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PRE-SHOW ISSUE

Dave Taylor
Director of Ecosystem Services
Madison, Wis.

Everyone **WINS**

**PARTNERSHIP HELPS CUT PHOSPHORUS
LOADINGS AROUND WISCONSIN'S CAPITAL**

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Bringing youths on board**

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A salute to the "Wrenchers"**

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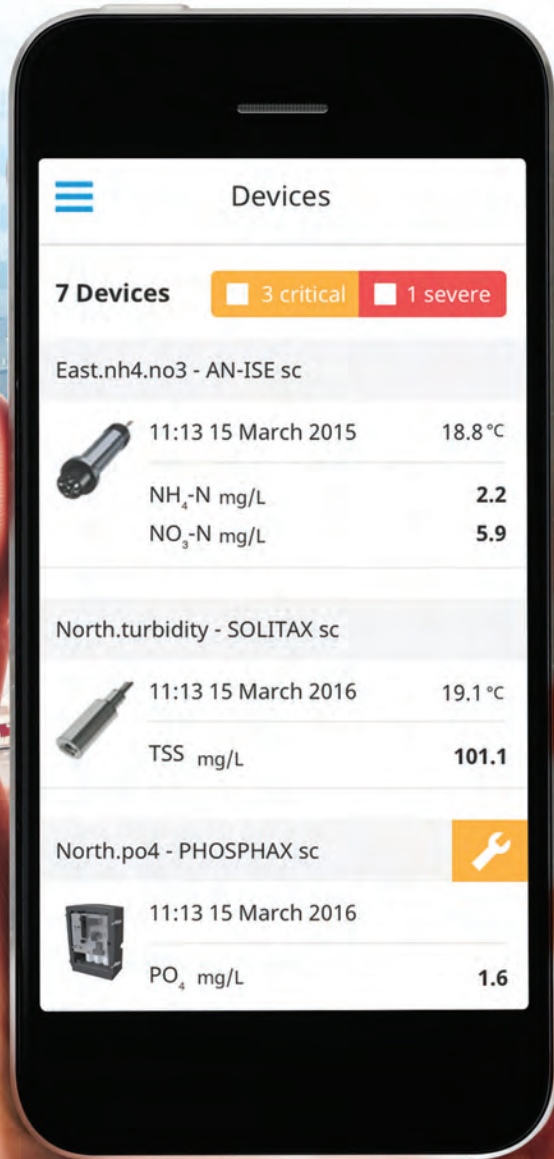
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on the cover

Six cities, eight villages, and five towns have joined the Yahara WINs (Watershed Improvement Network) to reduce phosphorus loadings to the lakes and rivers in and around Madison, Wisconsin. Dave Taylor, director of ecosystem services for the Madison

Metropolitan Sewerage District, says the program resembles nutrient credit trading, but goes further. (Photography by Lauren Justice)

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By Doug Day

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By Ted J. Rulseh, Editor

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- » How We Do It: Operations savings in Crown Point, Indiana
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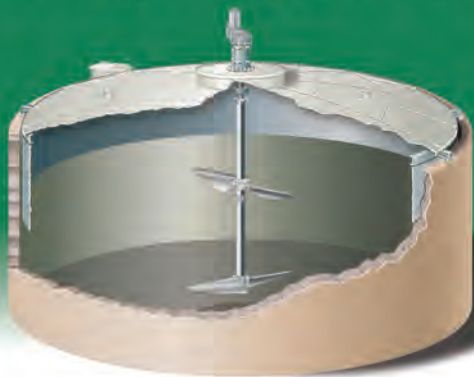
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let's be clear

Here's to the Wrenchers

THE IOWA WEA MAKES A POSITIVE STEP WITH SPECIAL RECOGNITION FOR THOSE WHO MAINTAIN AND FIX THE MECHANICAL EQUIPMENT THAT KEEPS PLANTS RUNNING RIGHT

By Ted J. Rulseh, Editor

Wastewater operators run the “bug factories” that churn out clean effluent day after day. But the processes depend on a host of mechanical and electrical equipment — pumps, blowers, scrapers, conveyors, augers, presses, electronic instruments and more.

That's where maintenance teams come in. Many operators, especially at smaller facilities, double as maintenance workers. Still, numerous plants rely on the skills of mechanics, electricians, plumbers, instrument technicians and other specialists to keep processes online.

WELL DESERVED

The Iowa Water Environment Association each year honors some of the best of those professionals with the Wrenchers Award. The most recent winners (2016) are Fred Hagenmaier, senior maintenance worker at the Ames Water Pollution Control Plant, and Andrew Hunter, plant mechanic with the Des Moines Metropolitan



Wastewater Reclamation Facility.

The Wrenchers are professionals who have performed exceptionally in water pollution treatment facility maintenance. Winners are honored at the IAWEA annual statewide meeting and are inducted into what the association calls “an exclusive club.” Each recipient receives an award plaque and lapel pin.

It's fitting recognition that not every WEA or operator association confers. Proper maintenance helps maximize equipment uptime and process continuity; prompt and skillful repairs lessen the impact of the occasional, inevitable equipment breakdown.

“Wrenchers is a very nice program,” says Larry Hare, treatment manager in Des Moines. “It's a chance to give excellent treatment plant mechanics the recognition they deserve. They keep these multimillion-dollar plants operating efficiently. That's great for the environment. Without the mechanics to keep them running, some of these aging plants wouldn't be able to meet their NPDES permit limits.”

Hagenmaier and Hunter join 35 other Wrenchers recognized since the award's inception in 1999 (see sidebar). Both earn high praise from their supervisors.

CARING DEEPLY

Hagenmaier, who has been with the Ames plant for more than 20 years, received the award with roughly the maximum humility: “I thought that since I’m planning on retiring this year, they were just throwing the old guy a bone. I always figured my wage was my pat on the back.”

Jim McElvogue, plant superintendent, considers Hagenmaier a valuable asset. “Fred is always looking to contribute to the efficiency of the plant,” he says. “He has always been very interested in how well the plant performs and in doing the best we can to put out the best water possible. He’s an outdoorsman and really cares about the environment.”

“Fred is our No. 1 guy when it comes to working on our vertical turbine pumps. He knows exactly the steps to follow when we’re changing out impellers or removing pumps for service and reinstalling them. Those are quite com-



Andrew Hunter

Many operators, especially at smaller facilities, double as maintenance workers. Still, numerous plants rely on the skills of mechanics, electricians, plumbers, instrument technicians and other specialists to keep processes online.

plicated procedures. He just gets in and gets the job done. He’s always willing to come in after hours or on weekends. It shows how much he cares about the job we do.”

LUBRICATION EXPERT

Hunter, who has been at the Des Moines facility for 15 years, is an enthusiastic team member and a self-starter. “Andy takes a lot upon himself to improve energy efficiency and plant operations,” says Hare. “He’s the main person who keeps our equipment lubricated correctly.”

Hunter performs oil analysis on major equipment, such as the plant’s process air blower and cogeneration engines. That helps him devise longer oil change intervals based on oil properties instead of simply changing the oil after a prescribed period.

“Andy did a six-month trial of synthetic versus conventional oil on our process air blower,” says Hare. “He compared before and after and found that the synthetic oil increased the blower’s energy efficiency by 0.5 to 1.5 percent.” The trial also led to a tripling of the oil-change interval. In total, the switch to synthetic oils saves \$2,300 to \$7,800 a year.

“That wasn’t the first time Andy stepped forward and with little or no recognition moved us ahead,” says Hare. “He’s one of our hardest workers. He doesn’t waste time. He’s willing to stay late or work through breaks or lunchtime if needed to finish a job within a day.”

Hunter observes, “It felt good to be recognized. A lot of good ideas go unnoticed that come from people on the maintenance side with years of experience in the field. If more of it were shared,

maybe people at other plants could use the same tools or techniques” to make their facilities perform better.

“Some people in this field don’t appreciate how much they know,” Hunter adds. “They do their job. They make it look easy. They just take it for granted. I think it would help if the higher-level managers at larger facilities made it part of their day to get out and see what their workers are doing — see it firsthand and ask questions. What’s the big problem of the day? How did you solve that problem?”

Here’s a hat tip to Hagenmaier and Hunter, and to the IAWEA for recognizing the contributions of a group of essential people to efficient and effective clean-water plant performance. **tpo**

ELITE SOCIETY

The Iowa WEA Wrenchers Award goes back to 1999. Here are the current and past winners of the award:

- 2016: Fred Hagenmaier, Ames; Andrew Hunter, Des Moines
- 2015: Scott Obernolte and Randy Heath, Allied Systems
- 2014: Cory Warner, Fairfield
- 2013: Joe Lander, Marshalltown
- 2012: Monte Whetstone, Ames
- 2011: Andrew Larson, Zimmer & Francescon; Bill Miller and Steve Moehlmann, Des Moines; Bob Ranson, Marshalltown; Jim Rasmussen, HR Green
- 2010: Terry Moss, Des Moines; Kevin Crawford, Indianola; Jim Fox, Muscatine
- 2009: Jay Merrill, Ottumwa
- 2008: Richard Nelson, Cedar Rapids
- 2007: Shawn Worley, Fairfield
- 2006: David Gliem, Perry
- 2005: Tom Fuller, Cedar Rapids; Alex Allison, Allison Mechanical
- 2004: Scott Shannon, Des Moines
- 2003: Ron Kayser, Le Mars
- 2002: Bob Jones, Muscatine; Darin Hoover, Knoxville
- 2001: Jim Pergande, Algona; John Noid, Cedar Rapids; Steve Beeler, Des Moines
- 2000: Terry Lund; Larry Metcalf, Ankeny
- 1999: Dick Burbank, Des Moines; Larry Trout; Tom Hansen, Iowa City; Dennis Belkin, Iowa Great Lakes Sanitary District; Darrell Hunter, Ames; Bob Watson, Pollution Control Systems; Lynn Pitts, Ankeny



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The liner was applied in 1,200-square-foot sections.

A Concrete Cure

A FLEXIBLE EPOXY LINER RESTORES THE DETERIORATED BOTTOM OF A WASTEWATER TREATMENT LAGOON AT A FOOD MANUFACTURING FACILITY IN GEORGIA

By Ted J. Rulseh

Effective aeration is critical to any industrial wastewater lagoon system. Insufficient oxygen and equipment failures may lead to violations and fines, disruption of production, and exceedance of the operation and maintenance budgets, significantly affecting the bottom line.

A wastewater lagoon system at a large food manufacturing facility in Perry, Georgia, was in a state of deterioration. The 500-foot-long, 200-foot-wide, 26-foot-deep pond was constructed of poured concrete that had cracked and no longer provided adequate containment. The pond needed a repair that involved completely sealing and waterproofing the concrete bottom.

CHALLENGING PREP

Southern Industrial Linings, an authorized Rhino Linings applicator, was contracted for the job. The company selected Rhino Linings Extreme HP 11-50, an industrial lining designed for difficult application conditions. It is formulated to perform well in indoor and outdoor settings, high humidity and low temperatures, and areas in contact with food or where sanitation is paramount.

The material has high chemical and corrosion resistance and has elastomeric properties that protect against damage caused by substrate vibration,

expansion, contraction, movement, flexing, abrasion and impact. In this case, those properties would allow the concrete basin bottom to flex without sacrificing the lining.

To prepare for application, the applicator drained the pond and removed a few feet of silt that had settled in the basin bottom. The amount of silt was

The material has high chemical and corrosion resistance and has elastomeric properties that protect against damage caused by substrate vibration, expansion, contraction, movement, flexing, abrasion and impact.

more than the applicator anticipated, and removal was limited to pumping because of existing disposal permits.

Once the silt was removed, the entire basin was pressure washed and then scarified. This process of deeply scraping the concrete removed the surface layer that was contaminated with vegetable oil and sticky residue built up over the years.

SEAMLESS APPLICATION

To repair the existing cracks, holes were drilled at either end of each crack to remove pressure and stop the progression. Each crack was abrasively blasted to remove debris. The applicator then blasted the entire basin to lower the surface profile, creating a smoother surface. This preparation process, covering 115,000 square feet, took two weeks from the time the basin was drained and cleared of silt.

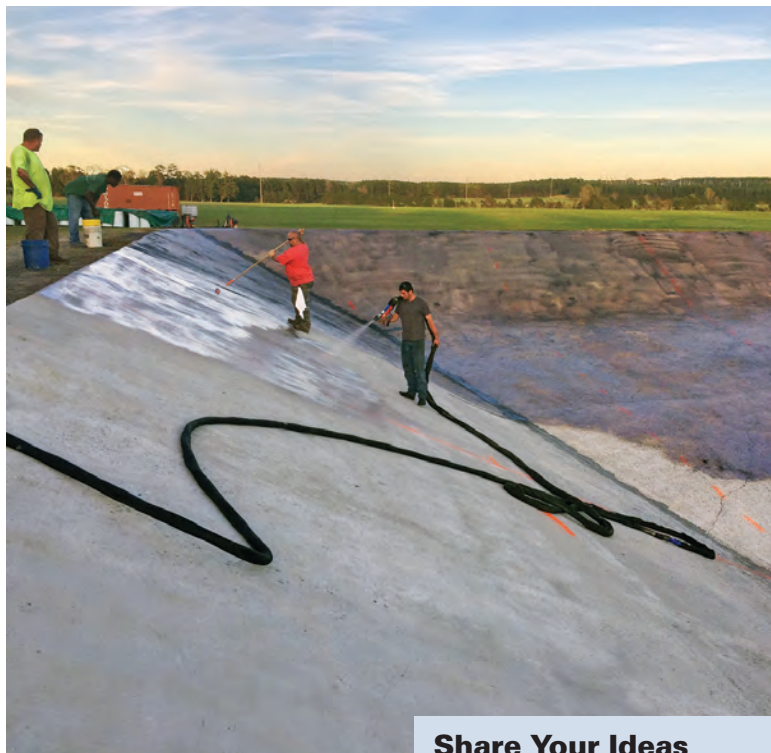
To ensure that the lining application was completed as specified, the applicator sectioned the pond into 1,200-square-foot sections to better monitor quality and the applied film thickness. To prepare this surface, the applicator chose Primer 101 — a 1-1 ratio, two-component, zero-VOC epoxy primer.

The primer's low viscosity allows easy application by brush or roller. It has high moisture tolerance, flexibility for substrates that may expand and contract, and a long overcoat window for subsequent coatings. The primer was spray-applied and broadcast with coal slag before it cured to improve adhesion with the final lining material.

Finally, the applicator spray-applied an entire 110-gallon set of the sealer in multiple overlapping passes to each 1,200-square-foot section, at a minimum thickness of 125 mils. This created a seamless, monolithic coating that met the food manufacturing facility's specifications.

LIFE EXTENDED

The extended silt-removal process delayed the project late into autumn, and the applicator had to contend with less-than-desirable weather and shorter days. Even with these difficulties, the entire application was completed in just over two months by a team of six to 10 workers, depending on the step in the process.



A primer coating is applied to the basin before the liner is sprayed on.

Share Your Ideas

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 877/953-3301

The customer reports satisfaction with how well the lining has performed. Ultimately, the application was an effective solution for repair of the failing concrete basin. The seamless containment lining is expected to significantly increase the life of the aeration pond. **tpo**

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WORKPLACE SAFETY

Avoiding Falls

Treatment plants have more than their fair share of hazards. Avoiding falls from storage tanks, elevated surfaces, vehicles and roofs goes a long way toward establishing a safe workplace. Safety specialist and wastewater treatment plant operator Sheldon Primus offers some tips for steering clear of fall-related accidents. tpomag.com/featured

LICENSING AND TRAINING

Why Operators Are Assets

Many water and wastewater treatment plant operators around the nation are aging and beginning to look toward retirement. The demand for industry professionals is on the rise, and attracting young minds to the field is of utmost importance. Guest blogger Jeff Kalmes explains why treatment plant operators are crucial assets to communities. tpomag.com/featured

OVERHEARD ONLINE

“The demand for innovation in the water industry is now stronger than ever due to dwindling supply, aging infrastructure and sustainability initiatives.”

How Cincinnati Is Transforming the Water Industry Landscape
tpomag.com/featured



GETTING TOGETHER

Water Clusters Emerge

Making meaningful change is never easy. Water groups throughout the nation are coming together to provide networking and innovation as they blaze a trail for the future of

the world's most important natural resource. See how these public-private partnerships might just change the world.

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YOUTH MOVEMENT

RISING STAR CHRIS COX BUILDS AN AWARD-WINNING CAREER AT THE CLEAN-WATER PLANT, MANAGING TREATMENT WHILE LEADING A TEAM OF YOUTHFUL, HIGH-ENERGY OPERATORS

STORY: **Jack Powell** | PHOTOGRAPHY: **Oliver Parini**

REMEMBER THE ADAGE, “YOUTH MUST BE SERVED?” AT THE Montpelier Water Resource Recovery Facility, chief operator Chris Cox and his young staff are the ones doing the serving.

They operate the 3.97 mgd (design) plant in Vermont’s capital efficiently, cost-effectively and in a way that produces effluent quality much higher than tough state and federal regulations require.

Since he joined the plant in January 2012 for his first job in the wastewater field, Cox, 27, has built some serious credentials. He has assembled an energetic team that includes Matt Lamson, 26, assistant chief operator; and Sam Campbell-Nelson, 30, operator. The team’s senior member is operator Devin Hoagland, 48, who came on board about the same time as Cox.

