flat, bonded window with clear cover and four cover securement options. Other features include field interchangeable covers and hardware, unobstructed walls for ease of conduit or component placement and NEMA 1, 3, 3S, 4X, 12, 13 and IP66 certified. **616/794-0700; www.stahlin.com.**

16. ASAHI/AMERICA PART SEARCH APP

The part number search tool app from Asahi/America locates part numbers and list prices for any Asahi/America product. The free app can be used with iPhone, iPad and Android devices. **800/343-3618; www.asahi-america.com.**

17. ENDRESS+HAUSER TWO-WIRE MAGMETER

The Proline Promag 200 two-wire electromagnetic flowmeter from Endress+Hauser offers the same measuring performance as four-wire magmeters. The Promag H200 is available in line sizes of 1/12 to 1 inch, while the Promag 200 is available in line sizes from 1/2 to 8 inches for measuring the flow rates of conductive fluids. No seals or external enclosures are required for installation in hazardous areas. **888/363-7377; www.us.endress.com.**

18. BADGER METER SMART VALVE POSITIONERS

The Research Control SRD series of smart valve positioners from Badger Meter deliver actionable diagnostic information about valve performance. The SRD 960 (explosion proof) and SRD 991 (intrinsically safe) digital valve positioners are designed for use in the water and wastewater industries. The SRI 900 base model provides analog valve control. The SRD/SRI positioners are compatible with Research Control valves and most other pneumatically actuated valves. **800/876-3837; www.badgermeter.com.**

19. GMI MAINTENANCE-FREE SINGLE GAS MONITOR

The maintenance-free PS1 Series single gas monitor from Gas Measurement Instruments features sensor options for monitoring hydrogen sulphide, oxygen, carbon monoxide or sulphur dioxide. The self-monitoring device has on/off capability and field adjustable alarm settings. During hazardous conditions users are alerted via vibration, red flashing LEDs and audible buzzer. The monitor has a stainless steel alligator clip that attaches onto a collar or vest, putting it near the breathing zone for maximum protection. **713/559-9290; www.gmiusa.com.**

20. BIONOMIC JET VENTURI SCRUBBER

The Series 6500 Jet Venturi scrubber from Bionomic Industries utilizes high velocity spray and scrubbing liquid flow to remove gaseous contaminants and particulate down to 0.75 microns. It can be used to rapidly reduce the temperature of high exothermic reactive gases or condense steam. Configurations are available in a pre-engineered ScrubPac skid-mounted package. **800/311-6767; www.bionomicind.com.** tpo

Calgon Carbon adds board member

Calgon Carbon Corp. appointed John J. Paro to its board of directors. Since 2009, Paro, 57, has served as chairman, president and chief executive officer of HallStar, a privately held specialty chemical company.

KSB Pumps opens Canadian headquarters

KSB Pumps, a member of the KSB Group, opened its new Canadian headquarters and engineering facilities in Mississauga, Ontario. The pump manufacturer also introduced its new line of MOVITEC standardized industrial pumps for the water and wastewater industries.

ETS drinking water systems NSF/ANSI Standard 61 certified

ETS, a wholly owned subsidiary of Neptune-Benson, has been certified as NSF/ANSI Standard 61 compliant for its UV drinking water system.

Benko Products celebrates 30-year anniversary

Benko Products celebrated its 30th anniversary in October. Based in Sheffield Village, Ohio, the industrial safety products company was founded in 1983 by John Benko, inventor of the Sahara Hot Box warming oven.

Metso flow control products receive SIL certification

Metso has certified several flow control products to SIL standards. Its Neles X and D-series ball valves, L6 and Mapag B-series butterfly valve, B-series actuators and ValvGuard VG9000 intelligent safety solenoid can be used in safety loops requiring safety integrity level (SIL) 3 classified automated on/off valves. Metso's Neles Finetrol eccentric rotary plug valve and ND9000 intelligent valve controller can be used in flow control loops requiring SIL classified control valves in applications where a control valve can perform the safety action.

Red Valve offers wastewater treatment selection guide

The valve selection guide for wastewater treatment plants from Red Valve Company illustrates product applications at each stage of the treatment process, from influent flow through effluent discharge.

