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TREATMENT PLANT OPERATOR

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> Kanahou Alana Lead Operator Long Key, Fla.

> > Florida Keys Aqueduct Authority

EXTENSIVE STUDY, CAREFUL OBSERVATION AND DILIGENT TESTING BRING BIG RESULTS FOR A SMALL FLORIDA BATCH PLANT PAGE 24

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November 2014







on the cover

Kanahou Alana knew nothing about wastewater when he became the operator of the Layton Wastewater Treatment Plant on Florida's Long Key. Through extensive study and observation, he fine-tuned the

facility to achieve excellent effluent quality. (Photography by Johnny White)

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"Running Water for Helena" lets residents experience the city's sensitive watershed and learn what's being done to protect and improve it. By Ted J. Rulseh

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By Ted J. Rulseh

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Extensive study, careful observation and diligent testing enable the operator of a small Florida batch plant to exceed design performance expectations. By Ted J. Rulseh

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Published monthly by COLE Publishing, Inc. 1720 Maple Lake Dam Rd., PO Box 220, Three Lakes, WI 54562

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Website: www.tpomag.com / Email: info@tpomag.com / Fax: 715-546-3786

SUBSCRIPTION INFORMATION: A one year (12 issues) subscription to TPO[™] in the United States and Canada is FREE to qualified subscribers. A qualified subscriber is any individual or company in the United States or Canada that partakes in the consulting, design, installation, manufacture, management or operation of wastewater treatment facilities. To subscribe, return the subscription card attached to each issue, visit tpomag.com or call 800-257-7222.

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ADDRESS CHANGES: Submit to *TPO*, P.O. Box 220, Three Lakes, WI, 54562; call 800-257-7222 (715-546-3346); fax to 715-546-3786; or email nicolel@colepublishing.com. Include both old and new addresses.

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EDITORIAL CORRESPONDENCE: Address to Editor, *TPO*, P.O. Box 220, Three Lakes, WI, 54562 or email editor@tpomag.com.

REPRINTS AND BACK ISSUES: Visit www.tpomag.com for options and pricing. To order reprints, call Jeff Lane at 800-257-7222 (715-546-3346) or email jeff(@colepublishing.com. To order back issues, call Nicole at 800-257-7222 (715-546-3346) or email nicolel@cole publishing.com.

CIRCULATION: 72,241 copies per month.

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let's be clear

Hide It? Or Showcase It?

SHOULD TREATMENT PLANTS BE TUCKED AWAY IN CORNERS IN MUTED COLORS? OR PUT ON DISPLAY, DECORATED, CELEBRATED? HERE'S AN ARGUMENT FOR BRIGHT AND BOLD.

By Ted J. Rulseh, Editor



There's a scene in the trailer for the movie *Psycho* where director Alfred Hitchcock gives a tour of a small house. On the way down a hall he pauses, points to a door and says, dismissively, "Bathroom." As in, no need to look in there. And we don't get to.

Sometimes I think communities (OK, not all) similarly dismiss their wastewater treatment plants. They're outside town, on the end of a road, behind a chain link fence, with a humble, well-worn wooden sign out front. Meanwhile, the fire station sits in the middle of town, with nice architecture, a manicured lawn, colorful flowers, neat shrubbery, maybe an antique fire

engine on display, everything spotless.

Now, I get why the fire station needs to be in the city center. I get why the clean-water plant often lies on the outskirts (it discharges to a river, which is at a low point; wastewater flows by gravity). In other words, there are practical and engineering considerations. But why are these facilities often (again, not always) deliberately hidden, nondescript?

REASON TO CELEBRATE

I suppose the reasons are obvious, but that doesn't make them good. In my assorted professional travels and in my time editing this magazine, I've seen some beautiful treatment plants. I've seen others considerably less attractive almost universally well kept but strictly utilitarian in their appearance.

In my humble opinion, every clean-water plant should be beautiful. To allow anything less is to debase the facility's function, the professionals who work there and their importance to the community. The treatment plant, even if away from town, should look as good as the firehouse. How else will citizens see fit to grant it equal stature?

Now, some plants are beautiful out of necessity. A treatment plant is an industrial facility, not naturally compatible with, say, a residential neighborhood. Plants in such areas, or where development nearby is expected, will typically have compatible architecture, attractive landscaping and extensive odor controls.

Doing all that for every plant, including those a couple of miles outside town, or those in industrial areas beside the river, wouldn't be cost-effective. But that doesn't mean those plants can't be beautiful.