Cox has been promoted twice, and in early 2016 received a 2015 New England Water Environment Association Operator Award. It’s an honor that recognizes the “best of the best” water-quality professionals within the 2,000-member NEWEA organization.

Bob Fisher, Cox’s mentor and previous chief operator, nominated him for the award. Fisher, who spent 12 years at the Montpelier facility, now serves as water quality superintendent for the city of South Burlington, Vermont.

Besides the honor for Cox, Montpelier received a 2015 Governor’s Award for Environmental Excellence, recognizing the water resource recovery facility’s energy conservation measures, which save about 475 MWh of electricity per year. The plant also earned a 2015 Wastewater Utility Award from the NEWEA Utility Management Committee for operations and performance excellence and energy conservation.



Chris Cox, chief operator of the Montpelier Water Resource Recovery Facility

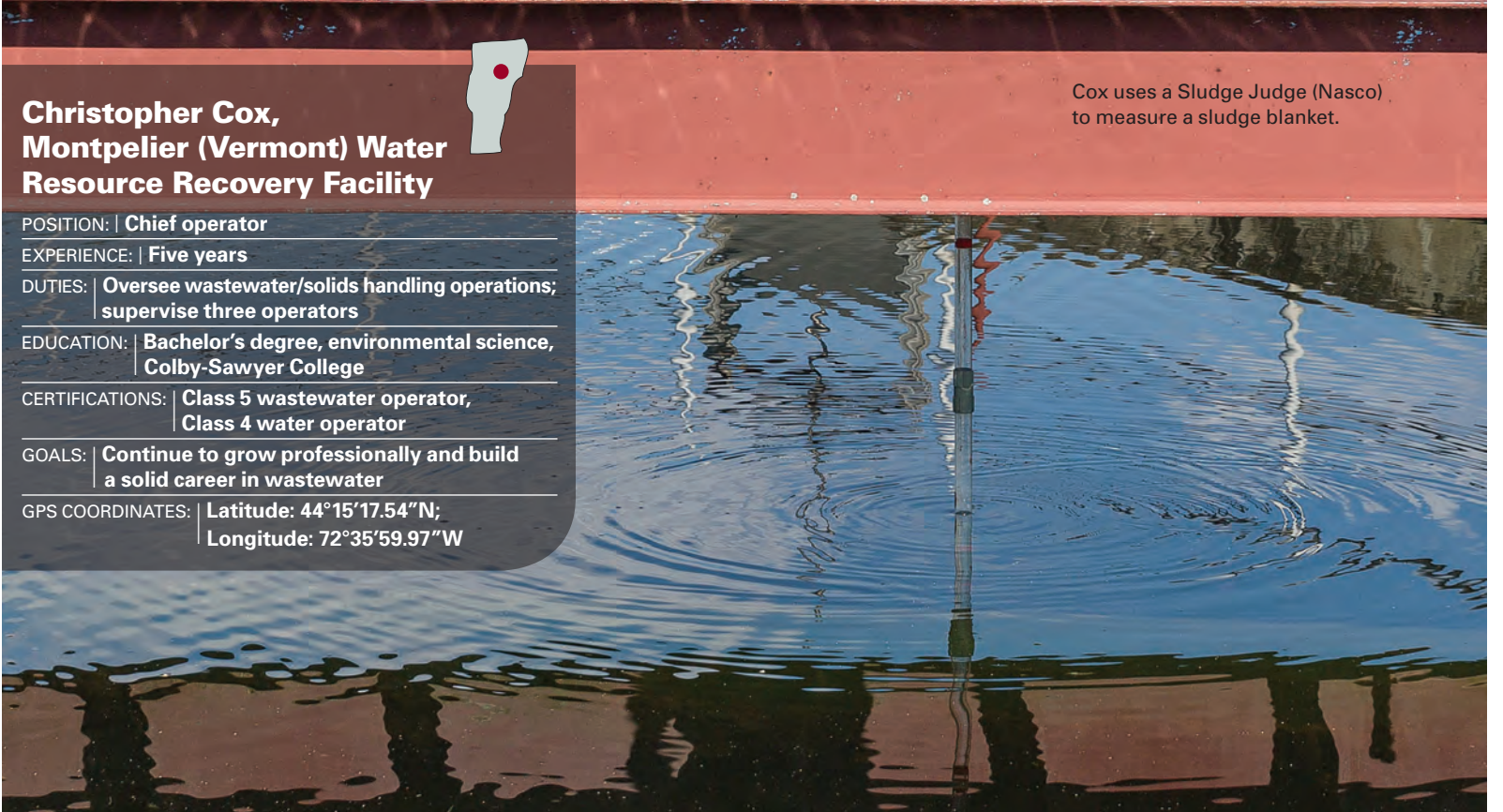
SCALING THE TOTEM POLE

“I was surprised and honored when I won the award,” says Cox, who in a year and a half earned his Class 5 wastewater certification and Class 4 water certification. He needed both as a part-time operator at a water treatment facility in Websterville (population 550). “Though I’ve come up the totem pole pretty quickly, it’s been a great learning experience and I’ve been lucky to have had a great teacher in Bob, a first-rate boss, and an excellent group of operators,” Cox says.

He’s a native of Graniteville (population 800), home to the Rock of Ages Corporation, the nation’s premier granite quarrier. He went to Spaulding High School and was recruited to play Division 3 basketball for Colby-Sawyer College, a private college in New London, New Hampshire. He graduated in 2010 with a bachelor’s degree in environmental science.

After graduation, Cox worked for the New Hampshire Fish and Game Department as part of a study of endangered Arctic and roseate terns. While he enjoyed the outdoor work, he wanted more responsibility, so when an operator’s job at the Montpelier facility came open, he applied and got it, ultimately replacing as assistant chief operator a 38-year veteran who retired.

Soon after, Cox represented Vermont in an operator exchange program with Rhode Island, learning new wastewater processes and various techniques used to keep the water supply clean. This included a visit to the 13.2 mgd Cranston Water Pollution Control Facility, which takes in neighboring facilities’ biosolids and processes them through a multiple-hearth furnace as a source of revenue.



Christopher Cox,
Montpelier (Vermont) Water
Resource Recovery Facility

POSITION: | **Chief operator**

EXPERIENCE: | **Five years**

DUTIES: | **Oversee wastewater/solids handling operations;**
| **supervise three operators**

EDUCATION: | **Bachelor's degree, environmental science,**
| **Colby-Sawyer College**

CERTIFICATIONS: | **Class 5 wastewater operator,**
| **Class 4 water operator**

GOALS: | **Continue to grow professionally and build**
| **a solid career in wastewater**

GPS COORDINATES: | **Latitude: 44°15'17.54"N;**
| **Longitude: 72°35'59.97"W**



Cox uses a Sludge Judge (Nasco) to measure a sludge blanket.



SOLIDS HANDLING: BIG BUSINESS

One of Chris Cox's major responsibilities at the Montpelier Water Resource Recovery Facility is solids handling, which generates \$750,000 in annual revenue for the city, and he works the solids processing equipment hard.

"We take in 30,000 gallons of septage and commercial sludge a day," Cox says. "That separates us from other facilities that can't handle anywhere near that amount. Companies pump the sludge and bring it to us from all over — New York, New Hampshire, Massachusetts and other parts of Vermont."

In addition, Cox and his operators process about 30,000 gallons of landfill leachate daily. Leachate is high in BOD and organic compounds. The plant has a 50,000-gallon leachate tank from which operators bleed the material into the treatment process at 30 gpm over a 24-hour period.

"Handling septage, commercial sludge and leachate in an environmentally responsible manner is something few facilities in the state can do," says Kurt Motyka, assistant public works director and city engineer. "It's been a great source of revenue, but at the same time it has pushed our belt filter presses and other equipment beyond what they were engineered to process. That's one reason our proposed update is so important; we need to make sure we have the capabilities to continue this work."

The Montpelier Water Resource Recovery Facility team includes, from left, Matt Lamson, Sam Campbell-Nelson, Chris Cox and Devin Hoagland.

He also spent time at the West Warwick Regional Wastewater Treatment Facility and its composting operation, and at the 45 mgd Field's Point Wastewater Treatment Facility in Providence, Rhode Island, which treats wet-weather flows up to 200 mgd.

NOT ABOUT AGE

The experience paid off: Cox was named chief operator three years after he started and is responsible for the plant's \$3 million budget. That's not the norm for Vermont, where many water and wastewater operators are older. Cox sees this firsthand as a board member of the Green Mountain Water Environment Association, where he is about 30 years younger than most of the other directors.

That fact isn't lost on Cox's boss, Kurt Motyka, assistant public works director and city engineer. He acknowledges that there has been turnover and that the facility's collective experience has gone from 100-plus years to less than 20 years, with some loss of institutional memory. Still, he feels his plant team is more than up to the challenge.

"With the older guys retired, we have a pretty young staff, and an excellent one, so age really doesn't matter," says Motyka, a former consulting engineer who has been with the city for eight years. "Chris and Matt are hardworking, dedicated individuals, as are Sam and Devin. As chief operator, Chris is very hands-on. He enjoys the physical work and the management aspect of the job, and he's great at both. We're lucky to have such a talented staff; we hope to keep them for a long time."

CHALLENGES AROUND

Cox and staff keep plenty busy, working 7 a.m. to 3:30 p.m. maintaining operations at the Montpelier facility, which treats an average of 1.8 mgd. Of course, given the city's combined sewer system, if it rains hard enough the flow can jump to 4, 5 or 6 mgd. The city's sewer department runs the collections system, including seven pump stations, and the water distribution system.

Operational since 1962, with multiple upgrades over the years, the conventional activated sludge plant uses chemical addition for phosphorus removal; it has no biological nutrient removal capability. That is likely to change as a result of a \$3.5 million upgrade of aging equipment expected to begin in 2018, with a strong emphasis on solids handling. Anaerobically digested biosolids are dewatered and sent to a landfill. Effluent flows into the Winooski River, a 90-mile-long tributary of Lake Champlain.

Protecting these valuable environmental resources is a responsibility Cox and his operators take seriously. They're cross-trained in all plant operations and constantly update their skills through online courses. And it doesn't hurt that Cox is eager to pitch in, regardless of the job.

INCLUSIVE MANAGEMENT

"With Chris, it's like we don't have a boss; we have another co-worker," says Lamson, a Class 5 wastewater operator and Level 1 lab analyst who worked part time at a treatment plant in the town of Waterbury before coming to Montpelier three years ago. "He's willing to do whatever it takes. If we have a tank cleaning, Chris is usually the one in the tank doing the work. Also, if we want to make changes in what we're doing, or want to go to training programs, he lets us do it."

Campbell-Nelson, the plant's newest hire, calls Cox "great to work for" and cites his commitment to getting the operators up to speed on plant processes right away. Campbell-Nelson, for example, is in charge of solids handling, which means he runs the belt filter presses, pumps primary sludge and makes sure levels in the digesters are properly maintained. It's a role he thoroughly enjoys as he learns sampling, equipment repair and lab assignments.

"Chris is great to work for; in fact, this has by far been my best professional experience," says Campbell-Nelson, who graduated from Earlham College in Richmond, Indiana, and earned a master's degree in water resource management from the Nelson Institute at the University of Wisconsin-Madison. "His excitement and drive are contagious. He likes to troubleshoot problems and make the system work as best we can."

As for management style, Cox looks on everyone as a team of equals whose opinions and ideas matter. That includes everything from training programs and process improvements to fixing problems. For example, one of the plant's secondary clarifiers (Lake-side Equipment Corporation) was inadvertently left off after an oil change. That caused TSS to rise; with the drive shut off, sludge normally suctioned from the tank bottom formed a blanket that floated to the

surface. Cox and his team got the issue resolved quickly and with no adverse environmental impact.

"We use four people's brainpower instead of one," says Cox. "In this job you have to know a little bit about everything, such as electrical, plumbing, soldering, data management; no one can know it all. Because we don't have decades of experience to fall back on, we have to rely on our knowledge and our capabilities. And I think we've done a great job for the plant and the residents here." *(continued)*

“Though I’ve come up the totem pole pretty quickly, it’s been a great learning experience and I’ve been lucky to have had a great teacher in Bob, a first-rate boss, and an excellent group of operators.”

CHRIS COX



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Chris Cox likes the variety he finds in operating the plant and appreciates the close working relationships he has with his team.

IT STARTED WITH TERNS

Before joining the Montpelier Water Resource Recovery Facility, Chris Cox spent a summer on the Isles of Shoals off the New Hampshire-Maine coast, watching and banding endangered terns — seabirds found worldwide near oceans, rivers or wetlands.

Working for the New Hampshire Fish and Game Department's Nongame Program, Cox and members of the Office of State Planning Coastal Program, Shoals Marine Laboratory, Terns LLC, Gulf of Maine Tern Working Group, and U.S. Fish and Wildlife Service monitored breeding colonies of Arctic terns, which have the longest migration of any bird, about 30,000 miles. They also monitored roseate and common terns. The goal of the Isles of Shoals Seabird Restoration Project is to manage and protect the breeding populations and their habitats.

"I banded a few hundred terns that summer," Cox says. "Despite the heat and mosquitos, it was fun to look for the birds I banded with a spotting scope and know that I was helping. Though I've always liked the outdoors, the job there really sparked my interest in conservation and ways to improve the environment, which I've applied here in Montpelier."

Each year since the program began in 1997, biologists and team members have lived and worked on White and Seavey islands throughout the tern breeding season from April through August. Cox admits that living conditions "are rustic to say the least" — no running water or electricity. But the staff finds innovative ways to make island life more normal, such as using solar panels to power laptops and cellphones, and providing propane tanks to cook hot meals and run a small refrigerator.

Teams conduct a census of terns nesting on the islands. They record the number of eggs each pair lays, how many of the eggs hatch, and how many of the chicks survive and eventually fly. Biologists also monitor feeding activity to determine how many and what kinds of fish the terns are eating.

SUCCESS ON EVERY LEVEL

Indeed, despite the Montpelier facility's advanced years, Cox declares, "We not only meet all the EPA and Vermont Department of Environmental Protection regulations, but we really blow them out of the water." As examples, he cites 95 percent removal of BOD, TSS and phosphorus.

The plant is also a model of efficiency, cutting energy consumption by 50 percent and doing so mostly without big upgrades — just through mechanical improvements (like a new methane flare and new power-use monitoring equipment) and process changes (like eliminating a 3 hp sewage grinder).

The plant captures and burns methane from the digesters to heat the digesters to 95 degrees F and to heat one of the plant buildings. As a result, the plant saves about 25,000 gallons of fuel oil annually, saving about \$58,000 a year and reducing greenhouse gas emissions.

Cox takes his success in stride, preferring to credit his boss and his team and move from task to task. Early in the day, he may be in a suit meeting with city officials or attending an association luncheon. Later, he's back in jeans working on pumps or cleaning pits. Because the plant is big on community outreach, Cox is in demand as a tour guide, regularly hosting mid-

“As chief operator, Chris is very hands-on. He enjoys the physical work and the management aspect of the job, and he's great at both. We're lucky to have such a talented staff; we hope to keep them for a long time.”

KURT MOTYKA

dle school groups, high schoolers, first-year college students and even college graduates, such as those from Norwich University, which brings in its engineering students.

For Cox, variety is part of the job's attraction. "There is always something different happening in wastewater," says Cox, who lives in the town of Williamstown (population 3,300), about 10 minutes from Montpelier. "The guys and I take a tremendous amount of pride in what we do and the fact that we're protecting the environment. Wastewater is going to be my career. I moved up pretty fast, and I want to stay and continue to improve on what my team and I have accomplished." tpo

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Learning by Doing

HIGH SCHOOL STUDENTS GET SIX WEEKS OF HANDS-ON TREATMENT PLANT EXPERIENCE IN AN EPA-FUNDED PROGRAM CONDUCTED IN LOWELL, MASSACHUSETTS

By Sandra Buettner

On returning to school in fall, many students get the age-old assignment to write about what they did on their summer vacation. If so assigned, four students will stand out by describing their experience working at the Lowell (Massachusetts) Regional Wastewater Utility.

Their opportunity to learn about the wastewater industry and the environment came through a grant from the U.S. EPA given to the New England Interstate Water Pollution Control Commission (NEIWPCC). Established in 1947, NEIWPCC uses varied strategies to meet the water-related needs of its member states in New England and New York.

The commission used the \$5,000 grant to hire a summer college intern with a background in environmental studies. The intern works with and supervises the four high school students throughout the six-week program. The students' salaries are paid by the city of Lowell Career Center.

More than 800 economically disadvantaged inner city high school juniors and seniors applied for jobs at the center last summer. Of those, 350 were placed in positions, and four took part in the Youth and the Environment Program.

NEIWPCC is headquartered in Lowell, whose wastewater treatment plant has a design flow of 32 mgd and an average flow of 25 mgd. The plant, built in 1980, serves a population of 180,000 and has 48 employees. It has hosted students for 23 of the Youth Environment Program's 25 years.

The Youth and the Environment Program was established by the EPA in 1990, and 2016 was the 25th summer program. It was only for lack of federal funding that the program was suspended for two years in the mid-2000s.

EYEING CAREERS

Mark Young, executive director at the Lowell plant, has been involved with the program since its inception and considers it a big plus for the students and the community. "The program was created to expose the students to careers in the environment," he says. "At the beginning, we had a lot more students participating. We realized pretty quickly that the students were not getting enough one-on-one time with their plant mentors, so in succeeding years, we pared down the number to four or five per summer.