Green roof reduces water runoff for Badger Meter

Badger Meter installed a 10,000-square-foot green roof at its Milwaukee, Wis., headquarters. The roof is estimated to reduce annual runoff by 90 percent (249,000 gallons). Badger Meter received $48,138 for the project as part of the Milwaukee Metropolitan Sewerage District's green roof incentive to help reduce the volume and number of sewer overflows.

Huber Technology receives Frost & Sullivan award

Huber Technology received the 2013 North American Frost & Sullivan Award for customer service leadership in the municipal and industrial water and wastewater treatment market. The award is based on service quality, timeliness of service and impact on overall customer value.

Busch celebrates 50th anniversary

The Busch vacuum and low pressure technology company celebrates its 50th anniversary. Begun in 1963 by Dr.-Ing. Karl Busch and his wife, Ayhan, the family-owned company has grown into an international group with more than 2,500 employees.

The Busch family, pictured in front of the group's headquarters in Maulburg, Germany, are (from left) Dr.-Ing. Karl Busch, Ayhan Busch, Sami Busch, Ayla Busch and Kaya Busch.

EQT Infrastructure acquires Synagro

EQT Infrastructure acquired Synagro Technologies for $465 million, eliminating the company's $200 million in outstanding debt. The new capital structure provides Synagro with the flexibility to pursue growth opportunities, including construction of a bio-recycling center in southwest Florida. The $4.3 million facility in Charlotte County is scheduled to be operational the first quarter of 2014.

ADS receives Department of Defense award

Advanced Drainage Systems received the Employer Support of the Guard and Reserve Above and Beyond award for exceeding the legal requirements of the Uniformed Services Employment and Reemployment Rights Act by providing its Guard and reserve employees additional, nonmandated benefits. ADS has four employees on active military duty and had 13 employees deployed the past three years.

Thomas & Betts publishes electrical brochures

Thomas & Betts published a series of electrical solution brochures, including versions available at www.tnb.com under the resources tab, in response to electrical power and service needs. The Solution Set brochures address corrosion prevention, safety, grounding and bonding.

Pump Solutions Group acquires Finder

Pump Solutions Group, an operating company within Dover Corp., acquired Finder S.p.A., designer and manufacturer of API engineered pumps. Finder has operations in Merate and Querceta, Italy, and Venissiex, France, as well as representatives in 75 countries. Finder will operate as a business unit within PSG and expects to generate revenue of approximately $80 million in 2013.

Nesser elected to Layne Christensen board

John T. Nesser III was elected to the Layne Christensen Co. Board of Directors. He fills the vacancy left by the retirement of Jeffrey J. Reynolds in June. Retired from McDermott International, Nesser has 40 years of executive, corporate and legal experience.

Siemens marks 100th anniversary of chlorine gas meter

Siemens Water Technologies celebrates the 100th anniversary of the first chlorine gas metering unit for water disinfection. The first commercially produced gas chlorinator was installed in a public drinking water system in 1913 by Wallace & Tiernan, now a Siemens Water Technologies company. **tpo**

tpo CLASSIFIED ADVERTISING

DECEMBER

DEWATERING

Accepting bids for (2) Sludge Dewatering Centrifuges and (1) PolyBlend Dry/Liquid Polymer Preparation System. For more information please visit http://bids.lebnh.net (o12)

4" Dia-Disk Double Diaphragm Pump: 5hp electric motor. Cost new - $17,000. Completely rebuilt. Variable flow, 0-200gpm, low-stroke - won't shear polymer. PRICE $7,500. Pictures are available upon request. Please call 910-738-5311. (oBM)

Two 15-cubic-yard Aqua-Zyme Dewatering boxes with insert micron liners with rolling tarps. INCLUDES polymer injection system. 5 years old, only used 2 times. $45,000 for everything OBO. 419-739-4917 (P01)

EDUCATION

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

MISCELLANEOUS

UV DISINFECTION EQUIPMENT: Attention: Small wastewater treatment plant owners and operators. Possible use with Fish Farms. Portable, or very easy installation. Brand new product. US patent pending. callagher@sbcglobal.net, www.thefecal-fighter.com. (oBM)

PUMPS

Two (2) 4" Thompson Double Diaphragm Pumps: 5hp electric motor, single phase. Cost new - $9,000 each. Will sell both for $5,000 or sell individually for $3,000 each. Pictures are available upon request. Please call 910-738-5311. (oBM)