IT DOESN'T TAKE THAT MUCH

My basic prescription would be: No matter where it's located, no matter how big or small, treat a clean-water plant

n my humble opinion, every clean-water plant should be beautiful. To allow anything less is to debase the facility's function, the professionals who work there and their importance to the community.

as a source of pride. It's making the river swimmable and fishable. It's protecting public health. It's helping the community prosper and grow. So - not just to operators but to community leaders - I'd say, don't treat it the way Hitchcock treated that bathroom.

Spruce it up. Give the road in a new coat of asphalt. Paint lines in the parking lot. Put up an attractive, colorful sign. Call in a landscape designer. Plant trees. Go crazy with flower gardens. Set out picnic tables. Try a little pond, maybe with a fountain. Put out bird feeders. Grow ivy on the fences. Make the whole setting eye-appealing. Treat it like the community asset it is.

On one of my first visits to a clean-water plant, the manager greeted me with a handshake and said, "Welcome to our plant — we're proud of it." Now imagine people in our cities, while driving visitors around town, telling them, "There's our clean-water plant. We're proud of it." Just as they might for city hall, the library or the firehouse. That would be great, wouldn't it? too





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See It, Appreciate It

'RUNNING WATER FOR HELENA' LETS RESIDENTS EXPERIENCE THE CITY'S SENSITIVE WATERSHED AND LEARN WHAT'S BEING DONE TO PROTECT AND IMPROVE IT

FIRE CHIEF PROJECT

By Ted J. Rulseh

he City of Helena, Mont., had tried public meetings, water festivals and citizen committees to raise awareness of issues facing the Tenmile Creek Watershed, a source of the city's drinking water. To keep the issues in the forefront and to try something different, they came up with, in Don Clark's words, "a crazy idea." Why not organize a run/

came up with, in Don Clark's words, "a crazy idea." Why not organize a run/ walk through the watershed in west-central Montana and let people experience the resources that need protecting? Thus was born the annual, "Running Water for Helena" event, held for the fifth time on July 26.

"We thought we'd have people come out and do a 10-mile run or a 5K run, get some media attention, have shirts made up and offer tours of the treatment plant," says Clark, water and wastewater treatment superintendent in the city's Department of Public Works. "Our city manager, Ron Alles, thought it was a great idea. He approved it right away."

FACING CHALLENGES

The event provides a forum where city officials can address critical issues facing the watershed. One is the cleanup of a U.S. EPA Superfund site, the

We thought we'd have people come out and do a 10-mile run or a 5K run, get some media attention,

have shirts made up and offer tours of the treatment plant." DON CLARK

Upper Tenmile Creek Mining Area, damaged by a legacy of gold, lead, zinc and copper mining from the mid-1800s through the 1920s. Another is the risk of wildfires after the mountain pine beetle killed almost all of the area's lodgepole pine trees.

Participants get an intimate look at the watershed, through which water flows to the city's Tenmile Water Treatment Plant. "We wanted to do something different," says Jason Fladland, water production supervisor. "We wanted people to actually see the watershed. They run or walk on the road right along Tenmile Creek. It's nice scenery, with pine and deciduous trees. The wildlife is abundant — you never know what you'll see out there."

A FULL DAY

On average, about 100 people attend, not all of them runners. The day begins with race registration at 7 a.m. The 10-mile run starts at 8 a.m. "At about 8:15, we have plant tours and educational booths," says Clark. "Then at 9 a.m. we start the 5K."

By 10 a.m. or so, the runners and walkers are coming back in. An elected official delivers a welcome and a few words about the watershed and its importance. Then come talks by representatives of the EPA, the U.S. Forest Service, the Montana Fish and Wildlife Service, and the state Department of Natural Resources and Conservation about projects underway in the watershed.

At about 11 a.m., race winners receive their awards, and all can win door prizes donated by local vendors. Participants receive metal water bottles, on

one side the city logo and on the other the emblem of Helena's "Take Back the Tap" initiative, encouraging people to use city water instead of bottled water.

AMPLE COOPERATION

"The money we receive from sponsors and registration fees, about \$3,000 each year, goes to the Montana Discovery Foundation and the Lake Helena Watershed Group, nonprofit groups that do educational projects in the watershed," says Clark.