"The individual attention helped a lot. The students learned more, got to understand and appreciate the industry, and got excited about the work. It exposed them to a real work environment where they were expected to act professional, show up on time, work hard, learn lab work, and learn to be safety conscious. The students are a big help to us. We have a lot of projects that I don't have enough operators to do. The students help us with the hosing and cleaning of the tanks and other plant projects."

Wastewater treatment was chosen as the field of study to expose students to this industry as a career path they may not have considered. It introduces



A graduation ceremony marks completion of each year's Youth and the Environment Program.

“The individual attention helped a lot. The students learned more, got to understand and appreciate the industry, and got excited about the work. It exposed them to a real work environment where they were expected to act professional, show up on time, work hard, learn lab work, and learn to be safety conscious.”

MARK YOUNG

them to a range of environmental careers including wet-weather management, combined sewer and sanitary sewer overflows, energy and waste management, and natural resource protection. Young encourages all the students to consider the industry on graduation from high school or for their college studies. He knows of two students from past programs who have stayed in the industry.

TYPICAL WORKDAYS

The students work six-hour days. The program traditionally starts the first Monday after July 4 and runs for six weeks. According to Justin Pimpare, regional pretreatment coordinator for the EPA who has been involved for 10 years, the workdays include overall maintenance of the treatment plant, such as hosing down algae or scum buildup outside the primary clarifier walls.

Students also work in the laboratory, performing simple analyses for pH, chlorine and turbidity. They also learn to perform BOD and TSS analysis and view bacteria under the microscopes. "It helps them to understand the potential environmental problems in their own community from what is discharged into the sewer system and how wastewater treatment technology is solving those problems," Pimpare says.

"They really enjoy the lab work. Some have a science background, but even those who don't really enjoy it. One of last year's students will go on to major in chemical engineering at the University of Massachusetts Lowell. All the other program graduates from last year plan to attend college."

Don Kennedy, training coordinator with NEIWPC, says the students get 30 to 60 minutes of daily classroom instruction on environmental topics from their college intern supervisor. The program also includes field trips. In 2015, students did sampling on Squam Lake in New Hampshire, went canoeing on the Charles River in Boston and did a river cleanup with the Charles River Watershed Association. In addition, they took a three-hour tour of the Massachusetts Water Resources Authority's Deer Island Wastewater Treatment Plant in Boston.

WETLAND STUDIES

For the past several years, the program has included a strong wetlands component. In 2015, the students went to a nearby community, harvested plants from a wetland, and transplanted them at the Lowell treatment plant, with the goal of replicating the wetland system. They planted 4- to 6-inch plants in old 250-gallon chemical totes and watered them using effluent from the primary clarifier.

"There are two wetland systems the students monitor," says Young. "One is from 2015 that they benchmark against and the other one is the new one that they created. They can see their progress compared to the prior year's results."

The students graduated Aug. 16 in a ceremony at the Lowell plant. The speakers included staff from the plant, EPA, and Lowell Career Center. The Lowell city manager and mayor were also invited. The students presented for 15 minutes on the work they performed and what they learned, and received certificates of completion.

"During and after their experience, the students are always amazed at what a wastewater treatment plant does," says Young. "Before, they probably thought it was done with screens or mechanical equipment. They didn't have any idea that we are essentially doing what Mother Nature does, only we're speeding it up. Instead of taking six months, we're doing it in six hours." **tpo**

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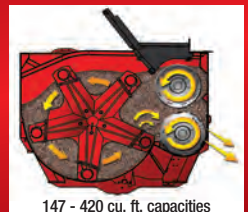
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STORY: **Doug Day**
PHOTOGRAPHY: **Lauren Justice**



A stormwater retention pond empties into an infiltration pond at the Madison Metropolitan Sewerage District facility.

PLANT UPGRADES TO MEET NEW PHOSPHORUS PERMIT limits can cost clean-water agencies millions of dollars. In Wisconsin, the Madison Metropolitan Sewerage District (MMSD) is leading neighboring communities in an alternate, less costly and more effective approach.

Six cities, eight villages and five towns have joined the Yahara WINs (Watershed Improvement Network), an alliance to protect the lakes and rivers in the Yahara River watershed from excessive nutrients, notably phosphorus.

The lakes in and near Madison, Wisconsin's capital city, are severely impaired by nutrient pollution and subject to severe summer algae blooms. Yahara WINs is a 20-year program aimed at reducing total phosphorus contributions from wastewater treatment plants, industries, urban stormwater and agriculture across the 540-square-mile watershed.

At a total cost of \$104 million, the plan carries estimated savings of \$13.5 million per year versus traditional point-source-centered approaches to phosphorus reduction, which would bring limited water-quality benefits in the watershed. Yahara WINs addresses point and nonpoint sources with a goal of reducing total phosphorus releases by 106,000 pounds a year. That would cut phosphorus contributions from 263,000 pounds per year to 157,000 pounds, the level the state Department of Natural Resources (DNR) has deemed sustainable.

MORE THAN TRADING

The Yahara WINs initiative is enabled by state law that allows clean-water agencies to meet phosphorus reduction goals through adaptive management — working with landowners upstream to reduce their contributions instead of, or in addition to, improving plant processes. About 10 other states have versions of adaptive management programs.



Dave Taylor, MMSD director of ecosystem services, says that while Yahara WINs has some characteristics of a nutrient credit trading program, it goes further. It includes a requirement to monitor actual phosphorus levels in the receiving water bodies.

“It’s similar to water-quality trading, but with significant differences,” he says. “It sets a higher bar than credit trading, where you purchase a pound of reduction from someone else and as long as you can document that purchase, you’re fine. With adaptive management, you also have to demonstrate that you can meet water-quality criteria.”

The approach extends across the watershed to reduce the total phosphorus loading from all sources, instead of focusing on small and increasingly expensive reductions from regulated entities such as wastewater treatment plants.



As an example, Taylor compares the \$104 million Yahara WINS cost to the price of phosphorus reduction at his district's 42 mgd Nine Springs Wastewater Treatment Plant: "If we looked at a brick-and-mortar addition to reduce just our phosphorus, it would cost more than \$100 million. The adaptive

management approach costs about \$12 million for us. But we're going after the sum total of phosphorus reductions required from all sources in the watershed, which is about 10 times what we are responsible for."

PROVING THE CONCEPT

Yahara WINS officially began in April 2016, after a four-year pilot program that proved the concept was workable. It began by gaining the participation of every city, village and town identified as having a discharge to the watershed (see table).

In addition to those communities and their clean-water utilities, the Yahara WINS participants include the Clean Lakes Alliance, Dane County, Madison Gas and Electric, the U.S. Geological Survey, Yahara Pride Farms, the Wisconsin DNR Nevin Fish Hatchery, the U.S. Department of Agriculture, and the Natural Resources Conservation Service.

Other entities interested in the initiative include the Capital Area Regional Planning Commission; Friends of Badfish Creek Watershed; River Alliance of Wisconsin; Rock River Coalition; the U.S. EPA, the Wisconsin Department of Agriculture, Trade and Consumer Protection; the Yahara Lakes Association; and Friends of Pheasant Branch.

"The goal of the pilot project was to see if we could get them all working together for four years and see if by working collaboratively we could get conservation practices on the landscape that would reduce phosphorus loads," says Taylor. "We were successful in both regards. We reduced phosphorus loads by more than 20,000 pounds during the pilot project by working collaboratively with rural and urban partners."

Yahara WINS participants		
CITIES	VILLAGES	TOWNS
Madison	Cottage Grove	Blooming Grove
Fitchburg	DeForest	Cottage Grove
Middleton	Maple Bluff	Dunn
Monona	McFarland	Westport
Stoughton	Oregon	Middleton
Sun Prairie	Shorewood Hills	
	Waunakee	
	Windsor	

THE FARMERS' PERSPECTIVE

"Agriculture is in a position that we have to be proactive versus reactive, and we're promoting things that actually work and make a difference," say Jeff Endres, board president of Yahara Pride Farms, a key participant in the Yahara WINS initiative to reduce phosphorus releases into the rivers and lakes around Madison, Wisconsin.

Promotion of conservation and sustainability programs is not new to the group, formed in 2011 to do just that. During the Yahara WINS pilot program, Endres' group provided cost-sharing for 2,500 acres of cover crop, yet farmers planted close to 6,000 acres.

"That tells me the farmers are very in tune to it and want to make a difference," he observes. "That says a lot about agriculture. Yahara WINS approached farmers in a very positive way and wanted to support agriculture. They wouldn't be where they are today without Yahara Pride Farms, and we wouldn't be where we are without Yahara WINS."

Yahara Pride Farms works with farmers to identify practices that protect soil and water, provides a cost-sharing program to test new and innovative technologies, and conducts education and outreach on water quality. "The bottom line is that if we don't show that we're making a difference, the rules and regulations will catch up with us," says Endres.

In May 2016, the group received the Outstanding Achievement in Resource Stewardship Award from the Innovation Center for U.S. Dairy for its cost-sharing program. Since 2012, more than 45 farmers have used the program to reduce phosphorus by 15,872 pounds.

Endres says that shows farmers that it's OK to get out and provide leadership on environmental issues. "The practices we're using today were invented and perfected by farmers themselves — nobody else did that for them," he notes. "So if we turn our attention to this and work together, we can probably make more positive impact faster."

Endres says conservation practices can be good for farmers' bottom line, and he cites reduced tillage as an example: "We've proven that there are a number of ways to reduce tillage that protect water quality with less erosion while maintaining crop yield. There are other effective conservation practices that may never support the bottom line. It's important to differentiate those to understand where to target our funds. The ones that are already working for farmers will take care of themselves."



Vertical tillage reduces soil erosion by cutting up field residue and mixing soil at shallow depths (Excelerator machine from Kuhn Krause).

PHOTO COURTESY OF DAVE TAYLOR

The team at the Madison Metropolitan Sewerage District includes, from left, Mike Northouse, biosolids and land application; Rhonda Riedner, laboratory manager; Kathy Lake, environmental specialist; and Dave Taylor, director of ecosystem services.

One successful tool was a grant program that focused primarily on urban reductions, says Taylor: “WINs helped fund a proprietary stormwater treatment practice, increased construction site inspections, and helped fund a leaf management study. Leaves are a big source of phosphorus in the urban environment.”

In the first half of 2015 alone, five mini grants reduced phosphorus loading by 483 pounds per year. Dane County, home to the city of Madison, established plans that reduce loading by more than 3,500 pounds per year.

ENGAGING AGRICULTURE

On the rural side, agriculture is a leading source of phosphorus and is generally regulated less strictly than urban sources. A 2011 study of the Yahara watershed showed that 90 percent of the sediment and 84 percent of the phosphorus entering area lakes came from agriculture, according to Yahara Pride Farms, a partner in Yahara WINs and a pilot program participant.

“WINs provided funding for Yahara Pride Farms, which worked with farmers to use strip tillage, cover crops, low-disturbance manure injection, and other practices that agricultural producers can use to reduce phosphorus loads,” says Taylor.

More important, the experience showed that farmers were willing to do projects on their own. “Yahara Pride quantified how many practices the farmers put on their land in the absence of any cost-sharing, and the number was really high,” says Taylor. “That shows they have a commitment and strong desire to leave the world in a better position than it currently exists for their kids and grandkids. There’s a tremendous willingness on the part of agriculture to work for a variety of reasons to implement conservation practices.”

In 2014, an \$80,000 grant to Yahara Pride Farms resulted in:

- Strip tillage of 52.5 acres, reducing phosphorus by 47 pounds
- Vertical manure injection on 273 acres, reducing 164 pounds
- Cover crops on 1,329 acres reducing 3,786 pounds

In 2015, farmers reduced phosphorus loading by another 2,159 pounds through cost-share programs funded by Yahara WINs, but another 6,483 pounds was removed from the environment through individual projects not covered by cost-sharing.

PAYING THE BILLS

Nearly half of the Yahara WINs budget will be covered by municipalities and government entities based on the amount of phosphorus reduction they are required to make to achieve their total maximum daily load as established by the DNR.

“About 45 percent of the phosphorus load comes from those entities, so they’re covering about 45 percent of the cost,” says Taylor. The rest comes from a combination of cost-sharing by agriculture producers and the U.S. Geological Survey, contributions from Dane County, state and federal programs, and



“We’ve gone beyond the finger-pointing to a mentality that says we’re all in this together — let’s roll up our sleeves and get it done.”

DAVE TAYLOR



Mike Northouse demonstrates how to test soil. The Madison Metropolitan Sewerage District is leading the way in helping to protect the Yahara River watershed from excessive nutrients.

funding from groups such as the Clean Lakes Alliance. An executive committee decides how to disburse funds contributed by municipal entities.

“We’re moving toward the ‘one water’ concept, rather than just focusing on wastewater treatment plant effluent,” says Taylor. “If we’re really going to make meaningful improvements to water quality, we have to think of this more broadly.”

The wastewater treatment plants in Madison, Stoughton and Oregon will have a series of four five-year discharge permits that include language relating to adaptive management along with specific phosphorus targets.

“The first set of limits we have to meet are the interim effluent phosphorus concentrations,” says Taylor. “That says we have to be down to 0.6 mg/L



Dave Taylor, MMSD director of ecosystem services

“The goal of the pilot project was to see if we could get them all working together for four years and see if by working collaboratively we could get conservation practices on the landscape that would reduce phosphorus loads. We were successful in both regards.”

DAVE TAYLOR



An example of poor practices leading to water impaired by nutrient pollution.

by the end of the first permit term, and then 0.5 mg/L by the end of the next permit term. Our Madison plant is already below those limits. Stoughton and Oregon are close to 0.6 and should be able to meet the 0.5 limit in the next 10 years.”

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MAKING IT WORK

Taylor says the key to putting together such a large group of collaborators was building trusting relationships. “That’s part of what the pilot project was all about, reaching out to those municipal entities and the agricultural community,” he says. “We’ve gone beyond the finger-pointing to a mentality that says we’re all in this together — let’s roll up our sleeves and get it done. From the municipal side, it was important to make the business case for adaptive management and to demonstrate that it’s less expensive than the traditional alternatives.”

He adds that adaptive management isn’t for everyone. “It starts by looking at the watershed. Can you easily identify the players? And how likely is it that they’d be willing to work together? It’s one tool. There are certainly places where water-quality trading or plant additions make more sense.” **tpo**



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From the Beginning

U.S. EPA'S ROBERT BASTIAN SHARES INSIGHTS FROM FOUR DECADES ON THE FOREFRONT OF ENCOURAGING AND REGULATING BENEFICIAL USE OF BIOSOLIDS

By Ted J. Rulseh

When the Clean Water Act started a wave of wastewater treatment plant construction and upgrades, one problem facing utilities and regulators was how to deal with solids that would be generated.

For four decades, Robert Bastian has helped develop and implement solutions. As a senior environmental scientist in the U.S. EPA Office of Wastewater Management, Bastian has been involved in crafting regulations that allow beneficial use of biosolids and in actively promoting beneficial practices through his agency's guidance materials.

He has seen recycling of biosolids (formerly called sewage sludge) through times of uncertainty and controversy right up to today's world, in which the material in various forms is widely (though not universally) accepted for its value as a soil amendment and its restorative power when applied to distressed land.

Bastian grew up on a farm in northwestern Ohio and "was used to putting manure on the ground and dealing with agriculture from a very young age." He earned bachelor's and master's degrees in biology, mathematics and environmental sciences from Bowling Green State University in his home state. He joined the EPA in 1975, after three years of active duty in the U.S. Army Corps of Engineers, where his assignments included overseeing a major wastewater spray application project in Muskegon, Michigan, during final construction.

With the EPA in Washington, D.C., Bastian started as a member of a technical group supporting the Construction Grants Program that funded wastewater treatment plant projects across the nation. He evolved into his role as an EPA authority on biosolids management. For his contributions to the Water Environment Federation, of which he has been a member since the late 1970s, Bastian was named a 2016 WEF Fellow. He reflected on his career and the progress of biosolids recycling in an interview with *Treatment Plant Operator*.

tpo: How did the EPA deal with biosolids in the early years?

Bastian: From the late 1960s to the late 1980s there was extensive research and development. Under the Construction Grants Program we had to come up with technical assistance and guidance on what projects would be fundable, and there was an effort to develop federal policy encouraging recycling of wastes. Sewage sludge ended up being a piece of that. Then there was the 40 CFR Part 257 rule under the Resource Conservation and Recovery Act that comprised the initial round of regulations putting restrictions on what could be done with the material. There was an effort to build state programs to manage how the material was handled.



Robert Bastian, senior environmental scientist for the U.S. EPA Office of Wastewater Management

tpo: How did the biosolids program evolve from those initial phases?

Bastian: In the late 1980s and early 1990s there was the National Sewage Sludge Survey, an effort to assess the quality of sewage sludge at that point in time. Technical regulations under 40 CFR Part 503 were completed in the late 1980s, dealing with land application, surface disposal and incineration. There was active federal oversight and encouragement of recycling where it could be done, and there was a lot of coordination with the state programs and external groups.

“EPA’s regulations don’t necessarily address the control of odors and other nuisance conditions. Some operations do the minimum level of treatment and can create odor and nuisance issues that can bother neighbors. Most of the opposition tends to focus on that.”