TRAILERS-VACUUM/TANKER

4,000-gallon Lely Self-Contained Vac/Press Tanker: Isuzu motor, Fruitland RCF 500 vacuum pump, Evans tri-axle trailer with aluminum wheels. Excellent condition - $27,500. Pictures are available upon request. Please call 910-738-5311. (oBM)

TPO **invites your national, state or local association to post notices and news items in this column. Send contributions to editor@tpomag.com.**

people/awards

Four King County wastewater treatment plants in King County, Wash., earned 2012 Peak Performance Awards from the National Association of Clean Water Agencies. The **South Treatment Plant** in Renton and the **West Point Treatment Plant** in Seattle received Platinum Awards, and the **Vashon** and **Carnation** treatment plants received Gold Awards.

Albert Bock, a Bay County wastewater operations supervisor, received the Dr. A.P. Black Award for outstanding personal performance from the Florida Water and Pollution Control Operators Association. **Gary Thrift,** the county's environmental specialist and pretreatment coordinator, received the Robert E. Heilman Award for performance above and beyond the requirements of Florida regulations.

The Washington Department of Ecology recognized 107 perfect-performing wastewater treatment plants in 2012 with its Outstanding Wastewater Treatment Plant Award. For a list of recipients, visit www.ecy.wa.gov/news/2013/206.html.

The **Raleigh (N.C.) Public Utilities Department Wastewater Treatment Division** received three 2012 NACWA Platinum Peak Performance Awards. Honored were the Neuse River Wastewater Treatment Plant, the Smith Creek Wastewater Treatment Plant, and the Little Creek Wastewater Treatment Plant.

The **Norman M. Cole Jr. Pollution Control Plant** in Fairfax County, Va., received a NACWA Platinum Peak Performance Award.

The **San Jose-Santa Clara (Calif.) Regional Wastewater Facility** received a Gold Peak Performance Award from NACWA.

David Pigg, operations supervisor at the Wards Corner Regional Wastewater Treatment Plant in Clermont County, Ohio, received the Professional Wastewater Operations Award from the Ohio Water Environment Association.

The **Eagle River Wastewater Treatment Facility** in Anchorage, Alaska, received the NACWA Platinum Award.

The Water Environment Federation announced these award recipients:

- **Robert Villee,** Middlesex, N.J., New Jersey Water Environment Association, Collection Systems Award
- Authors **Jes Vollertsen, Thorkild Hvitved Jacobsen** and **Asbjorn Haaning Nielsen** for their article, "Effect of Sewer Headspace Air-Flow on Hydrogen Sulfide Removal by Corroding Concrete Surfaces," Eddy Wastewater Principles/Processes Medal
- **Rao Y. Surampalli,** Lenexa, Kan., Nebraska Water Environment Association, Emerson Distinguished Service Award
- Authors **Gary R. Johnson, James Thurrott** and **Manjiang Chen** for their article, "Optimizing Low-Level Nitrogen Removal," Gascoigne Wastewater Treatment Plant Operational Improvement Medal

TPO *welcomes your contribution to this listing. To recognize members of your team, please send notices of new hires, promotions, service milestones, certifications or achievements to editor@tpomag.com.*

education

Alabama

The Alabama Water Environment Association offers:

- Dec. 17 – Collection System Operators Seminar, Tuscaloosa
- March 25 – Collection System Operators Seminar, Huntsville

Visit www.awea-al.com.

Florida

The University of Florida TREEO Center in Gainsville offers:

- Dec. 9-13 – Wastewater Class A Certification Review, Tampa
- Dec. 10-13 – Wastewater Class B Certification Review, Tampa
- Jan. 14-16 – Introduction to Electrical Maintenance, Gainesville
- Jan. 14-17 – Water Class C Certification Review, Gainesville
- Jan. 21-23 – Process Control of Advanced Waste Treatment Plants, Gainesville
- Feb. 4-5 – Water Reclamation & Treatment Processes, Gainesville

Visit www.treeo.ufl.edu/wastewater-courses.aspx.

Georgia

The Georgia Association of Water Professionals has a Backflow Prevention Specialty Workshop in Marietta Dec. 11. Visit www.gawp.org.

Indiana

The Alliance of Indiana Rural Water offers:

- Dec. 10 – Collection System Maintenance and Solutions, Seelyville
- Dec. 12 – Compliance Sampling, Connersville

Visit www.inh2o.org.