"The Montana Discovery Foundation, a nonprofit arm of the Forest Service, is instrumental in helping us organize the event. We solicit volunteers and sponsors and provide funds and other support, without which we wouldn't be able to pull this off." **tpo**





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letters

Preparation does it!

I passed the stringent exam for Connecticut Department of Energy and Environmental Protection (CTDEEP) Class IV Operator on the first try. Phil Bassett was correct: Preparation is the No. 1 way to ensure success with certification examinations ("Passing the Test," September *TPO*).

I consistently studied for the exam for five months. I started by arranging a study location and gathering the materials. I made flash cards for all the key vocabulary words and formulas. I reviewed specific "sewer math" problem sets. Then I went online and gathered more exam-specific materials.

Lastly, I spoke to 15 current operators about their experience with the Class IV exam. I probably should have supplemented the experience with a review course, but my job and family time commitments did not allow it.

While my average score on the three previous operator exams hovered around 90 percent, I received a 72 percent (70 percent is a passing score) on the Operator IV Exam the first time I sat for it last July. I'm sure I made mistakes during the test and should have scored higher, but I think the preparation was the key. The brain requires small bites of information over a long period of time. As the great champions in any field state, "There are no shortcuts to success."

Derek Albertson, MPA Class IV Operator Operations Manager Town of Branford (Conn.) Water Pollution Control Facility

Do the math

Thank you for the article in the September *TPO* magazine. As a 25-year career wastewater person, I appreciated Phil Bassett's approach to test preparation. He is absolutely correct — there is no way to pass the exams from most states without preparing.

Having taken the highest-level test in three states (Maryland, Oregon and Michigan), I can tell you there is no way I could have passed these exams without extended preparation time, particularly Michigan's test, which was the most difficult. One caveat I would add is that wastewater testing success can be bolstered by brushing up on the math.

The math questions, which usually make up at least one-third of these tests, should be guaranteed correct answers with the right preparation. Most of the folks I have worked with have struggled most with this portion of the test, but it doesn't have to be that way. With the preparation workbooks offered by WEF and others, like Lumpy's, (although we found some mistakes in that one), a testing candidate can be ready to guarantee onethird right answers.

During my tenure in McMinnville, Ore., I helped a number of our folks gain the highest certification by working with them through those workbooks. Gaining certification is the primary way wastewater operators can ensure long and successful careers.

Ron Gillenardo Water Pollution Control Center Manager Brookfield, Wis.

Community colleges can help

Many community colleges in eastern Pennsylvania, with support of the Department of Environmental Protection (DEP), offer water/wastewater classes to help those interested in this career to pass the licensing exam. The test fail rates were 80 to 90 percent in Pennsylvania.

I decided to take the course after working in industrial pretreatment for seven years. The Wastewater Operator Certificate Program was taught by instructors from local plants and included many plant tours during the



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course work. This was very informational and connected us with operations that would be looking for future operators. The DEP offered 18 months' experience for 180 hours of class work.

Once in the field, I only needed six months on the job to obtain my state license. I passed the test on my first try after taking the class. It's important to keep the information fresh in your head. I think the biggest struggle is the math parts of the test, since many of the students have been out of school for some time.

I remember one instructor teaching us how to use the formula sheet given to us during the test. That was a huge help in just knowing what numbers to plug in and where to plug them in. I would advise others out there interested in the water treatment field, or those having difficulties taking the test, to look around at your local colleges and see if they offer courses for this. I believe that helped me get to my goal of being a licensed operator. Good luck and study smart!

Mark E. Rightmyer Class A Wastewater Operator Miller Environmental

A rose is a rose

In response to the Letters page in your June 2014 edition, I read with great delight the submission from CJ Kilgore, "Don't muddy the waters." CJ hit it on the head: Where does the name-changing end? With over 20 years in both professions, I don't care what title you throw at me, but I am what I am: a wastewater and water operator. Remember the old saying? A rose by any other name is still a rose.

Gary Boileau T.H. Enterprises Arizona City, Ariz.

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OVERHEARD ONLINE

"After seeing all of these wipes, I'm officially switching back to toilet paper," says Dr. Mehmet Oz after a tour of the Newtown Creek Waste Water Treatment Plant.

Dr. Oz Vows to Stop Flushing Wipes tpomag.com/featured

How to Keep Your Cool in a Crisis

It's raining cats and dogs, and the heavy precipitation has overwhelmed your system. Sewage is overflowing into the local river. The media is knocking at your door, and they want answers. What do you do? Just remain calm and follow these 10 commandments of crisis control. With a little preemptive planning, you'll be well prepared for any media inquiries, and you'll sound

> like the pro that you already are. tpomag.com/ featured



LOOKING FOR ANSWERS Should Microcystin be Micromanaged?