ROBERT BASTIAN

tpo: What came next?

Bastian: From the early 1990s into the 2000s, there was significant coordination with state programs to encourage them to take delegation, because they were on the front line and could deal with recycling projects a lot easier than EPA could. There was less active EPA oversight but continued support for recycling. Around that time the Environmental Management Systems concept was developed to help deal with odor and other issues that

weren't part of the federal regulations. The EPA provided funding to the National Biosolids Partnership to support that. There were also efforts to address dioxins, radiation, bioaerosols and emerging contaminants and to look at bioassay as a way of screening for potential contaminants.

tpo: What have been the major developments in the past decade or so?

Bastian: Since the early 2000s, there has been continued work with state programs, monitoring state enforcement activity and the practices various agencies use for tracking information on permittees. There's an effort now to convert data collection to electronic discharge monitoring reports. From the time the 503 rules were issued, permittees have been sending in paper reports.

tpo: Despite progress in public acceptance of biosolids over the past decades, why do we still see public controversies around beneficial use projects?

Bastian: It's a combination of things. There are materials like Milwaukee's Milorganite, which has been sold for more than 70 years, but Milwaukee received discharges from breweries and food processors that made for a nice product. Other treatment plants received more industrial discharges with high levels of contaminants. And there's the idea that if you treat wastewater and make it safe, the contaminants tend to concentrate in the solids.

The other side is that EPA's regulations don't necessarily address the control of odors and other nuisance conditions. Some operations do the minimum level of treatment and can create odor and nuisance issues that can bother neighbors. Most of the opposition tends to focus on that. Then there is the issue of certified organic products. When the USDA set up their standards, they excluded the use of sewage sludge and some other materials. It wasn't based on science and technology. It was based mainly on opposition they received to the idea of growing food crops on soil with human waste applied to it.

tpo: What has been the impact of industrial pretreatment?

Bastian: Cadmium, lead and mercury were focused on as part of the 503 rulemaking. Before the industrial pretreatment program was in place in the late 1970s and early 1980s, some materials had pretty high levels of these metals. For example, Chicago biosolids at one time had over 300 ppm of cadmium. They are now down under 10 ppm through industrial pretreatment controls.

tpo: How does the prevalence of beneficial use in Europe, Canada and elsewhere compare with the United States?

Bastian: We are pretty much on the same level as in the European Union. Australia also recycles a lot of its biosolids. From what I've seen, both here and in those places, there is a movement toward more Class A and Class A EQ products. However, if plenty of land is available to put the material on, such as to reclaim land that was grossly disturbed through mining, it might make more sense to do that than to invest in more processing so you can sell it as a product.

tpo: How would you assess the future of biogas as a more universal renewable fuel?

Bastian: The issue of energy recovery and in some cases making wastewater plants energy self-sufficient or even net energy producers is getting a fair amount of attention. The underlying problem is that it takes an anaerobic digester to produce biogas. And among plants that have anaerobic digesters, well over half are just flaring the gas. Many are just using the gas to heat the digesters or for other heating needs. There is a growing interest in combined heat and power, but that takes capital investment.

tpo: Is anything happening to help facilities get over that financial hurdle?

Bastian: There is growth in private sector investment money being

made available. Private entities are working with treatment plants to do energy recovery inside the fence. Power purchase agreements are just one of many financing possibilities.

tpo: What is EPA doing now to promote more beneficial use of biosolids?

Bastian: There is the broad issue of recycling to reduce the amounts of organics going to landfills. That's the big item on the promotion side. On the funding side, we have the State Revolving Fund programs. In addition, Congress has created the Water Infrastructure Finance and Innovation Act to help with infrastructure reinvestment, and projects that involve beneficial use of biosolids are eligible. A couple of other programs are in development.

“Congress has created the Water Infrastructure Finance and Innovation Act to help with infrastructure reinvestment, and projects that involve beneficial use of biosolids are eligible. A couple of other programs are in development.”

ROBERT BASTIAN

tpo: What events in your career involving biosolids are the most personally satisfying?

Bastian: Research has found that biosolids have worked well on contaminated sites. In one case, on a Superfund site where plants wouldn't grow, they could actually get vegetation established, and reduce the uptake of contaminants by plants, by using the biosolids as a soil amendment. The concept of using the material on those sites, reducing the bioavailability of contaminants, and vegetating steep slopes with contaminants on them that would otherwise run off into surface waters is a pretty dramatic development.

tpo: What advice would you give to clean-water agencies today that may be struggling with some aspect of beneficial use?

Bastian: They need to involve the people who raise the questions so they can see the benefits first-hand. Public education programs and demonstration projects have been effective where authorities have put some effort into them.

tpo: Looking ahead 10 years from now, where do you see beneficial use headed?

Bastian: In California, they're now using biosolids to help close landfills rather than fill landfills. Some treatment plants are becoming energy self-sufficient and even marketing excess energy. They're taking in other residuals like food waste and adding those to the digesters to generate more biogas and turn themselves into power generators. The whole idea of converting wastewater treatment into resource recovery seems to have a positive message. **tpo**

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Low-Salt Diet

THE SEWERAGE DISTRICT IN WISCONSIN'S CAPITAL CITY AIMS TO CURTAIL SALT FOR ROADS, SIDEWALKS AND WATER SOFTENERS TO PROTECT DRINKING WATER AND THE ENVIRONMENT

By Craig Mandli

Salting roads is a way of life in Midwest winters. But all that salt has to go somewhere when the snow and ice melt.

And in an area where nearly every home has a water softener, a lot of salt ends up in local streams. While some salt in the drinking water supply is fine, too much can lead to environmental and health issues.

“The problem is, when too much salt is put down, it ends up in our waterways,” says Kathy Lake, an environmental specialist with the Madison (Wisconsin) Metropolitan Sewerage District. “We have a permit limit for chloride that is being exceeded. That’s why we’re trying to be proactive.”

BECOMING SALT WISE

That’s why the district is teaming with several organizations to host training sessions that teach contractors and municipalities how to keep salt use in check. The district is part of the Wisconsin Salt Wise Partnership, a coalition of city and county agencies, educators and environmental groups promoting responsible salt use.

Road salt is inexpensive and so it is a cheap insurance policy against liability for accidents caused by slippery surfaces. A 2014 report from Public Health Madison & Dane County says more than 240,000 tons of salt were dumped on the city’s and county’s roads since 2010. That doesn’t count what was spread on county highways and private parking lots, sidewalks and driveways. Combined with the salt used in softeners, it’s too much. It’s concerning because for people with medical conditions such as high blood pressure, certain heart diseases, or kidney or liver diseases, sodium in water is a serious concern. High sodium levels can also harm plant life, and together with chloride, increase corrosion in pipes, pumps, hot-water heaters and fixtures.

“Because salt dissolves and we don’t see it, we haven’t paid a lot of attention to it, and there hasn’t been a lot of easy reference on what the right amount of salt is and when we should use it,” says Lake. “With Wisconsin Salt Wise, we’re trying to get that information out.”

RIGHT, ABOVE: A 2014 report from Public Health Madison Dane County says more than 240,000 tons of salt were applied to Madison and Dane County roads since 2010. RIGHT: The Madison District posts “Shovel, Scatter, Switch” signs at salt retailers informing homeowners how to apply salt efficiently.



PHOTOS COURTESY OF THE MADISON METROPOLITAN SEWERAGE DISTRICT

Be Salt Wise!

Once you put salt down, it doesn't go away. It washes off surfaces and accumulates in local lakes, streams and drinking water. You can keep sidewalks and driveways safe this winter while protecting our waters by following these simple steps:

1. Shovel



Clear walkways and other areas before the snow turns to ice. The more snow you remove manually, the less salt you will have to use and the more effective it will be.

2. Scatter



If you apply salt to pavement, aim for a pattern like this, leaving space between salt grains. A coffee mug full of salt is enough for about 60-70 feet of sidewalk. A hand spreader can help create this pattern.

3. Switch



When the pavement temperature is below 15 degrees, salt won't work. Switch to a different ice melter (like a blend) that works at a lower temperature, or use sand for traction.

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PERMIT COMPLIANCE

The goal is to meet a standard chloride permit level of 395 mg/L. While the Madison area has seen a reduction in chloride, the level is still regularly in the 400 to 430 mg/L range. The district estimates that roughly 10 percent of its salt load comes from road salt.

“Just because the ice melts doesn’t mean it’s clean,” Lake says. “That salt is still around, but it’s dissolved in our lakes, streams and groundwater. So it’s really out of sight, out of mind. We’re trying to raise awareness year-round so that people know that salt is always going somewhere.”

While Lake says it’s sometimes hard to measure the effect of outreach to homeowners who spread salt on driveways and sidewalks, feedback from the district’s municipal applicator training sessions pointed to a common theme.

“There are many reasons applicators apply too much salt,” she explains. “That can happen when a public works department gets a call about a slip-



Ralph Erickson, pretreatment coordinator, shows what 90 tons of salt looks like.

“We need to dispel the myth that more is better. More salt is not better.”

KATHY LAKE, P.E.

Road salt is ineffective when the temperature drops below 15 degrees F, at which time municipalities could apply sand or other de-icers. However, most turn to salt because it is cheap. “We need to dispel the myth that more is better,” says Lake. “More salt is not better.”

REACHING THE PUBLIC

Salt reduction goes beyond training salt truck drivers. The campaign aims to educate the general public. It directs them to look at alternatives to salt and to show patience with public works crews who apply salt.

“We certainly want everyone to be safe, but if a public works department gets multiple calls on one corner, you can bet they are going to make sure it is taken care of,” says Lake. “That often leads to an over-application of salt. We teach them that there are other options, such as brine solutions and mechanical deicing equipment.”

Salt outreach doesn’t end when winter does. The district is working with softener manufacturers and suppliers on how to make home units operate more efficiently.

“We found through a study with softener suppliers that by replacing outdated softeners and optimizing newer ones, we can cut salt use by 27 percent,” says Lake. “We use rebates to encourage people to replace outdated softeners, and we work with service professionals to provide price breaks for optimizing systems. We’re seeing results.”

pery road or someone falls on the sidewalk. The answer is typically to just throw more salt on it.”

That can be overkill, and the science often doesn’t back it up.

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The district regularly plots chloride levels in its water supply, and the trend in recent years is downward. The district also commissioned a study on treating the hard source water at a treatment plant to eliminate the need for private softeners. Unfortunately, that would have cost about \$400 million.

The utility has applied for a variance through 2020 to bring chloride levels within the limit, and Lake is confident the goal can be met. “It’s about being diligent in making sure people are informed,” she says. “We’re never going to get all the chloride out of our water, but there’s still room for improvement. We’re finding that room.” tpo

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MILITARY VETERANS AND OTHER QUALIFIED PROFESSIONALS KEEP CLEAR REUSE WATER FLOWING AT FLORIDA'S LOXAHATCHEE RIVER DISTRICT

STORY: **Jim Force**

PHOTOGRAPHY: **Benjamin Rusnak**



VETERANS TAKE MANY SKILLS WITH THEM WHEN THEY RETIRE FROM the military. Many of those skills are recaptured at the Loxahatchee River Environmental Control District Wastewater Treatment Facility in Jupiter, Florida.

All five maintenance staff members are U.S. Navy veterans. “Hiring veterans is a priority here,” says Tom Cavanaugh, lead operator, day shift 2. “Our human resources manager, Tom Reynolds, a Purple Heart recipient, is ex-Army.”

The district recruits veterans through the U.S. Department of Veterans Affairs and its own website. “The core values of vets match up well with the district’s core values,” says Reynolds, who served in the infantry in Iraq from 2003 to 2008. “There’s a culture of hiring veterans here. The training and education they receive in the military matches up well with our training and education programs. They’re dedicated, work hard and ask good questions.”

Cavanaugh says the staff does most work in-house, including major projects. As a result, the plant saves money and gets the job done right: “These guys are amazing.”

Albrey Arrington, district executive director, puts it this way: “We have a long history of people doing really good work. They were the folks who went before us: board members, workers with boots on the ground. It’s what sets us apart. In some places, there might be acrimony between the board and staff. Not here. Our board provides active collaborative leadership and our staff implements.”

Multiple awards are proof of the performance at the treatment plant, which produces reuse water. Recent project-of-the-year honors have come from the American Society of Civil Engineers. The Florida Water Environment Association and the U.S. EPA have recognized the facility for outstanding operations and maintenance. EPA Region 4 honored the district with its Municipal Water Use Efficiency Award, and the collections system was rated best by the FWEA in 2016. Recently the plant received the FWEA David W. York Water Reuse Prize.

NOTHING TO SURFACE WATERS

The district’s 72-square-mile territory includes the communities of Jupiter, Tequesta, Juno Beach and Jupiter Inlet Colony and surrounding unincorporated areas.

No water from the treatment plant is discharged to a stream. An average daily flow of 7.45 mgd is used for irrigation or injected into a deep well. Biosolids are dewatered on a pair of belt presses (Alfa Laval Ashbrook Simon-Hartley), pelletized and used for fertilizer in a joint venture with five other utilities. Pelletizing, distribution and sale of the pellets are handled by New England Fertilizer Co. (NEFCO).

The team at the Loxahatchee River Environmental Control District Wastewater Treatment Facility includes, from left, Deveyand Dave, Jason Argraves, Waldo Cruz, Tom Cavanaugh, Dan Leucht, Tom Vaughn, Billy Slavik II, Virgilio Manera, Anthony Campbell, Anthony Nicoletto and Brandon Collins.

The original facility was built in 1976 as a 4 mgd advanced treatment plant discharging to the Loxahatchee River, the state's first wild river. The plant was expanded to 6 mgd in 1986, and effluent reuse was instituted. Expansions in 2000 and 2005 brought the facility to the current design capacity of 11 mgd.

After bar screens (Parkson Corp.), the plant uses Gardner Denver diffused air blowers in an extended air configuration. That's followed by four secondary clarifiers, enough to allow one to be taken down for maintenance. Clarified effluent goes through high-rate filtration and a Wallace & Tiernan chlorine disinfection system (Evoqua Water Technologies). The plant has two filtration trains: traveling bridge units (now being replaced with deep-

PROVIDING IRRIGATION

About 80 percent of plant effluent is used to irrigate 14 area golf courses and Roger Dean Stadium, spring training home for the St. Louis Cardinals and Miami Marlins. The district also stores reuse water in some 40 acres of lakes on the plant property.

"We're really proud of the fact that we supply water for the stadium," says Arrington.

The balance of the treated effluent is pumped into a 3,000-foot-deep well next to the plant. Reject water from nanofilters at the district's water treatment plant across the road is also deep-welled or blended with water in the storage lakes.

Over the years, the plant has become surrounded by homes, condominiums and commercial businesses, so odor control is important. Evoqua supplied an odor-control sys-

“All operators are trained to run the entire plant blind, using the control system alone.”

TOM CAVANAUGH

tem behind the biosolids dewatering building that uses caustic and sodium hypochlorite, and a biological system behind the headworks building.

Plant processes are controlled by a high-technology redundant control system employing programmable logic controllers and meters, plus a self-contained server room. "All operators are trained to run the entire

plant blind, using the control system alone," Cavanaugh says.

The facility is also prepared for emergencies, notably hurricanes. "We have two emergency generators that can run the plant when we lose power, and we have portable generator hookups on all essential components of the plant," says Cavanaugh. "Plus, we have portable generators available to supply power to lift stations out in the field. We have power outlets in the electrical rooms so we can hook up if necessary."

Although the area hasn't endured a major hurricane since 2003, power outages can be daunting. "Weather is one of our major challenges," says Arrington. "In case of major storms, we have the capacity to keep things going and prevent any overflows." Chief operator Waldo Cruz and crew do a "fantastic job," Cavanaugh says. "We make really good water."

ACCOMPLISHED PLANT TEAM

What makes the treatment plant tick is an operations and maintenance staff that can do it all. The veteran-anchored crew, led by Anthony Nicoletto, maintenance supervisor, has achieved significant savings for the district. Reynolds points out that the veterans often bring skills and knowledge in pumps, piping and plumbing that fit right in with the district's work.

A prime example is the dewatering building. The original plan was to tear down the existing building and erect a new one, but the in-house crew was able to retrofit the old building. They installed new girders and gussets to reinforce the structure, took off the aluminum skin and replaced it, all at considerable savings.

In another case, the staff cut apart and removed a lime silo no longer in use because solids were no longer being land-applied or landfilled. The in-



Tom Vaughn, director of operations, in the blower room (blowers from Gardner Denver).

Loxahatchee River Environmental Control District Wastewater Treatment Facility, Jupiter, Florida

BUILT: | 1976; expanded 1986, 2000, 2005

FLOWS: | 11 mgd design, 7.45 mgd average

POPULATION SERVED: | 70,000

AREA SERVED: | 72 square miles

TREATMENT LEVEL: | Tertiary

TREATMENT PROCESSES: | Diffused aeration, high-rate filtration

RECEIVING STREAM: | 80 percent to irrigation, remainder deep-well injected

BIOSOLIDS: | Pelletized for fertilizer

EMPLOYEES: | 81 full-time

ANNUAL BUDGET: | \$14.7 million (operations)

WEBSITE: | www.loxahatcheeriver.org

GPS COORDINATES: | Latitude: 26°55'25.05"N; longitude: 80°8'21.57"W



bed filters) and synthetic-media Fuzzy Filters (Schreiber), which handle the majority of the flow, about 6 mgd.