Kansas

The Kansas Water Environment Association offers:

- Dec. 4-5 – Understanding and Troubleshooting Electrical Motors, Lawrence
- Dec. 6 – Introduction to Wastewater Chemistry, Hays
- Dec. 12 – An Examination of Your Safety, Emporia
- Dec. 17 – Introduction to Water and Wastewater Conveyance, Garden City
- Dec. 18 – An Examination of Your Ethics, Pratt
- Dec. 27 – Small Wastewater Systems, Dodge City
- Jan. 8 – Introduction to Water and Wastewater Conveyance, Garden City
- Jan. 14-15 – Wastewater Collection Systems, Arkansas City
- Jan. 15 – Wastewater Treatment, Colby
- Jan. 23 – Small Systems Wastewater, Holton
- Jan. 24 – Special Topics – Ultrasound and UV, Garden City
- Jan. 28 – Wastewater Treatment, Pratt
- Jan. 29 – Wastewater Collection Systems Management, Iola

Visit www.kwea.net.

Missouri

The Missouri Rural Water Association has developed a series of free apps for wastewater operators using the Android and iPhone systems. Search MRWA in the Google Play and Apple stores. Visit www.moruralwater.org.

Ohio

The Ohio Water Environment Association offers:

- Dec. 5 – Biosolids Workshop, Lewis Center
- March 13 – Government Affairs Workshop, Lewis Center
- May 1 – Collection Systems Workshop, Lewis Center
- May 21-22 – Operations/Lab Analysis Workshop, Lewis Center

Visit www.ohiowea.org.

Wisconsin

The University of Wisconsin Department of Engineering-Professional Development offers:

CALENDAR OF EVENTS

Jan. 22-23
Water Environment Association of Texas Collection Systems Conference and Expo. Visit www.weat.org.

Jan. 26-29
New England Water Environment Association Annual Conference and Exhibit, Boston Marriott Copley Place Hotel. Visit www.newea.org.

Feb. 4-6
New York Water Environment Association Annual Meeting and Exhibition, New York Marriott Marquis. Visit www.nywea.org.

Feb. 25-28
Water Environment Federation 2014 Utility Management Conference. Call 703/684-2441 or visit www.wef.org.

March 18
Wisconsin Department of Natural Resources Spring Biosolids Symposium, Stevens Point. Visit dnr.wi.gov.

March 29-April 2
Missouri Water Environment Association/American Water Works Association Joint Annual Conference, Osage Beach. Visit www.mwea.org.

April 16-17
Nebraska Water Environment Association Great Plains Conference, Embassy Suites, LaViasta. Visit www.ne-wea.org.

April 21-24
Alaska Water Wastewater Management Association Annual Conference, Centennial Hall, Juneau. Visit www.awwma.org.

April 27-30
Arkansas Water Works and Water Environment Association Annual Conference, Hot Springs. Visit www.awwwea.org.

April 29-May 2
California Water Environment Association Annual Conference, Santa Clara Convention Center. Call 510/382-7800, ext. 115, or visit www.cwea.org.

- Dec. 3-5 – Sanitary Sewer and Collection System Engineering
- March 24-25 – Upgrading Your Sanitary Sewer Maintenance Program
- March 26-28 – Wastewater Pumping Systems and Lift Stations
- April 15-17 – Nutrient Removal Engineering: Phosphorus and Nitrogen in Wastewater Treatment

Visit http://epdweb.engr.wisc.edu.

The Wisconsin Department of Natural Resources offers:

- Dec. 3-5 – Sanitary Sewer and Collection System Engineering, Madison
- Dec. 17 – Permit-Required Confined Space Entry, West Salem
- Feb. 17-21 – General Wastewater Treatment-Intro and Advanced, Madison
- Feb. 25-26 – Anaerobic Digestion-Intro and Advanced, Green Bay
- March 4-5 – Phosphorus Removal-Intro and Advanced, Janesville
- March 10-14 – General Wastewater Treatment-Intro and Advanced, Green Bay