Many water operators are struggling with microcystin. How should it be treated? How will the EPA manage it? And better yet — what can be done to prevent microcystin contamination in the first place? Find out how states across the country are dealing with the toxin, and learn more about the EPA's efforts to provide guidance.

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STORY: Trude Witham PHOTOGRAPHY: Amanda Loman

The Spring Hollow Water Treatment Facility in Salem, Va.

G TREATMENT PLANT OPERATOR

THE WESTERN VIRGINIA WATER AUTHORITY HASN'T

been around all that long, but you'd never know it upon first review.

Formed in 2004 from the former utility departments of the City of Roanoke and Roanoke County, the authority is often cited as a model for regionalism. It uses innovative water management to provide excellent service to 158,000 people.

In 2011, the authority signed an energy savings performance contract with Honeywell to increase meter accuracy, improve leak detection, reduce energy costs and improve carbon dioxide emissions, with minimal impact to its operating budget.

The upgrades will help the authority save more than \$1 million a year in electricity and operating costs and add about \$1.5 million in revenue through increased water meter accuracy. The authority has replaced all 58,000 meters with wireless meters. An advanced metering infrastructure network was installed, HVAC and lighting upgrades completed and 17 pumps replaced with high-efficiency systems.

These water management and energy saving initiatives have benefited the treatment plant operations staff: By setting competitive and sustainable rates, the authority can better support infrastructure maintenance and improvements to provide customers with reliable long-term water service.

"The treatment plant operators feel a sense of pride with what we are doing," says Gary Robertson, executive director of water operations. "When they know you're investing in the system, they do a better job."

COMBINING RESOURCES

In 2004, the Western Virginia Water Authority was the first such organization in the state formed from two existing organizations to treat, deliver



and administer water and wastewater. The result has been more dependable water and wastewater service, better drought protection and emergency backup. Other advantages include lower costs, more efficient planning and greater rate stability.

Droughts in 1999 and 2002 were the catalyst for the merger. "The droughts made it clear that the City of Roanoke did not have enough water capacity," says Robertson. "The cost of developing new sources and the cost of wastewater treatment convinced officials that we needed a regional approach. Also, Roanoke County needed help with debt service, so the staff started meeting and coming up with options. Combining our resources was no small hurdle, but we overcame that."

Before the merger, the county billed for water service every other month, and the city billed quarterly. After the merger, the authority began billing everyone monthly, but the bills were based on actual readings one month and an estimated reading the next month.

"We were planning on installing radio-read meters so we could bill based on actual readings each month," says Robertson. "But once we started talking to Honeywell and seeing the results of their energy audits, we decided to go with the fixed network system with wireless meters."

Western Virginia Water Authority, Roanoke, Va. FOUNDED: | 2004

POPULATION SERVED: | 58,000 metered customers

SERVICE AREA: | Roanoke, Franklin and Botetourt counties, cities of **Roanoke and Salem**

SOURCE WATERS: | 72 wells, four reservoirs, streams, lake

TREATMENT PROCESS: | Conventional, microfiltration, upflow clarification

DISTRIBUTION: | 1.500 miles of pipeline

SYSTEM STORAGE: | 34.5 million gallons

KEY CHALLENGES: | Increasingly stringent water quality regulations, source water protection, infrastructure improvements

ANNUAL BUDGET: | \$8.6 million (water plants and distribution)

WEBSITE: www.westernvawater.org

GPS COORDINATES: | Latitude: 37°16'08.41" N; longitude: 79°56'26.72" W





HIGHLY DECORATED

Formed just 10 years ago, the Western Virginia Water Authority has been recognized many times by water and government agencies. A 2013 Association of Metropolitan Water Agencies (AMWA) Platinum Award recognized the authority for outstanding achievement in effective utility management. Other awards include:

- 2013 National Association of Clean Water Agencies (NACWA) Platinum Award for five consecutive years of perfect wastewater treatment permit compliance
- 2013 NACWA Platinum Award for excellence in management
- 2012 Western Virginia Workforce Development Board Business of the Year
- 2012 NACWA National Environmental Achievement Award in Public Information and Education
- 2010 Psychologically Healthy Workplace Award (from Virginia Psychological Association and the American Psychological Association)
- 2009 Water Environment Federation Public Education Award
- Virginia Department of Health Excellence in Waterworks Operations (multiple times)

Dean Wood, production supervisor, checks the ferric sulfate feed pumps (Pulsatron) in the chemical room of the Spring Hollow facility. The room uses high-efficiency T8 fluorescent lighting on motion detectors and timers to save energy.