The deep-bed filters will give the plant adequate nitrogen removal to meet more stringent effluent guidelines in the future, says Cavanaugh. They are being built by John J. Kirlin Construction using a design from the Hazen and Sawyer engineering firm.



Deveyand Dave, plant operator, performs a microbiological examination of a water sample.



Sabrina Carter gives courses and training on customer relations at the plant.

house team also cleans the aeration basins, equalization tanks and clarifiers, including sand removal, sandblasting and painting.

“We also have a couple of guys who are expert welders,” Cavanaugh says. “They can weld anything. It’s really amazing.”

Another staffer, Ross Cowell, is an expert in pumps. He built an oven so he could bake on the lacquer needed for the copper wiring on pump motors.

Loxahatchee River Environmental Control District Wastewater Treatment Facility PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
TSS	201 mg/L	4 mg/L	5 mg/L
BOD	155 mg/L	2.8 mg/L	45 mg/L weekly avg.
Nitrogen	Not recorded	6.15 mg/L	Not required
Phosphorus	Not recorded	3.15 mg/L	Not required

Monthly averages, June 2016

“In addition, we have a great metal fabrication team, so we can build just about anything in our shop,” says Cavanaugh. Bob Ward adds electrical expertise. Jason Argraves is safety and compliance officer, responsible for trench training and safety training.

Cavanaugh also lauds the laboratory staff: “They’ve provided the most extensive and complete record of water quality in the Loxahatchee River over nearly 40 years of regular testing and monitoring, as well as monitoring treatment plant performance.”

The culture of economy extends to the collections department, where the district shares two Vac-Con combination trucks with neighboring utilities. The savings are annually reported to the district board, with the pleasant result that sometimes bonuses have been paid to the staff.

DILIGENT TRAINING

The district also handles training in-house to save money and time. “We concentrate on on-the-job training, but the plant also has a training room where we do testing for licenses in-house, and conduct training for CEUs,” Cavanaugh says.

(continued)

Albrey Arrington, district executive director, is proud of the display that helps visitors understand the working of the treatment plant at the Busch Wildlife Sanctuary, which is the public part of the Loxahatchee River District treatment plant property.



TEACHING TOOLS

Few clean-water plants can actually show visitors the quality of the water they produce the way the staff can at the Loxahatchee River District. Here, visitors can step onto a viewing platform and view some 40 acres of lakes that contain the plant's reuse water. They'll also see ducks and migrating birds.

"People take pictures, and wildlife photographers use it to get dramatic shots of birds in flight," says Tom Cavanaugh, lead operator. Right next door is the Busch Wildlife Sanctuary, a free public zoo containing fish, alligators and birds. Wildlife expert Jack Hanna comes in once in a while for educational demonstrations. The parking lots are always full.

The zoo also refers to the treatment plant with an interactive diagram showing how water passes from homes and businesses to the plant and then to the reuse lakes. "We give plant tours all the time," says Cavanaugh. "As many as 250 people last year. We get a lot of students from elementary school to college level. Recently, we've had 15 to 20 students a month from Florida Atlantic University."

Wastewater treatment is also featured at the Loxahatchee River Center a few miles from the plant. Supported by Friends of the River, the center shows the flow of the river from its headwaters, through the cypress-dominated floodplain, and across the sandbar into the coral reefs. A number of aquariums and interactive displays teach visitors about water quality and solutions for preserving the river in the face of growing population and development.

Cross-training is critical. Maintenance workers join the operational staff at times, and vice versa. Plant staffers also exchange with collections workers, learning how to drive the cleaning trucks and handle other tasks.

"PLC training is conducted by the district's IT staff, and training for hazardous activities is handled by the fire department's hazmat team just down the road," Cavanaugh says.

Arrington understands the value of these activities: "There's no silver bullet, but the better your people are, the more efficiently everything works.



Tom Vaughn, left, director of operations, and Tom Cavanaugh, lead operator, near one of the plant's reuse water storage ponds.

I'm a big fan of the TV program *Undercover Boss*. Not all ideas are home runs, but our staff has good ones. Collaboratively, we get better as an organization."

As with all plants, even those with several award plaques on the wall, the future presents challenges. "We have challenges across the board: money, staffing, regulations," says Arrington. "We strive to maintain high performance, permit compliance and minimal odors. The challenge is doing all things cost-effectively."

To Cavanaugh, the goal is even more explicit: "We are in charge of keeping the river clean."

Whatever the task at hand, the seven Navy and two Army veterans on the staff are a perfect fit. "Just like in the service, there's a brotherhood here," says Reynolds. "We've got each other's back." **tpo**

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Hauling contractors deliver 70,000 gallons of FOG every week, allowing the Durham plant to run its cogeneration engines at full capacity.

Greasing the Wheels

A CLEAN WATER SERVICES FACILITY EXPANDED COGENERATION CAPACITY BY ADDING A FOG RECEIVING STATION TO HELP PRODUCE MORE BIOGAS

By Doug Day

The Durham Treatment Facility has used cogeneration since 1993, but the 500 kW system was too small and getting old. Serving 250,000 people around Tigard, just south of Portland, Oregon, the 20 mgd plant was flaring excess biogas and the engine wasn't as clean or efficient as today's technology.

"It was an old rich-burn system with no gas treatment, and we were producing about 30 percent more gas than the engine could use," says Bruce Cordon, business opportunities manager for Clean Water Services, the regional wastewater management utility. "That's wasteful."

In its place, the plant opened a 1.7 MW cogeneration system in April 2015 that uses all available biogas and has capacity to use gas produced in a fats, oil and grease (FOG) receiving facility. The old engine was replaced with two 848 kW gas engines (Jenbacher). Unison Solutions provided the gas treatment system.

Between the new cogeneration system and a 2-year-old 403 kW fixed solar array, about 60 percent of the plant's power comes from renewable sources. That's about 12,800 MWh per year, enough electricity to power 1,100 homes and avoid producing 6,000 tons of carbon dioxide.

The \$16.8 million project, which included some smaller plant renovations, received \$3 million in cash incentives from Energy Trust of Oregon and \$2.8 million in tax credits from the Oregon Department of Energy. It saves \$800,000 per year in energy costs, including \$100,000 for heating, and will produce some \$340,000 in tipping fees.



Two 848 kW Jenbacher engines replaced a single 500 kW unit to provide up to 1.7 MW of capacity. A 403 kW SolarCity solar installation provides 450,000 kWh per year.



A Unison Solutions gas treatment system is installed outside the cogeneration building.

LESSONS LEARNED

As much as FOG has helped, it also brings challenges. "The FOG does increase your capital costs because you have to build the infrastructure," Cordon says. "And there's always the question of what it's going to do to the digesters. We had some nervousness about that, but we knew of some places that had done this. Our engineers went to some of those and talked to the plant staffs."

The introduction of FOG was slowly ramped up and caused no digester issues, but the material produced more energy than expected. "Originally, we were thinking we'd need 100,000 gallons of FOG per week," says Cordon. "We're getting about 70,000 gallons, and that's enough to run our engines at full capacity."

That doesn't mean the going has been completely smooth. "We have four contractors that deliver to us," Cordon says. "Sometimes they don't show up when they're supposed to, or they give us more FOG than we bargained for. The scheduling part can be a bit of a challenge. And we've had a few problems with contaminants like chunks of concrete. We do have a rock trap that helps clean out that material before it gets too far into our system, but it's not foolproof."

For a while, the plant also accepted waste from a food processor. "It turned out the FOG was much better, probably twice as good when it comes to gas production," says Cordon. "We told the food processor we'd have to charge a higher tipping fee, but they balked at that and we parted company. It took several months to run through that experiment, and we switched to FOG exclusively in the fall of 2015."

SOLAR HELPS

The solar array on plant property, owned and operated by SolarCity, provides 450,000 kWh per year to the plant through a power purchase agreement. That's about 2 percent of what the plant needs. Cordon would like to



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expand solar resources, but there are some barriers.

“We have space for it and are going to be replacing roofs on some buildings, so it makes sense to bring in more solar,” he says. “But we’re up against a problem I think is something you can encounter in other states. For net

metering (with local electrical utilities) in Oregon, you can’t have more than 2 MW of generation on your site. We’re already up against that at Durham.”

So Cordon continues to explore options for increasing sustainability at Durham and other Clean Water Services facilities. **tpo**

MARKET FORCES HAMPER SUSTAINABLE SOLUTIONS

Clean Water Services operates four wastewater treatment plants serving 560,000 customers around Washington County, south of Portland, Oregon. Since 2004, the agency has worked with Energy Trust of Oregon on more than 100 improvements, creating more than 9 million kWh in annual electricity savings.

But not everything has worked out as planned. A proposed vehicle biogas project at the 30 mgd Rock Creek Advanced Wastewater Treatment Facility has been held up by low fossil fuel prices and a lack of a market for its excess biogas.

Rock Creek’s old cogeneration plant provides 30 percent of its electricity with two 500 kW Superior engines; a 65 kW SolarCity system also supplies power. There was a plan to invest \$3.5 million to capture its surplus methane and compress it into vehicle fuel using \$1.2 million in federal grants through the Oregon Department of Transportation and another \$880,000 in tax credits from the Oregon Department of Energy. The project would have produced the equivalent of about 600 gallons of diesel fuel per day.

“Compressed natural gas vehicles haven’t really taken off in Oregon,” says Bruce Cordon, business opportunities manager for Clean Water Services. “We don’t have a regulatory mandate like

California. We have people willing to buy our gas and ship it to California and sell it. The problem is how to put the gas into the pipeline. Our local gas utility has impossibly high quality standards that have to be met.”

One company approached Cordon about transporting the gas by tanker to a nearby interstate pipeline, but hasn’t made a firm offer. For lack of a market, Cordon had to turn back the grant and the tax incentives.

Another firm broached the topic of gasifying the plant’s biosolids. “We want to look at this hard from a feasibility standpoint,” Cordon says. “They tell me it’s a low-energy gas so I’m not sure what we would do with it. One thing is certain: We’d end up with a lot less solids to manage.”

The plant ships about 11,000 dry tons of biosolids over long distances annually, mostly to eastern Oregon farms. That adds up to about 500,000 miles per year and 100,000 gallons of diesel fuel.

A startup company approached Cordon about a new process to convert biogas into a biodegradable plastic using microbes. “I don’t think they’re quite ready for prime time,” he says. “But it’s interesting to think about.” In the meantime, Rock Creek continues to flare biogas. Says Cordon, “We’d like to change that situation.”

Gerry Spape (left) of Dragon Products describes the smooth-walled Mini Frac tank to a 2016 WWETT Show attendee.



PHOTO BY CRAIG MANDLI



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Roll-Off for a Tight Footprint

A SMOOTH-WALLED FRAC TANK FROM DRAGON PRODUCTS BRINGS AN OILFIELD PRODUCT TO WASTEWATER SECTOR

By Craig Mandli

Wastewater treatment plant products need to work effectively and also save space. Typical roll-off containers require a tractor-trailer-size footprint and can be awkward to move around.

The Mini Frac, shown by Dragon Products at the 2016 Water & Wastewater Equipment, Treatment & Transport Show, could solve a variety of problems for both municipal and industrial operators.

The 8,500-gallon smooth-walled, lined liquid storage unit is smaller than full-sized roll-off containers. It includes three access points — 4-inch drainage lines in the front and back and a fill point at the top.

The unit is severe-duty engineered. Its development answered the call to build a smaller frac tank to suit customer requests, says Gerry Spape, Dragon's Northeast region sales representative: "Most of our customers come from the oil and gas sector, so this product is a diversification into the wastewater sector."

Spape says the unit's smaller footprint allows ease of transport via a roll-off truck or trailer. It is coated in a durable paint and lining, has an undercoated floor structure, and steel is grit-blasted and painted. The liner is impervious to caustic chemicals.

"This tank is made for heavy use over a long period of time," he says. "The biggest difference between the smooth walls and the corrugated is that the smooth walls are much easier to clean, which makes it a better fit for wastewater treatment."

Units are available with optional equipment that converts them to a mini mix tank. "The mixing option comes with a three-phase motor that works to solidify the product for easier removal," says Spape.

“The biggest difference between the smooth walls and the corrugated is that the smooth walls are much easier to clean, which makes it a better fit for wastewater treatment.”





GERRY SPAPE

"We talked to a lot of people who work on the environmental end of the industry, which was a nice surprise for us," he says. "We're definitely interested in coming back to the show and exploring that market. 877/231-8198; www.dragonproductsltd.com. tpo



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Tackling Turbidity

PLANT UPGRADES AND CONSTANT VIGILANCE AGAINST CHANGING SOURCE WATER CONDITIONS HELP EARN A PRESIDENTS AWARD FOR THE TEAM IN HERSHEY, PENNSYLVANIA

STORY: **Trude Witham**

PHOTOGRAPHY: **James Robinson**

TEAM MEMBERS AT THE G.C. SMITH TREATMENT Facility and Operations Center have faced wildly fluctuating turbidity from farm runoff into the source water creek. They've fought their way through snowstorms and floods.

They've overcome those obstacles and more and continue to excel, striving to provide the best water in the state to 19,000 customers, including the Hershey Foods chocolate factory and Penn State Milton S. Hershey Medical Center.

The plant in Hershey, Pennsylvania, started working with the Partnership for Safe Water in 1996. In pursuing the Presidents Award in 2014, the staff had already taken steps to improve plant performance, including a switch from alum to a ferric chloride/polymer blend to improve filter run-times and turbidity.

Justin Brame, production supervisor, compiled the necessary turbidity data for the Presidents Award, with help from Branden Leaphart, SCADA programmer. "We knew we were eligible," says Brame. "Our turbidity numbers were incredible by industry standards, and we had met the Phase IV Partnership criteria for years. But we just hadn't had the time to crunch the numbers and complete the paperwork."

The plant's combined filter effluent turbidity during that period was 0.03 NTU, and settled water turbidity was 0.50 NTU. "The team worked diligently to achieve and maintain these standards, and I knew I needed to find the time to make sure they were recognized for their efforts," says Brame. "I was glad to see all that work pay off when we received the Presidents Award in 2015."

MAJOR UPGRADE

The G.C. Smith plant (11 mgd design, 7 mgd average) is owned by Pennsylvania American Water and is named after former president Gerald C. Smith to honor his 47 years with the company. The plant was placed in service in 1992.

Source water is from Swatara Creek, but the plant can switch to Manada Creek to supplement that supply. On Swatara Creek, water is withdrawn into a concrete intake and through a traveling or stationary screen (FMC Technologies) before being pumped to the plant.

A ferric/polymer blend coagulant is added, along with caustic soda for pH control. Chlorine, potassium permanganate, powdered activated carbon and cationic polymer are added as required. The water passes through a static mixer, then into a mixing chamber. From there, it enters one of five distribution chambers where chlorine can be added if necessary.

Next, the water enters a vacuum chamber where it is lifted and released, creating a pulsating action in the clarifiers. The water then enters one of five Superpulsator clarifiers (SUEZ). The clarified water flows to a perforated pipe leading to a flume for chlorine addition. From there, it passes through five multimedia filters and is piped to a chamber where chlorine, zinc orthophosphate and caustic soda are added. It then enters a 2-million-gallon clearwell.





Operator Richard Bitting checks one of many turbidity meters at Pennsylvania American Water's G.C. Smith Treatment Facility and Operations Center.

An \$8 million upgrade in 2011 added the fifth Superpulsator to increase capacity from 9 mgd to 11 mgd. It also added an ammonia feed system that allowed the conversion from free chlorine to chloramine disinfection. A chlorine scrubber system (Purafil - a Filtration Group Company) was installed for safety reasons.

FLASHY CREEK

Fluctuating raw water conditions keep operators on their toes. "As long as we are diligent, our water can be fairly easy to treat," says Brame. "But raw water turbidity can change from 5 to 500 NTU in a few hours because of the large number of farms in the watershed. We are fortunate to have operators who are very knowledgeable and dedicated to providing the best possible product for our customers regardless of the creeks' conditions.