Visit http://dnr.wi.gov. **tpo**

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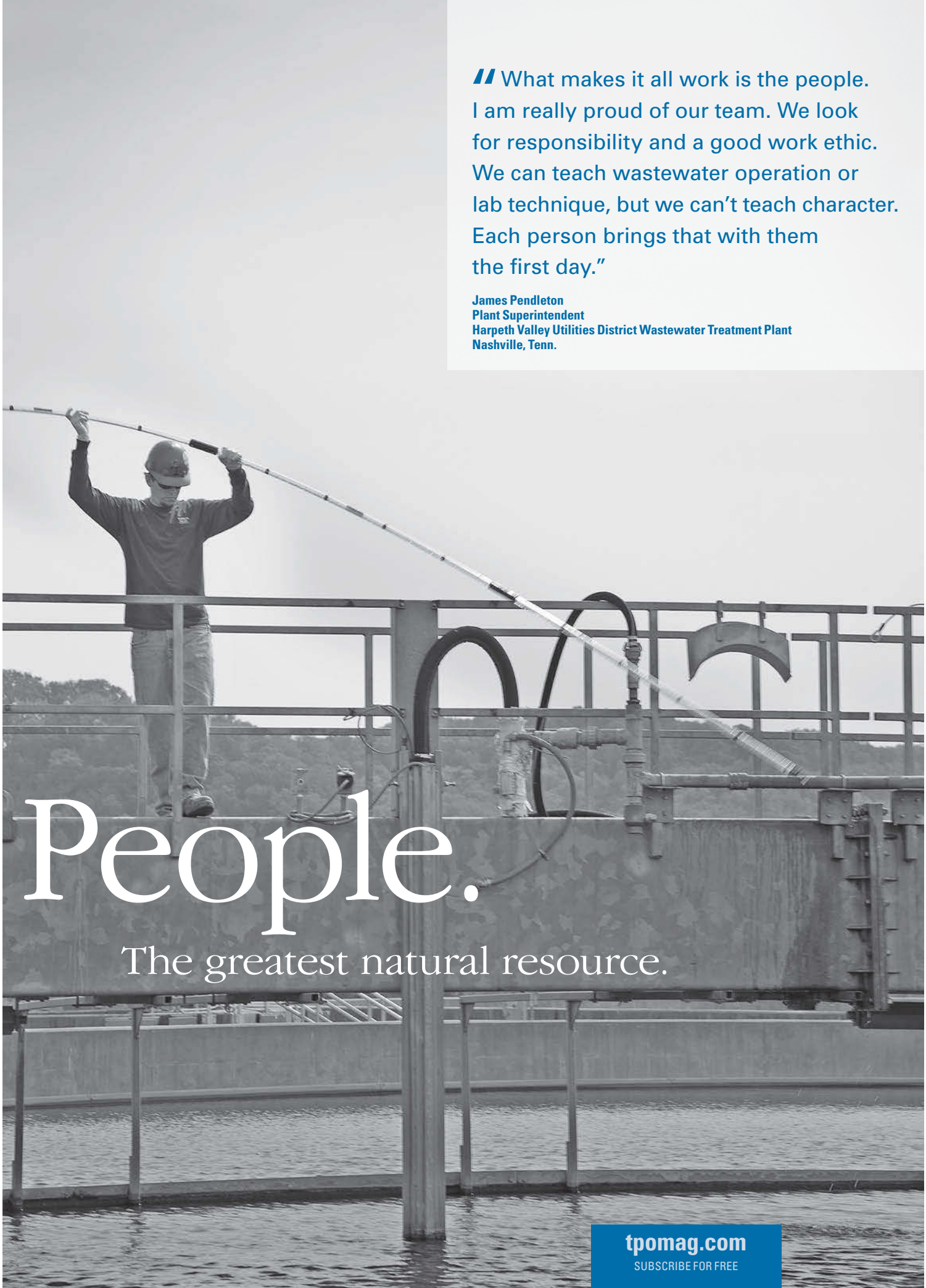

"What makes it all work is the people. I am really proud of our team. We look for responsibility and a good work ethic. We can teach wastewater operation or lab technique, but we can't teach character. Each person brings that with them the first day."

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

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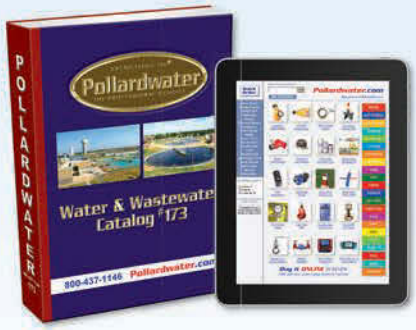

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