By switching to the more accurate remotely read meters, the authority picked up an additional 5 to 10 percent revenue and the ability to detect leaks immediately. The team also replaced pumping station pumps from the 1950s to 1970s with more energy-efficient ones, saving \$500,000 per year in electricity.

Reducing the number of meter readers also saved money. "We had four full-time readers and also contracted some of the reading out," says Robertson. "We eliminated the contract and repurposed the former meter readers to other positions."



Cheryl Brewer, lab supervisor, analyzes the pH of a water sample in the plant lab (Thermo Fisher accumet XL250 pH/mV/temp/ISE meter from Thermo Fisher Scientific). The Spring Hollow facility is now heated with natural gas, which replaced electric heaters as part of an energy improvement project.

MULTIPLE PLANTS

The authority has 72 wells (active and inactive) and also draws water from the Spring Hollow, Carvins Cove, Beaverdam Creek and Falling Creek reservoirs; Crystal Spring; the Roanoke River; and Smith Mountain Lake.

The authority owns four water treatment plants and shares in treatment capacity from a plant in Bedford, Va., to serve Franklin County. The owned plants are:

- Crystal Spring 5 mgd microfiltration plant, built 2002.
- Carvins Cove 28 mgd conventional treatment plant, built 1946, upgraded in the 1950s and 1990s.
- Spring Hollow 18 mgd upflow clarifier plant (Wheelabrator Technologies), built 1996.
- Falling Creek 1.9 mgd conventional plant, built in the late 1800s and remodeled in the 1990s.

When built, Crystal Spring was the state's largest microfiltration plant.

The filtration system (Evoqua Water Technologies) treats about 4 mgd of mountain spring water and can filter out all particles larger than 0.2 microns.

The entire water system is monitored with a SCADA system that allows operators to control the plants and 20 remote transmission units throughout the distribution system. A laboratory supervisor and two technicians at the Spring Hollow laboratory handle testing for all four plants.

Water quality is excellent: Average turbidities are typically 0.01 NTU at Crystal Spring, 0.09 NTU at Spring Hollow, 0.12 NTU at Carvins Cove and 0.19 NTU at Falling Creek. "Our haloacetic acid and trihalomethane levels have stayed under the limits, but they can be a challenge to maintain within acceptable limits, due to the location of our storage tanks and distribution piping length," says Robertson. "We're lucky, though, because we have good plants and not much total organic carbon in the source water."

The Carvins Cove and Spring Hollow plants are staffed 16 hours per day with at least two Class I operators. Falling Creek is staffed by one Class II

operator working a 12-hour shift. The automated Class II Crystal Spring plant can run without a licensed operator on site. The authority employs 23 Class I, two Class II, five Class III and two Class IV water treatment operators, as well as 11 distribution system operators. Water treatment plant and distribution system leaders are:

- Jeffrey Booth, production superintendent
- Jamie Morris, production manager
- Gregory Belcher and Dean Wood, production supervisors
- Nathan Carroll, senior water operations manager
- Ron Agee, Lloyd Paige and Randy Smith, water operations supervisors
- Steve Nichols, water operations coordinator
- Gregory Honeycutt, Paul Paige and Rodney Witt, lead operators
- Cheryl Brewer, lab supervisor
- Travis Lane, distribution manager

"Most of these employees have been with the authority since it was formed in 2004, and they have many more than just these 10 years of experience," says Robertson.

IN-HOUSE EMPHASIS

The authority's water management and energy saving initiatives have succeeded largely because of operations staff involvement. "Honeywell's proposal was to do the work or contract it out, but we used our own staff to do a third of the meter replacement, because we wanted them to be involved in this program," says Robertson. The distribution team replaced more than 10,000 of the 58,000 residential and commercial meters. Water operators coordinated the large pump and generator installations, assisting the contractor, MEB Construction.

The customer service staff was also involved. "As we were updating the meter technology, we upgraded our billing system to better integrate with the meter data," says Robertson. Customer service staff now can see the entire record of a customer's water usage on screen. "One customer called and questioned the high water usage listed on the bill, and our employee asked if they had an irrigation system," says Robertson. "She could see a lot of usage at one specific time. It turned out the irrigation system was on and the customer didn't know it."