"It seems like today, more than ever, the creek source is flashy. The small to average rain events have been replaced with huge rain events, floods, huge

G.C. Smith Treatment Facility and Operations Center, Hershey, Pennsylvania

BUILT: | 1992

CUSTOMERS SERVED: | 19,000

SERVICE AREA: | Dauphin and Lebanon counties

DAILY FLOWS: | 11 mgd design, 7 mgd average

SOURCE WATER: | Swatara and Manada creeks

TREATMENT PROCESS: | Conventional

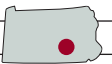
DISTRIBUTION: | 315 miles of water mains

SYSTEM STORAGE: | 6.4 million gallons

KEY CHALLENGE: | Maintaining the Presidents Award

WEBSITE: | www.amwater.com/paaw

GPS COORDINATES: | Latitude: 40°17'3.87"N; longitude: 76°40'30.40"W

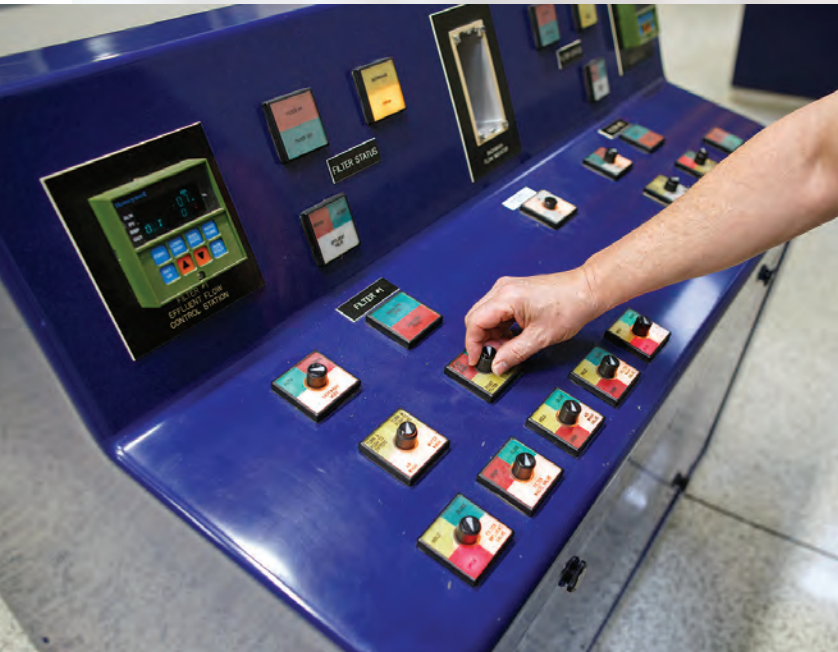




“Our turbidity numbers were incredible by industry standards, and we had met the Phase IV Partnership criteria for years. But we just hadn’t had the time to crunch the numbers and complete the paperwork.”

JUSTIN BRAME

Technicians hand-test for chlorine to calibrate the chlorine analyzer.



This control panel is used to flush the filters. Upgrades at the plant have greatly improved filter runtimes and turbidity.

snow events, and droughts. This makes water treatment challenging. But it appears to be the new norm, and we have to be prepared for it.”

Plant operators try new chemicals, technologies and lab equipment to help them understand source water conditions and treat them effectively and efficiently.

“We have been working hard on updating our source water protection

plan, so we have a better understanding of our watershed and the risks and hazards upstream of our raw water intake,” says Brame. “We meet with local officials, schools, clubs, associations and customers to get the word out about protecting and improving our watershed.”

Having an automated system helps. According to Brame, the programming for the SCADA system from Allen-Bradley (Rockwell Automation) is among the best: “The programs that the SCADA teams developed over the years, and what Branden Leaphart maintains and improves, have made the Hershey plant one of the most automated facilities at American Water.”

TRACKING TURBIDITY

Brame was water-quality supervisor when the plant team began pursuing the Presidents Award. In compiling turbidity data, he was required to focus on raw water, settled water and combined filter effluent water turbidity at 15-minute intervals for 12 months.

“We were also required to provide the 15-minute turbidity data for each individual filter during that 12 months,” says Brame. “For the last requirement, the Partnership states that the turbidity following a backwash may be greater than 0.10 NTU for no more than 15 minutes. After evaluating all this data and preparing it for submission, we knew we met and exceeded all the criteria for the award. We even tightened many of our own plant standards regarding turbidity. We just wanted to keep improving and making things better and safer.”

The switch in 2010 from alum to a ferric/polymer blend (PVS Technologies) greatly improved filter runtimes and turbidity. “NTUs are well below

0.03 most of the year, and filter runtimes are 120 hours without exceeding headloss parameters,” says Brame. “In the past, there were times when the filters could barely make it for eight hours before exceeding head loss regulations and needing to be washed.”

“We meet with local officials, schools, clubs, associations and customers to get the word out about protecting and improving our watershed.”

JUSTIN BRAME

STORMY WEATHER

The team has faced its share of bad weather over the years. A historic flood in 2011 and a snowstorm in 2015 presented major challenges. “Last winter, we received 38 inches of snow from one storm,” Brame recalls. “I scheduled two operators to stay at the plant and rotate shifts to keep the plant

covered.” The operators ended up staying at the plant for four days. Fortunately, the facility keeps cots and emergency food and drink on hand.

“We have a very dedicated staff, and they take a lot of pride in what they do,” says Brame. “It seems like a job at this plant is a stepping stone to advancement. I was an operator here and then moved into management.” Several

The team at the G.C. Smith Treatment Facility and Operations Center includes, front row, from left, Richard Bitting, Branden Leaphart, Justin Brame, Joe Woodward and Terry Patrick; back row, Devin Cook, Michael Barger, George Cradic, Robert Troutman, Toby Jones and Dale Skinner.



ABOVE AND BEYOND

Operators at the G.C. Smith Treatment Facility and Operations Center have weathered some serious storms. In September 2011, Tropical Storm Lee dumped 13 inches of rain on the Hershey area, which caused Swatara Creek to overflow.

Before the heaviest rain arrived, teams from plant owner Pennsylvania American Water began preparing for the worst. They reviewed flood emergency plans, removed critical equipment from low areas, placed sandbags around vulnerable infrastructure, scheduled emergency staff, and filled water storage tanks to the maximum.

The rising creek shut down two of three raw water pumps at the intake building, seriously reducing the source water supply. Normal access to the building was impossible, and the only way to restart the pumps was to enter through the roof.

A helicopter was dispatched to transport personnel, sandbags, pumps and other equipment to the roof. When the crew entered the

building via a ladder from the roof hatch, they found the water rising and flowing onto the operating floor.

To protect the electrical switch gear, they set up evacuation pumps and built a cofferdam. Joe Woodward, Pennsylvania American Water field operations manager, and Gary Witmeyer, production superintendent, spent the night on the roof to monitor water levels and keep the pumps running.

By this time, Swatara Creek was at 26.8 feet, far above the flood stage of 7 feet. The next day, the creek began to recede. Team members continued to monitor the situation from the roof until the water receded enough to allow access through the intake building door.

Amazingly, the treatment plant’s finished water quality was never compromised. No boil water advisories were required, and water service continued uninterrupted, thanks to the operators and other staff members who worked around the clock to stabilize and protect the water system.

operators have moved on to management positions over the last few years.

Some staff members who assisted in winning the Presidents Award have since moved up within American Water: George Cradic, fleet manager in the Mechanicsburg office; Robert Troutman, production supervisor at the West Shore plant in New Cumberland; Toby Jones, backflow specialist at the Hershey plant; and Jon Prawdzyk, superintendent in the Mechanicsburg office.

Besides Brame, who has been at the plant for five years, operators include Michael Barger, Richard Bitting and Terry Patrick, a 34-year veteran. The plant is staffed with one operator for 12 hours each day. The operators work one week on, one week off. Barger also handles maintenance, as does 25-year veteran Dale Skinner, maintenance services specialist.

The operators are responsible for all process control decisions, sample collection and laboratory testing, and routine maintenance. Brame says their greatest strength is the ability to self-motivate: "They see what needs to be done without my telling them. They go above and beyond, and this sets them apart."

FUTURE CHALLENGES

Although the Hershey area is growing fast, a 2011 study showed that the plant's 11 mgd capacity will meet population needs well into the future. Brame does expect some challenges, though.

"Water treatment is different than it was 20 years ago, with population increases, stormwater runoff, and the need to keep up with new rules and regulations that seem to change every year," he says. The plant team continues to monitor for emerging contaminants in the source water and adjusts treatment techniques and technologies to suit changing conditions.

Replacing employees who move up or retire is a concern. Says Brame, "In 1970, many young people entered this industry, and now almost 50 years later they are retiring. Over time, operators gain a lot of knowledge. When troubleshooting a problem, for example, they can say, 'I've seen that before and I know how to fix it.'" That institutional memory isn't easy to replace.

Perhaps the biggest test will be maintaining the Presidents Award. "The key is to not become complacent, but to ask ourselves every year how we can improve and become more efficient," says Brame. "It is not an easy award to get, so maintaining it is important." tpo



Justin Brame,
production
supervisor

“We have a very dedicated staff, and they take a lot of pride in what they do. It seems like a job at this plant is a stepping stone to advancement.”

JUSTIN BRAME

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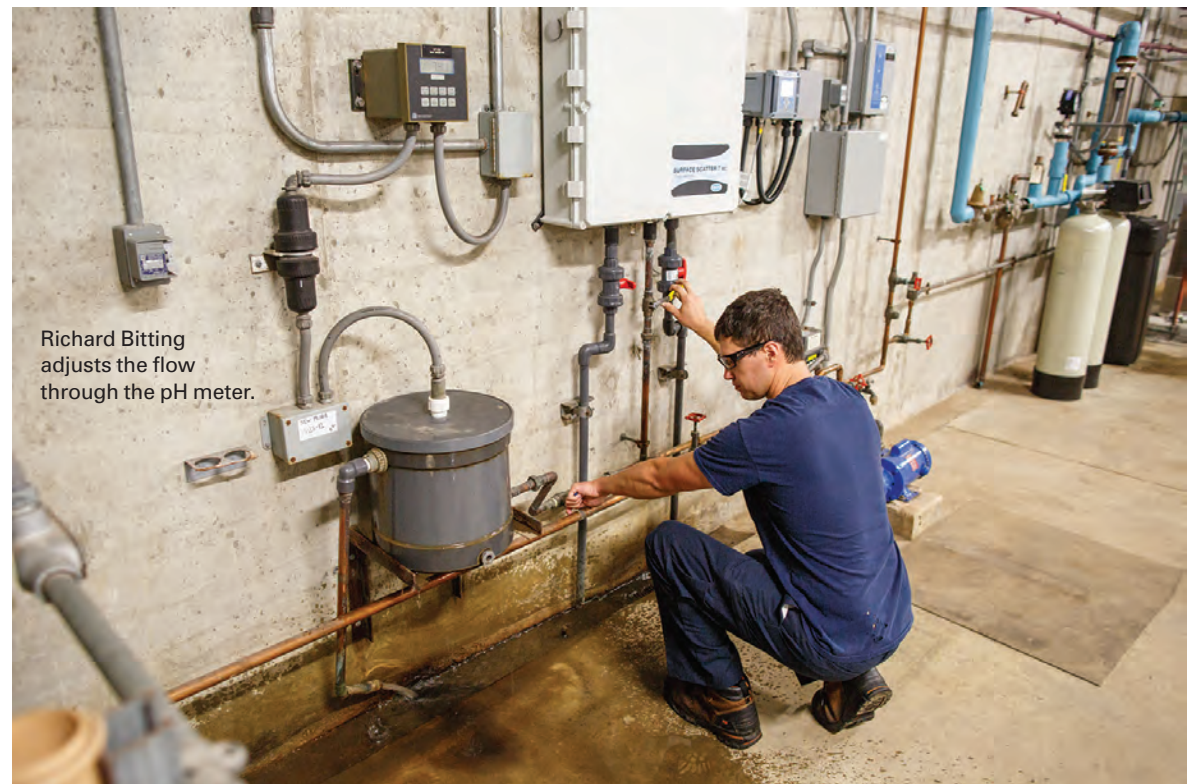
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Supporting Sound Decisions

NEW HMI/SCADA SOFTWARE IS DESIGNED TO HELP PLANT OPERATORS ACCESS CRITICAL INFORMATION FASTER AND TAKE THE MOST APPROPRIATE ACTIONS

By Ted J. Rulseh

SCADA systems and human-machine interfaces help water and wastewater operators keep track of trends around complex facilities and get quick access to data that helps them make sound decisions.

But can these monitoring and visualization systems themselves become so complicated that operators can't follow trends or notice anomalies as quickly and easily as they would like?

GE Digital addresses that concern with a new-generation automation software that goes beyond traditional approaches to offer decision support capability.

New GE HMI/SCADA software aims to provide comprehensive monitoring and visualization capability, along with work process management, analytics and mobility features. The solution is based on International Society of Automation high-performance design principles to help operators troubleshoot faster, reduce waste and increase productivity.

The technology is designed to help operators spend less time navigating, find critical data faster and resolve alarms more successfully. It also aims to enable HMI/SCADA systems to be built out more easily and in less time. Matt Wells, general manager of automation software with GE Digital, talked with *Treatment Plant Operator* about the technology.

tpo: What market observation led to the development of this technology?

Wells: What we look at is the performance of the people using our software, in particular facility operators. Most of the time when people construct HMIs, it's just a plant engineer or a system integrator defining the user experience for the operators. We took a step back and looked at how this affects operators, and we saw a lot of opportunity to improve operators' ability to

make decisions. Our new HMI is geared around simplifying how to construct an efficient HMI and facilitating how operators use that efficient HMI.

tpo: How does this system provide information that helps operators make sound decisions?

Wells: First, we incorporate standard operating procedures. Every plant has its control room, but when it's time to act it's still a mental process for operators to look at a laminated card to follow a procedure, or remember it from a training meeting. So we embed workflows into the HMI to facilitate execution of SOPs. That increases the quality of performance.

tpo: What other characteristics support better decision-making?

Wells: We use intelligent alarms that leverage analytics running in real time to provide complex indications. For example, we can have analytics looking at a pump's efficiency. If it is falling off the efficiency curve, the system can send an intelligent alarm calling on the operator to make a control change and get the pump back on point.

tpo: What is the difference between an intelligent alarm and an ordinary alarm?

Wells: Most alarms are simple limit-based alarms, such as for pressure or temperature, but an operator may be looking at several points in order to determine the state of that asset. What we do is apply complex algorithms to create a single unified alarm that helps the operator understand that something needs to be done.

tpo: What is the key benefit of the mobility features in this solution?

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Wells: We first launched our mobility product with the intent to mobilize operators — to enable them to pick up a tablet, move around the plant and still be able to observe and even control the plant's performance remotely. In reality, we found the greatest value is for the people who support the operators. In any plant there are one or two go-to people whom operators call when they can't figure something out. Now, when those folks go home and they get a call from an operator, they can pull out their iPad, look at the data, diagnose the problem, and give the operator guidance over the phone, instead of driving to the plant. That saves on downtime.

tpo: What is being done to simplify the creation of the HMI itself and to help operators more easily monitor the plant and access data?


Wells: We are creating a web-based HMI that works in the context of a model. The idea is to use simpler graphics and different levels of graphics. The top-level overview screens should be straightforward views of key performance indicators (KPIs) presented in context. That reduces the effort required to see what's going on in the plant and react to it in real time.

tpo: Can you sketch a scenario of how this might help an operator in a facility?

Wells: Consider a large water distribution network. Typically, operators in a control room see a large screen with a topographical view of the network — lines going everywhere, multiple pressure readings. And they need to look at multiple data points to evaluate the network's health. Instead, we facilitate creation of a graphic that shows only the KPIs and shows them in consolidated objects. Now operators can see at a glance whether the network is healthy. And if something looks out of spec, they can click on it and instantly see whether there are any alarms, and quickly view any trends.


“ We took a step back and looked at how this affects operators, and we saw a lot of opportunity to improve operators' ability to make decisions.”

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tpo: What happens if there is an alarm?

Wells: An alarm can trigger a workflow that helps correct the problem. That workflow could contain embedded knowledge from veteran process experts who have moved on or retired — a way of capturing that institutional memory. So the alarm is triggered and the workflow provides decision trees that can help operators in step-wise fashion figure out how to resolve it.

tpo: How does this technology affect the cost of creating and deploying an HMI?

Wells: Our system simplifies the creation of an efficient HMI. To help engineers create the right user experience, we provide predefined smart objects and templates designed using efficient HMI concepts. Standard layouts and cards, such as trends, alarms, alarm summaries and KPIs, are available out of the box. That speeds up configuration and improves users' situational awareness. The more we talk with customers, the more they gravitate toward this approach. They recognize that the cost to maintain highly customized systems is becoming more and more burdensome, and they want to reduce that.

tpo: Are there any other significant benefits you would like to mention?