The staff conducts classes on water treatment and conservation at the local schools. "We take a proac-

tive approach to reaching the next generation of employees by providing water outreach classes to over 11,000 students a year in K-12 and at the college level," says Robertson. "Our water plant operators assist with treatment facility tours, sharing their knowledge and passion for the job."

READY FOR ANYTHING

While the water operations team faces many challenges, "One of the most critical is making sure we are always prepared when unexpected things happen," says Robertson. "Operators need to be able to think and react quickly."

For example, during extremely cold weather or large temperature fluctuations, the field staff is busy repairing water lines that fail or responding to customer calls about frozen water lines. "We are especially busy during these times, as an increase in broken water lines means an increase in the water we need to produce and send through the distribution system," Robertson says. (continued)



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The Spring Hollow Water Treatment Facility team includes, from left, Cheryl Brewer, lab supervisor; Courtney Old, maintenance worker; Elizabeth Smith, lab technician; Mike Altizer, project manager; Jeffrey Booth, production superintendent; Dean Wood, production supervisor; Merritt Ford, water operator; Gary Robertson, executive director of water operations; and Gregory Belcher, production supervisor.

Operators were tested by extreme weather during a sudden derecho (straight-line windstorm) in summer 2012 that caused widespread power outages for a week. "Roanoke Valley and Franklin County were crippled by this windstorm, which caused some of our facilities to lose power, including the Carvins Cove and Falling Creek plants, the Crystal Spring pump station, 14 other water pumping stations and nine water storage tanks," recalls Robertson.

Honeywell's proposal was to do the work or contract it out, but we used our own staff to do a third of the meter replacement, because we wanted them to be involved in this program." GARY ROBERTSON

Nine on-site and five portable generators supplied power for 595 hours. Field operations crews delivered 3,000 gallons of fuel to keep them running. "Emergency response planning and the efforts of the staff kept water and wastewater service operating without interruption, and there were no collection system or pump station overflows," Robertson says.

Operators must also be diligent in keeping adequate spare parts on hand to repair or replace equipment. "Our operators perform maintenance such as replacing large valves and electric actuators," says Robertson. "This reduces our cost by eliminating outside maintenance services."

PSYCHOLOGICALLY HEALTHY

Cross-training is important at the authority: Water operators rotate through the treatment facilities. "Our best asset is highly trained and motivated employees," says Robertson. "So we have programs to develop existing employees and create opportunities where new staff entering the business can learn from our current workforce." The Water and Wastewater Certificate program, created in 2008 with Virginia Western Community College, lets future employees take classes taught by authority executive staff, water operators and engineers. At the end of the one-year program, participants practice their skills as operators in training, learning alongside veteran employees.

The training pays off. "We have very low turnover among our staff, and in fact, one employee who retired came back to work part time," says Robertson. "We promote a team approach, rather than a top-down approach." Other motivators are service awards, an employee picnic, recreational teams (kickball, volleyball, basketball, golf) and a Polar Express float in the Roanoke holiday parade.

The future looks bright. "The Honeywell program is paying off, and they have guaranteed that we will see enough savings to pay our \$2.5 million debt service," says Robertson. "Now that all the meters have been installed, we'll soon be able to verify those savings."

Robertson also considers the possibility of adding more counties to the mix. "We were established to be a regional authority in 2004, and Franklin County joined in 2009," he says. "While we don't want to force ourselves on other counties, we would like to work more closely together, because we do share resources." **tpo**

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GREEN AND SUSTAINABLE FEATURES PERMEATE BUILDINGS AND PROCESSES AT CALGARY'S ADVANCED PINE CREEK WASTEWATER TREATMENT PLANT

By Doug Day

rom green roofs to new odor control technology, one of Canada's most technologically advanced clean-water plants is in Calgary, Alberta. The Pine Creek Wastewater Treatment Plant opened in 2009 after five years of construction to serve a growing population. Built with a focus on sustainability, the \$390 million complex has a LEED Gold certified administration and operations building and the latest innovations in wastewater treatment, according to George Kewley, operations supervisor. The plant (26.4 mgd design, 21 mgd average) has a 30-person staff, including 20 operators on four rotating shifts.

LEADING TECHNOLOGIES

Treatment begins with 6 mm perforated screens followed by highly efficient cyclone grit removal. The primary clarifiers are rectangular for a smaller footprint. The two 82,000-cubic-foot biological nutrient removal bioreactors use the Westbank configuration for enhanced phosphorus and nitrogen removal.

The four 150-foot-diameter circular secondary clarifiers have a rapid sludge removal system for better mixing. From the clarifiers, the flow goes

Processes and technology are changing all the time. Plants are getting bigger and better, and treatment is getting better."



George Kewley, operations supervisor, in front of the Pine Creek plant's secondary clarifier.



The Pine Creek Wastewater Treatment Plant is the most technologically advanced wastewater treatment plant in Canada. It went online in 2009.

through disk filtration and UV disinfection before discharge to the Bow River, a rainbow and brown trout fishery that attracts anglers from all over the world.

"We put a lot of thought into odor control," Kewley says. "Nobody wants a wastewater treatment plant in their backyard, and houses are getting closer and closer to the plant."

All wastewater channels, grit tanks and blend tanks and the rectangular clarifiers are covered. Foul air is forced through one of three biofilters that consist of rocks covered with activated carbon. A microbiological film grows on the rocks and feeds on the foul air, especially the mercaptans and hydrogen sulfide.

The filters use biological media designed to last 15 to 20 years, whereas older filters with activated carbon and potassium permanganate need media changeout every one to three years.

GREEN STRATEGIES

Many green features increase sustainability and help the plant fit into the environment. "The buildings have 18,000 square feet of green roofs with drought-resistant native prairie grasses," says Kewley. "That keeps them cooler in summer and warmer in winter.

"We have very little asphalt and lots of drought-resistant native prairie landscaping. We even have wildlife corridors that we'll maintain as we expand the plant." All storm drains inside the fence line flow to the headworks. Dry ponds collect runoff from the rest of the site so that it evaporates instead of reaching the river.

Half the plant's electricity comes from a wind farm in southern Alberta. "We don't make enough methane at the moment for viable power generation," Kewley says. "We will with the next expansion. The plant was designed to expand to 185 mgd, seven times bigger than it is now." Kewley notes that the University of Calgary is developing fuel cell technology that uses methane gas.

The Pine Creek biogas isn't wasted: It fuels boilers for process heat and water heating, including in-floor radiant heating in the operations and maintenance building. To save potable water, reclaimed water is used in the plant for purposes that include low-flow, dual-flush toilets. "That's one thing that is going to happen in the future for wastewater plants," Kewley says. "It's definitely on people's radar. Even community expansions may include 'purple pipe' systems for using reclaimed water."

Once an agreement is finalized with a nearby golf course, about 10 percent of Pine Creek effluent will be reclaimed. "We have a 20-year lease with the City of Calgary for a tree farm on a part of our 340-acre site," says Kewley. "It uses treated effluent for irrigation, and we're always open to businesses knocking on the door."

Biosolids from three wastewater treatment plants are decanted in lagoons and given to farmers through the city's Calgro program. "We have farmers and ranchers lining up for it," Kewley says. About 44 million pounds of biosolids are injected annually on 4,200 acres of farmland within a 30-mile radius.

Aesthetics played a big role in plant design. "Many wastewater plants across North America are putting a lot of value and time into architecture to make them look nice to the public," says Kewley. "We used rock gabion walls, and the buildings are clad in brown zinc, a noncorrosive metal that will last 100 years. We've tried to blend in with the neighborhood." Berms strategically placed around the property help it fit with the surroundings. Outside lighting meets dark-sky standards.

FLOOD PROTECTION

While it sits next to the river, the plant property is still outside the 100year flood plain. "We have to pump wastewater up 20 feet to the plant," Kewley says. Excavation was limited during construction, and the plant is built on pilings driven into bedrock to keep it above the flood plain.

The wisdom of that became clear in June 2013, when the worst flooding in Alberta history hit the region. Though the city's Bonnybrook treatment plant was out of operation for about three weeks, Pine Creek wasn't affected.

Kewley says the plant's design demonstrates Calgary officials' long-term thinking and the innovation found in the wastewater profession. "Processes and technology are changing all the time," notes Kewley. "Plants are getting bigger and better, and treatment is getting better." **tpo**

TREATMENT FOR THE FUTURE

Besides treating wastewater for the people of Calgary, the Pine Creek Wastewater Treatment Plant will be involved in finding new ways to protect the environment from current and future pollutants, such as pharmaceuticals.