Wells: We've employed native HTML5 web technology in the construction of our HMI, and that greatly simplifies deployment, especially within water treatment plants. Access to data is becoming more and more critical, and many customers want the engineers, the plant manager, and people off site to see the exact same screens the operators see. By leveraging HTML5 technology, we can facilitate that. We can run on almost any kind of device. **tpo**

Reuse, Recovery and Energy Management

By Craig Mandli

Asset Management

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Hach Mobile Sensor Management provides clarity through easy access to crucial information, helping manage processes and being proactive in maintenance. It guides the user through actionable sensor information, helps to align process and laboratory measurements, and provides simple maintenance instructions. The web-based software provides access to enrolled



Mobile Sensor Management from Hach

Hach analytical instrumentation through any internet-enabled device with a standard browser. All access is controlled by secure authentication. The status information provided gives an overview of the performance of each individual analytical instrument. It also provides specific information about upcoming maintenance activities for each instrument. Maintenance procedures can be started easily from the dashboard of the software. Interactive and step-by-step guidance through the various maintenance steps allows for quick and accurate execution. **800/227-4224; www.hach.com**

PHOENIX CONTACT ROGOWSKI COIL

Rogowski Coil solutions from Phoenix Contact provide a current-transformer alternative that can measure alternating currents in eight ranges, from 0 to 100 to 0 to 4,000 amps. Unlike traditional split-core CTs, they are flexible, lightweight, and can provide eight DIP switch-configurable CT ratios with just one part number. The Rogowski principle of operation eliminates dangerous open-circuit voltages and the need for CT shorting blocks. The measurement coil is designed as an open-ended loop, allowing the coil to be installed quickly on an existing conductor. There are no tools to handle and no hardware to lose, thanks to a busbar mounting clamp and a simple bayonet latch on the coil housing. There are two available transducers that connect to the measurement coil — a 0-1 amps CT output or a standard 0-10-volts 4-20mA analog output. The outputs are universal and can be integrated with equipment from virtually any manufacturer. **800/322-3225; www.phoenixcontact.com**



Rogowski Coil solutions from Phoenix Contact

Biogas

AERZEN BIOGAS BLOWER

Biogas Blowers from Aerzen USA are designed for digester gas applications. They ensure process safety and reliability, and are available with intake volume flows of 50 to 1,500 icfm and positive pressure up to 15 psig. They meet the European requirements for ATEX Directive 94/9/EC as well as North American requirements for NEMA Class 1, Group C and D, Division 1 areas. They offer gastight sealing of the drive shaft; a combined sealing system including a floating ring and lip seals, and balanced neutral chamber with gas leakage returned to suction; a Chem-coat fluoropolymer internal coating for corrosion protection; base support with integrated discharge silencer (explosion-proof up to 20 bar); explosion-proof acoustic hood fan; flexible machinery mountings; a V-belt drive system with automatic tensioning, antistatic belts and spark-proof guard; suction silencer designed for operating over pressure 1.1 bar g; a non-return flap for installation between two flanges; and expansion joints with stainless steel liners. **610/380-0244; www.aerzenusa.com**



Biogas Blowers from Aerzen USA

JDV EQUIPMENT CORPORATION DOUBLE MEMBRANE BIOGAS HOLDER

The Double Membrane Biogas Holder from JDV Equipment Corporation is easy to install, has low up-front capital costs and requires low operating capital. Its design allows for variable biogas storage within the inner membrane at constant pressure during gas production and utilization, while the air-inflated outer membrane provides gas pressure and protection. The outer membrane is constructed of a high-tech cross-woven fabric, coated with PVC and UV ray protection. Sensors monitor the volume of gas present, giving operators full control of optimizing the utilization of biogas. Storing digester biogas can eliminate flaming from the



Double Membrane Biogas Holder from JDV Equipment Corporation

digester, and can help reduce or completely eliminate the need for electric grid power when generators and/or hot-water boilers are incorporated into the facility design. **973/366-6556; www.jdvequipment.com**

Drives

DANFOSS VLT DRIVES MIDI DRIVE FC 280

The Midi Drive FC 280 from Danfoss VLT Drives offers software features like sleep mode with boost, integrated PID, flying start, broken belt, compressor start, and the ability to do positioning. It is ideal for precise and efficient motor control, allowing users to use an efficient permanent magnet or induction motor to meet the application need. With Modbus RTU standard on all products and the dual port EtherNet/IP, PROFINET, PROFIBUS and CANopen choices designed as part of the control card, it can help reduce the cost of a system, communicate faster, and add more efficiency. It has coated, printed circuit boards, operating ability in a 113-degree F ambient climate at full load with no derating, a built-in brake chopper and a DC choke for improved harmonic performance, reduced input currents, and better protection against line fluctuations and voltage spikes. **414/514-1255; www.danfossdrives.com**



Midi Drive FC 280 from Danfoss VLT Drives

High-Efficiency Motors/Pumps/Blowers

CRANE PUMPS & SYSTEMS BARNES SOLIDS HANDLING SERIES

The Barnes Solids Handling Series from Crane Pumps & Systems is a municipal-quality line of submersible nonclog pumps with 3- through 10-inch discharge sizes and horsepower availability from 2 to 150. The pumps deliver clogging resistance by providing three impeller styles to match varying solids loads. They have a plug-and-play power cord that eliminates the need to pull power cords out of conduit in order to work on the pump. They provide flows up to 4,000 gpm and heads to over 240 feet, including low-flow, high-head pumps with steep performance curves designed for low-flow connections to existing pressure mains. **937/778- 8947; www.cranepumps.com**



**Barnes Solids Handling Series
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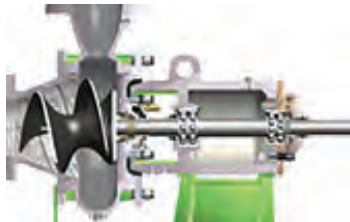
**S Series peristaltic pump from
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Built to NEMA 4X for demanding applications, the S Series peristaltic pump from Stenner Pump Company interfaces with process control systems through multiple programmable inputs and outputs. Operational modes include scalable, invertible 4-20mA or 0-10-volts DC inputs, Hall effect (frequency), PPM feed, pulse, timer and manual. Users can program up to three output relays in response to conditions

such as tube leak, motor drive fault, process alarms or transfer to a backup pump. The tube's life expectancy can be programmed to initiate a tube change indicator on the operating display when the set runtime is reached. Tube replacement without tools is standard with the QuickPro pump head. The totally enclosed pump is outdoor rated and the brushless DC motor has ball bearing support. Listings include NEMA 4X, NSF 61 & 372, cULus indoor/outdoor and CE IP65. **904/641-1666; www.stenner.com**

VAUGHAN COMPANY TRITON

Triton screw centrifugal pumps from Vaughan Company handle thick biosolids, large or stringy solids, shear-sensitive fluids, and delicate or highly abrasive materials. They have non-overloading power characteristics, heavy-duty power frames and a flushless mechanical seal. A water-flushed mechanical seal or packing is available. **888/249-2467; www.chopperpumps.com**



**Triton screw centrifugal pumps
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Water/Wastewater Reuse

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H2Zero Backwash/Recycle Systems from AdEdge Water Technologies help conserve water by storing and treating contaminated backwash water from filtration and treatment systems. Systems can be customized

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**H2Zero Backwash/Recycle
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- Aerzen USA Biogas Blower
- JDV Equipment Corporation Double Membrane Biogas Holder

Drives

- Danfoss VLT Drives Midi Drive FC 280

High-Efficiency Motors/Pumps/Blowers

- Crane Pumps & Systems Barnes Solids Handling Series
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The completed operations building at the Lake Whitney Water Treatment Plant.



Green roof foliage provides year-round blooming on the completed operations building.

PHOTO COURTESY OF CHRIS McVOY

PHOTO COURTESY OF MICHAEL VAN VALKENBURGH ASSOCIATES

Land That Tells a Story

COMMUNITY INVOLVEMENT HELPED A CONNECTICUT WATER AUTHORITY CREATE A UNIQUE BUILDING AND A LANDSCAPE WITH EDUCATIONAL AND FUNCTIONAL VALUES

By Jeff Smith

The story of how a community’s drinking water is collected and processed has been cleverly designed into the landscape and buildings at the award-winning Lake Whitney Water Purification Plant owned by the Southern Connecticut Regional Water Authority.

A functional landscape that replicates a watershed and the stages of water treatment, a 28,000-square-foot green roof at nearly ground level, and a uniquely designed operations building are all located on 14 acres next to a residential area in New Haven, Connecticut.

ALL INTEGRATED

The landscape is at the forefront of the design and includes six distinct areas, each representing a segment of the treatment process in the plant.

An elevated area behind the plant, representing a mountain as a water source, allows water to pass through each discrete landscape area. Swales and undulations direct rainwater through small meadows, fields, valleys, grassy mounds and vegetated areas, ending in a wetland for filtering, and then a holding pond before recharging the water table.

“The goal of the landscape was not only to educate but also to provide a marsh-like area that controls runoff,” says Jim Hill, operations special projects manager for the authority.

The green roof, the largest in the state, has 21 domed skylights that shed light into the plant, which is 70 percent below grade. Visitors can use the

skylights to observe the treatment process. The green roof is designed for low maintenance and requires no mowing or irrigation.

Vegetation on the roof was chosen to provide year-round blooming along with the desired foliage height and texture. Nearly 900 pounds of several species of sedum cuttings cover the roof. Some 7,000 flowering perennials were planted as plugs and cover various roof areas. Together, the flowering plants, leafy succulents, creeping herbs and shrubs provide aromas typical of a mountain meadow.

“The goal of the landscape was not only to educate but also to provide a marsh-like area that controls runoff.”

JIM HILL

UNIQUE BUILDING

The most striking feature of the 15 mgd facility is its 360-foot-long operations building, shaped like an inverted drop of water. Clad in shingles that cover 190 tons of structural steel, the long keyhole-looking building with its dual-curved façade and abundant glass also houses the laboratory, conference room, and exhibition lobby.

The parcel of land surrounding the facility is available from dawn to dusk as an outdoor park for residents. Paved pathways meander through the park, and strategically located benches allow visitors to rest at popular observa-



PHOTO COURTESY OF CHRIS McVOY

View from the front interior of the operations building at the Lake Whitney plant.

tion points and watch native and migrating birds and a variety of wildlife. The planting schemes for the park were modeled after an alpine meadow with rock outcroppings to minimize the impact of foot traffic. As with the green roof, all use native grasses and shrubs that require no fertilizers or pesticides, reducing the facility's downstream impact. Meadow-like habitat for birds, butterflies and small mammals was created to achieve the sustainable, functional and aesthetic objectives of the design. Eliminating discharge of stormwater into the nearby Mill River was also critical. Rather than using drains and piping, the drainage system is

managed through the landscape. Runoff from the green roof and the entire park area collects in the pond for return to the water table. "Stormwater abatement on site was important to us and became a critical requirement of the landscape design," says Hill.

COMMUNITY PROJECT

The facility was completed in 2005 and was built on the site of a water plant that had been decommissioned in 1991. To be a good neighbor, the authority involved residents in setting the design objectives. The design firm of Michael Van Valkenburgh Associates received the 2010 American Society of Landscape Architects Design Honor Award, and building architect Steven Holl Architects won the 2007 Top Ten Green Projects Award from the American Institute of Architects Committee on the Environment.

Hill says the original intent was to allow students and visitors to see the water treatment process from within the plant. That plan changed after the tragedy of 9/11, and visitors now are allowed inside the facility by appointment only.

The Lake Whitney facility, one of four owned by the authority, serves nearly 430,000 people in 15 towns. Its environmentally sensitive design integrates landscape, infrastructure and striking architecture in a public park. Says Hill, "The entire site serves as a state-of-the-art model for effective water stewardship through the integration of best management practices of green roof, vegetative swales and wetlands." **tpo**

Share Your Ideas

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

case studies

REUSE, RECOVERY AND ENERGY MANAGEMENT

By Craig Mandli

Cloth media filters assist city in meeting its reuse goals

Problem

The Orange County South Water Reclamation Facility (North Plant) in Orlando, Florida, uses reclaimed water to irrigate citrus groves and golf courses, recharge wetlands for endangered species and the freshwater aquifer, and provide cooling water to the Orlando Utility Commission's Stanton Energy Center. The facility began operation in 1957 with a 1 mgd trickling filter treatment system, and needed to upgrade to accommodate the community's growth and increasingly stringent effluent requirements.

Solution

In October 2003, three of the plant's existing traveling bridge sand filters were retrofitted using eight 12-disc-package **AquaDisk cloth media filters** from **Aqua-Aerobic Systems**, which provided a 60 percent increase in average hydraulic capacity on the basis of flow per square foot of filtration area. The cloth media filters provide the plant additional loading capacity with a smaller footprint. The pile cloth filter media allows higher hydraulic and solids loading rates than conventional media, resulting in up to 75 percent less land requirement.

RESULT

The eight filters are designed to treat 29.75 mgd (avg) and 59.56 mgd (peak). They will accommodate future design capacity expansion from the current 30.5 to 43.0 mgd. They also reduce TSS to required



reuse quality levels of 5 mg/L and prefilter the effluent before it goes through chlorine treatment in order to provide 100 percent reuse of the plant's effluent. **815/654-2501; www.aquadiskfilter.com. tpo**

WWEMA/Boenning Leading Demand Index builds momentum

The Water and Wastewater Equipment Manufacturers Association and Boenning & Scattergood released the 2016 third-quarter WWEMA/Boenning Leading Demand Index, which rates funding conditions for municipal water and wastewater projects. The index increased slightly in the third quarter, reversing a recent downward trend. The index reports that water and wastewater utilities are continuing to expand payrolls. Also, water and wastewater equipment demand has improved, water stocks rebounded sharply in the third quarter, ductile iron pipe prices reversed a second-quarter slide, and the housing market remains a wild card that could complicate recovery.

Aqua-Aerobic Systems to provide Nereda granular activated sludge process

Aqua-Aerobic Systems and Royal HaskoningDHV signed an agreement making Aqua-Aerobic Systems the exclusive provider of the Nereda Granular Biomass Treatment System in the U.S. Aqua-Aerobic Systems will build a full-scale Nereda granular activated sludge process at the Rock River Water Reclamation District in Rockford, Illinois. Nereda replicates the effluent quality of an enhanced BNR facility without the use of chemicals by using aerobic granular sludge technology. The reduced footprint and low energy requirement provide a competitive alternative for high-performance plants.

Joint venture brings renewable fuel source to CHP

TTcogen LLC — a joint venture affiliate company of Tecogen and TEDOM — offers a biogas-powered line of CHP equipment. From 35 kW to multi-megawatt units, TTcogen's clean power products from TEDOM meet the needs of facilities of almost any size.

Ovivo signs exclusive licensing arrangement with DC Water

Ovivo has signed an exclusive licensing arrangement with DC Water for the utility's post-aerobic digestion process. Marketed under the brand DigestivorePAD, this approach places an aerobic digester after an anaerobic digester, providing increased volatile solids destruction, enhanced nitrogen and phosphorus removal, and improved dewatering. The technology will combine DC Water's years of collaborative research and open innovation with Ovivo's experience in sludge stabilization at high solids concentrations using anaerobic and aerobic digestion.

Lystek organic material recovery center services Bay Area

Lystek International is increasing operations at its new 150,000-ton organic material recovery center at the Fairfield Suisun (California) Sewer District. In addition to a base volume of 14,000 tons per year from FSSD and commitments from other Bay Area agencies, Lystek entered into a four-year service contract with Central Marin Sanitation Agency for the diversion and treatment of its biosolids. The agreement allows CMSA to diversify its biosolids management program and divert over half of this volume to the new facility, where it will be used to produce LysteGro, a Class A EQ product that is high in organic matter and nutrients and is recognized by the California Department of Food and Agriculture as a licensed fertilizer.



Huckaby joins Sprayroq as director of business development

Jeremy Huckaby has joined Sprayroq as the director of business development. Huckaby will address the needs of a maturing trenchless technologies market and help expand applications for the company's products. Huckaby has a background in coatings, including 12 years with commercial and industrial coatings contractors, architects, engineers, owners and city decision-makers for Sherwin-Williams. He also has experience in surface preparation and commercial/industrial coatings recommendations for various substrates.



Jeremy Huckaby

WERF announces 2016 Paul L. Busch Award winner

The Water Environment & Reuse Foundation awarded Dr. Jeremy S. Guest, assistant professor in the Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, with the 2016 Paul L. Busch Award. With the \$100,000 prize, Dr. Guest seeks to link fundamental research on microalgal metabolism and biochemistry to industry applications at water resource recovery facilities. His proposed research will develop technologies that leverage native phototrophic eukaryotes (microalgae) for biological nutrient recovery from wastewater.

U.S. Boiler promotes Massey to director of sales

U.S. Boiler Company announced that Chris Massey, former regional sales manager — N.Y. Metro Region, has been promoted to director of sales — eastern states. Massey will direct sales activities of U.S. Boiler's sales representatives from Maine through central New Jersey. Massey has 26 years' hydronic sales experience.



Chris Massey

Jett named controller for Washington County Service Authority

Melinda Jett has been named controller for the Washington County Service Authority in southwest Virginia. Jett will direct WCSA's financial affairs and serve as a member of the capital improvement funding, planning and leadership teams. She has more than two decades' experience, and she comes to WCSA from Highlands Union Bank in Abingdon, Virginia, where she served as director of internal audit for 10 years. **tpo**

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3. SINGER VALVE LEVEL CONTROLLER

The LCP-TP single-process level controller from Singer Valve complements Singer's single solenoid-operated/override control valves and sensor. The controller is programmed with customized level control algorithms and offers local control via interactive display or remote control via 4-20mA or Serial Modbus SCADA communication. It has AC or DC external power options and contains 24-volts DC internal power supply for PLC and field sensor power. It has an IP67 enclosure rating and is UL-certified, built with surge protection as well as over-circuit protection. It is capable of on/off level control using input from level switches or 4-20mA level transmitters. **888/764-7858; www.singervalue.com**

4. FLYGT - A XYLEM BRAND SUBMERSIBLE PUMP

The 3000 Series electric submersible pumps from Flygt - a Xylem brand, provide a rental option for temporary bypass pumping projects. The small and mid-sized pumps cover a large performance range and are classified as low-, medium- or high-head pumps. The nonclog pumps work well for solids-bearing liquids. The submersible pumps are a cost-effective rental option for lift station repairs and plant upgrades. Hoses, HDPE piping, generators, high-tech monitoring and control systems are also available from any Xylem rental location. **855/995-4261; www.xylem.com/pumping**

5. ENDRESS+HAUSER MICROPILOT FREE-SPACE RADAR LEVEL TRANSMITTERS

Endress+Hauser's FMR10 and FMR20 free-space radar level transmitters measure liquid levels in storage tanks, open basins, open channels, weirs and canal systems. The FMR10 measures up to 16 feet with 0.2-inch accuracy, while the FMR20 measures up to 66 feet with 0.08-inch accuracy. The FMR10 has a 4-20mA output and is Bluetooth-enabled. The SmartBlue app provides secure communication with the

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water: product spotlight

Plug valve a fit for multiple applications

By Craig Mandli

The **Model 54-4MJ Flo-E-Centric plug valve** with Mechanical Joint (MJ) connections from **Flomatic Corporation** is a heavy-duty service valve with a wide industrial application range. While it is primarily designed for the potable water and wastewater markets, other applications include handling a variety of liquids, slurries and gases, including air and some chemicals.

“With its round port, globe body eccentric plug design, it is a natural for easily passing and controlling flow with solids or slurries in wastewater systems, or can be used for feedwater in potable applications,” says Mike Jones, municipal/industrial product manager for Flomatic. “It is available in both flanged and MJ end connections.”

The round-port eccentric plug valves are designed in compliance with ANSI/AWWA C517-09. They are available from 2 through 12 inches, with a spherical full-ported seat/plug design, and 14 through 24 inches with a rectangular full-ported seat/plug. The valve body and top-work are epoxy-coated inside and out. The Mechanical Joint valve-end connection meets the requirements of ANSI/AWWA C111/A21.11. All fasteners and washers are stainless steel, making them suitable for water or wastewater service.

“It’s a product we have been considering and researching for several years as an addition to our wastewater valve offering,” says Jones. “As well as functional design features, we especially looked at the automation capability that would allow us to incorporate our FCEL Electric Actuator platform.”

The Flo-E-Centric spherical plug-forming circular seat and plug face are offset from the shaft centerline to provide tight shut-off and wear resis-

tance. The specially designed plug moves in and out of the seat with minimal contact, resulting in low operating torque.

“The Flo-E-Centric automated plug valve as a part-turn, 1/4-turn valve provides a great automation value package,” says Jones.

The Model 54-4MJ has a totally enclosed and sealed worm gear actuator with position indicator for above-ground service, and externally adjustable open and closed stops. The worm segment gear is ASTM A536 Grade 65-45-12 ductile iron with a precision bore and keyway for connection to the valve shaft. Bronze radial bearings are provided for the segment gear and worm shaft. Alloy steel roller thrust bearings are provided for the hardened worm. All gear actuators are designed to withstand, without damage, a rim pull of 200 pounds on the hand wheel and an input torque of 300 ft-lbs for nuts. Jones says the response from the industry has been positive so far.

“We’ve had a very good response,” he says. “It is a product line we are very excited about because of the benefits it offers to the water and wastewater industry.” **800/833-2040; www.flomatic.com**



Model 54-4MJ Flo-E-Centric plug valve from Flomatic Corporation

transmitter to configure or view envelope curves. The FMR20 has a 4-20mA HART smart output for optional remote configuration. Hermetically sealed wiring and fully potted electronics eliminate water ingress in harsh environments. **888/363-7377; www.us.endress.com**

6. SCHNEIDER ELECTRIC AQUIS 7.0

Aquis 7.0 from Schneider Electric is an advanced software for water distribution network management that reduces operation and energy costs by providing behavior forecasts for water networks. Improvements include enhanced hydraulic engine management, faster load and save time of model files, enhanced find functionality, faster master/operator communications for improved collaboration, extended system log facilities, and improved display of control mode of pumps and valves. **888/778-2733; www.software.schneider-electric.com**

7. APPLETON GROUP HAZARDOUS-AREA PLUGS AND RECEPTACLES

UPR Series plugs and receptacles from Appleton Group simplify specification in hazardous locations. A UPR plug can also be used safely in a standard, nonhazardous area when connected to an interlocking nonhazardous receptacle. Compact, lightweight and corrosion resistant, UPR Series plugs and receptacles are ideal for portable or stationary electrical equipment, such as industrial lighting systems, heaters, conveyors, motor generators and pumps. The 16- and 32-amp models are constructed of nonmetallic polyamide for corrosion resistance, and provide safety features such as color coding, mechanical interlock and a keyed design. A lockable external switch complies with IEC 60309-1,

and keeps the receptacle locked while giving visual status confirmation. **800/621-1506; www.appletonelec.com**

8. CARUS POTASSIUM PERMANGANATE TABLETS

Cairox CR Potassium Permanganate tablets from Carus are designed to treat hydrogen sulfide odors in municipal wastewater when the use of feed equipment is not practical. They can be easily deployed in polyester mesh bags in remote sites, lift stations and manhole applications. Controlled release technology allows the tablets to begin reacting with hydrogen sulfide and other odor-producing compounds in seconds. Tablets are passive, prevent sulfide-based corrosion and eliminate the health risks associated with hydrogen sulfide exposure. **800/435-6856; www.caruscorporation.com**

9. ELECTRO-CHEMICAL DEVICES UNIVERSAL ANALYZER SYSTEM

The modular X80 universal transmitter and S88 intelligent sensors from Electro-Chemical Devices include a sealed barrier design with heavy-duty construction for reliable measurement of pH, ORP, DO, turbidity and conductivity. The Model X80 is available in single- or dual-channel for continuous measurement with standard Modbus or optional HART digital communication and three optional alarm relays. The Model X80 communicates with any Model S88 sensor, automatically configuring menus and display screens to the desired measurement parameter. The X80 and S88 include 316 stainless steel housing and a large, sealed display. **800/729-1333; www.ecdi.com tpo**

(continued)

wastewater: product spotlight

Flow conditioners improve accuracy of flowmeters in tight quarters

By Craig Mandli

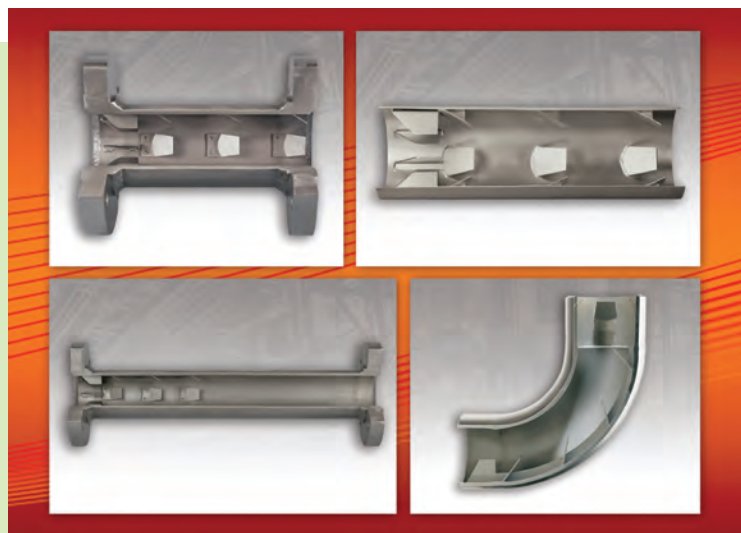
As technological innovations progress, many wastewater plants are becoming increasingly crowded with infrastructure. That's why **VORTAB flow conditioners** make sense for operators who need to add a liquid flowmeter in already crowded equipment areas where there is insufficient upstream straight pipe. The units are designed to ensure a smooth flow profile for accurate measurement by flowmeters, which often must be installed in close proximity to pumps, valves or elbows due to limited plant real estate.

"Most flowmeters typically require a six- to 10-pipe-diameter straight run for an accurate reading, and these flow conditioners can mimic that straight run in a much smaller distance," says Don Lundberg, VORTAB's principal engineer. "In today's plants, operators need to fine-tune their processes. This helps give them exact measurements."

Most liquid flowmeters, including differential pressure, magnetic, ultrasonic and turbines, have sensing technologies that can be significantly affected by asymmetrical flow conditions in the pipe. These conditions degrade measurement accuracy and repeatability. Unfortunately, many plants are rich with bulky equipment and other real estate limitations, which make it difficult to achieve the straight-run distance necessary for accurate liquid flow measurement. Plant upgrades and retrofits can also require adding more flowmeters in locations that are difficult to accommodate without flow conditioning devices because they lack straight pipe run requirements. VORTAB flow conditioners reduce the required upstream straight pipe requirements to only a very few diameters for effective compact meter installation and accurate flow measurement.

"They actually improve efficiencies by not having to install flowmeters on every line," says Lundberg. "They can be installed after a bend, where a tech can actually use a removable, portable meter to check the flow."

The design results in a low-pressure drop, providing significant energy savings and maximizing attainable plant product throughput. Non-recov-



Flow conditioners from VORTAB

erable pressure loss can reduce maximum flow capability in process lines, creating process inefficiencies and requiring greater energy expenditures to move process liquids and gases.

"When you create a consistent flow stream, it helps all the machinery connected to that stream operate at a higher efficiency and last longer," says Lundberg. "That saves a municipality money and saves downtime."

There are four different flow conditioner models to accommodate a variety of process requirements. The Insertion Sleeve can be installed directly into existing pipe or specially designed to meet unique piping configurations. The Meter Run offers a complete, simple pipe section replacement for new and existing piping systems. It is a seven-pipe-diameter spool piece composed of three pipe diameters of flow conditioning internals and a built-in downstream settling chamber. The Short Run offers a simple flow conditioning pipe section replacement for new and existing piping systems. It is a three-pipe-diameter flow conditioning spool piece with just flow conditioning internals. The Elbow, a 90-degree long-radius elbow, has the ability to isolate irregular velocity profiles and swirl normally encountered in a single elbow, but also has the ability to isolate any irregular velocity profiles.

"We believe that we have a model of conditioner that will meet any irregular flow need," says Lundberg. **800/854-9959; www.vortab.com**

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- 8. Carus Cairox CR Potassium Permanganate tablets
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people/awards

For the sixth time in 11 years, the Kansas Water Environment Association honored Gardner's Kill Creek Water Resource Recovery Facility as Wastewater Treatment Plant of the Year in Class 4. The staff includes **Scott Millholland, David Birzer, Steve Duke, Matt Solorio, James Allen** and **Dale Rittinghouse**.

Haberberger, a full-service mechanical contracting firm in St. Louis, received Outstanding Mechanical Installation awards from the Mechanical Contractors Association of Eastern Missouri for its work on Metropolitan St. Louis Sewer District and Mallinckrodt projects. The firm was recognized in the Process Piping — Public Utility category and for Process Piping Large Projects — Public Utilities.

The city of Palestine, Texas, named **Felipe Garcia** deputy director of utilities in the Public Works Department. He has 30 years' experience in water and wastewater systems and will oversee the wastewater treatment plant, water treatment plant and water distribution team.

Jim Spielvogel, a 14-year operator at the Ellwood City (Pennsylvania) Wastewater Treatment Plant, received a Water Environment Federation Ingenuity Award for a hook assembly he created to lift the skimmer assembly on the clarifier's boom arm to prevent the boom arm from icing up during cold weather.

Rick Brocius was named executive director of the Bradford (Pennsylvania) Sanitary Authority.

The Clearfield Municipal Authority in Pennsylvania hired **John Williams** as manager. He had served as assistant manager since 2013.

Zlatko Psenicnik, wastewater treatment plant operator for the village of Skaneateles, New York, retired after 23 years in that position.

The city of Sultan, Washington, hired **Nate Morgan** as a public works field supervisor, **Brian Funk** as wastewater treatment plant manager, and **Sam Dugo** as a utility worker.

Robert M. Henninger was hired to manage the Development Authority of the North Country Wastewater Treatment Plant in Ogdensburg, New York.

Patrick Terrell, operator III at the Westside Wastewater Treatment Plant in Tyler, received the Operator of the Year award for the East Texas Region for cities with a population of more than 10,000 from the Texas Water Utilities Association.

The town of **Winkelman** received the Wastewater Treatment Center of the Year award from the Rural Water Association of Arizona.

The **Tacoma (Washington) Central Wastewater Treatment Plant Flood Protection Project** received a 2016 Public Works Project of the Year award from the American Public Works Association in the Disaster/Emergency Preparedness category.

The **Greer Commission of Public Works Maple Creek Wastewater Plant** received a Gold Peak Performance Award from the National Association of Clean Water Agencies.

The **Clayton County (Georgia) Water Authority** was among 61 entities that received the Water Resources Utility of the Future Today designation from the National Association of Clean Water Agencies, the Water Environment Federation, the Water Environment and Reuse Foundation, and the WaterReuse Association.

events

Jan. 22 – 25

New England Water Environment Association 2017 Annual Conference and Exhibit, Boston Marriott Copley Place. Visit www.newea.org.

Jan. 30 – Feb. 2

Indiana Section AWWA Annual Conference, Marriott Hotel, Indianapolis. Visit www.inawwa.org.

The U.S. EPA announced **Fort Worth, Texas**, as one of nine cities recognized for promoting the WaterSense program. The city earned an Excellence Award for Education and Outreach.

Springdale (Arkansas) Water Utilities received a Commitment Level Award for business excellence from Gov. Asa Hutchinson.

Middlesex Water's **Carl J. Olsen Water Treatment Plant** in Edison, New Jersey, received a 2016 Partnership for Safe Water 15-Year Directors Award of Recognition.

The AWWA Wisconsin Section deemed the **Green Bay Water Utility's** water as the state's best. The city beat Kenosha in the surface water category and then edged out Mayville, champion in the well-water division, to win the honor.

The **Wauwatosa (Wisconsin) Water Utility Department** received AWWA Wisconsin Section awards for its outreach during a Windows Into Wauwatosa tour and for its work on a massive transmission line project.

The Louisville (Kentucky) Board of Water Works named **Spencer Bruce** as the president and CEO of Louisville Water Co. Bruce had been interim president and CEO since January 2016.

WaterReuse Arizona named the Potable Water Reuse Pilot tested in Tucson as the 2016 Project of the Year award winner. A handful of University of Arizona students and faculty contributed to the six-month pilot, which was a collaboration led by **CH2M HILL** and partnered with **Tucson Water** and the **WaterReuse Research Foundation**. The project focused on pilot-testing a method of wastewater treatment to see if it could be used for drinking water.

The Pennsylvania Department of Ecology presented the **Sunland Wastewater Treatment Facility** with a 2015 Wastewater Treatment Plant Outstanding Performance Award. The facility is part of the Sunland Water District.

The **Eastsound Water and Sewer District's Eastsound, Orcas Village** and **Rosario Resort wastewater treatment plants** were recognized by the Washington Department of Ecology for full permit compliance in 2015.

The city of **Cumming Utilities Department** received two awards from the Georgia Association of Water Professionals: a Gold Award for the water production division and a Platinum Award for the Bethelview Road Advanced Water Reclamation Facility.

The Association of Metropolitan Water Agencies presented the **Coachella Valley (California) Water District** with its Gold Award for Exceptional Utility Performance.

The **Thomaston (Georgia) Water Treatment Plant**, operated by Severn Trent - North America, received the Directors Award of Recognition from the Partnership for Safe Water.

TPO welcomes your contributions 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. tpo

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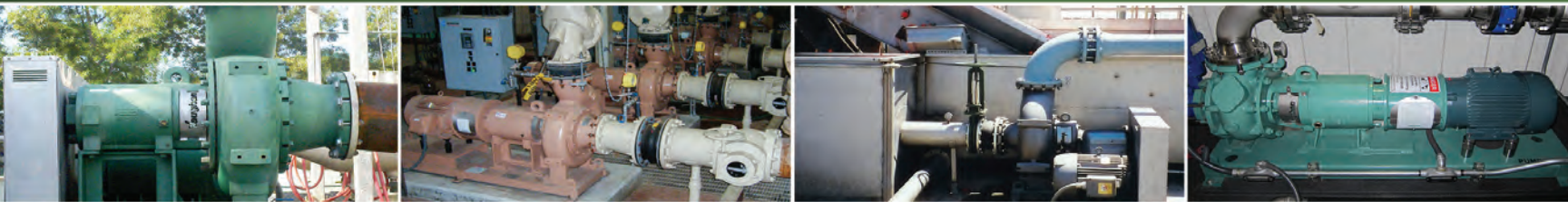
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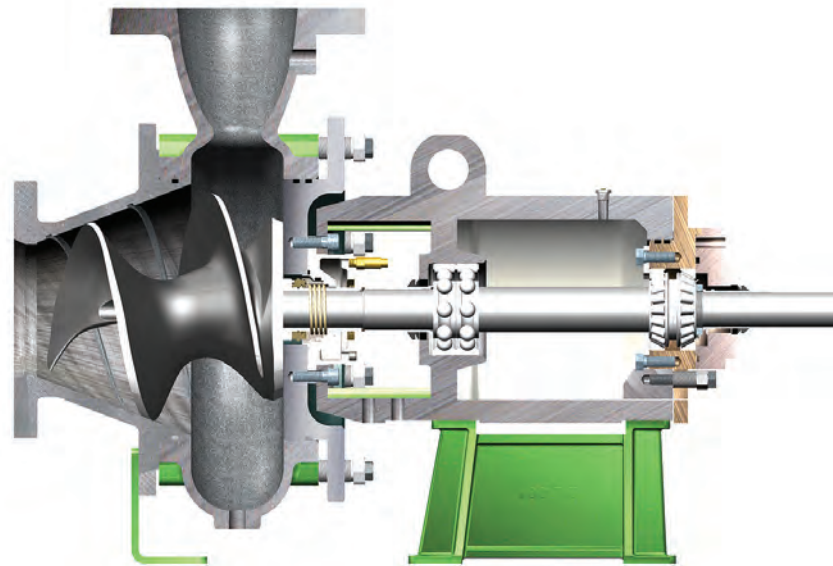
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