Advancing Canadian Wastewater Assets (ACWA, www.ucalgary.ca/acwa) was formed through an agreement between the City of Calgary and the University of Calgary. It will operate its own wastewater treatment facility at Pine Creek, including a dozen experimental streams filled with water from the Bow River.

The 0.1 mgd ACWA facility has three parallel, independent treatment lines for advanced oxidation, ozonation and reverse osmosis. It will take effluent from the Pine Creek secondary clarifiers or fully treated and UV disinfected effluent. The treatment lines can also be operated in tandem for further research and can accommodate future treatment technologies.

The onsite ACWA laboratory has \$3.7 million in laboratory equipment. It's located next to the plant lab so that the two can share expertise and technology. Back on campus, the school will use its Aquatic Microbiology and Isotope Science labs for further research.

ACWA's Pine Creek facility will also be used to experiment with existing and emerging technologies to better treat wastewater contaminants. "It's a long-term study to look at new and innovative ways to treat wastewater," says George Kewley, Pine Creek operations supervisor. "Sometimes when you add a chemical to get rid of something, it has ripple effects down the line. By partnering with the university, we can find beneficial, innovative treatment processes for the future."



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Knowledge Is

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Kanahou Alana, lead operator, checks a final effluent sample for clarity.

EXTENSIVE STUDY, CAREFUL OBSERVATION AND DILIGENT TESTING ENABLE THE OPERATOR OF A SMALL FLORIDA BATCH PLANT TO EXCEED DESIGN PERFORMANCE EXPECTATIONS

STORY: Ted J. Rulseh PHOTOGRAPHY: Johnny White



KANAHOU ALANA ADMITS HE KNEW NOTHING ABOUT WASTEWATER WHEN he became the operator of the Layton Wastewater Treatment Plant on Florida's Long Key five years ago.

He didn't let that stand in the way of achieving excellent performance. Today, the 66,000 gpd (design) sequencing batch reactor (SBR) plant produces effluent of significantly higher quality than its permit requires. That includes, on an annual average, 95 percent removal of total nitrogen (to 3.01 mg/L in the effluent) and 92 percent removal of total phosphorus (to 0.69 mg/L).

Alana notes that the plant, designed to meet Florida's best available technology standards, now meets advanced waste treatment standards. It does so in part with an innovative simultaneous nitrification-denitrification process for biological nutrient removal.

"I'm not interested in doing only what's required to meet the permit," says Alana, whose plant won the 2013 Plant Operations Excellence Award from the Florida Department of Environmental Protection. "From the day I came here, my goal has been to produce the best water I possibly can. That's the only way I know how to operate."

SEASONAL CHALLENGES

The Layton plant is one of five operated by the Florida Keys Aqueduct Authority (FKAA), formed in 1937. The authority's original mission was to supply drinking water to all residents of the Florida Keys, but it later took on wastewater treatment for certain areas of the Keys.

Layton Wastewater Treatment Plant, Long Key, Fla.

COMMISSIONED: | 2006 POPULATION SERVED: | 150 homes (up to 142,000 annual state park visitors) FLOWS: | 66,000 gpd design, 30,000 gpd average

TREATMENT LEVEL: | Advanced secondary

TREATMENT PROCESS: | Sequencing batch reactor

RECEIVING WATER: | **Aquifer injection**

BIOSOLIDS: | Landfilled

ANNUAL BUDGET: **\$180,000 (operations)**

WEBSITE: | www.fkaa.com

GPS COORDINATES: | Latitude: 24°48'19.21" N; Longitude: 80°50'38.72" W



Within any part of a wastewater system, time is of the essence."

Alana joined the FKAA in 2006, working on the 130mile transmission pipeline that brings water to the Keys from an aquifer on the Florida mainland. A year later he went to work as a trainee at the Layton plant; two years after that he became the lead operator. He's assisted by part-timers Danny Price and Branson Bruce, who handle permit-required weekend plant checks and testing. "If there's a problem, they'll call me," says Alana. "I make all the operational decisions, and I have for the past five years."

The Layton plant faces challenges in seasonal changes in influent volume and strength. The plant serves mainly the community of Long Key and its 150 residences, but tourists boost the population, especially in winter. About 142,000 visitors a year pass through Long Key State Park, which has 60 campsites often occupied by recreational vehicles that empty their wastewater tanks at the park dump station.

"The strength of the influent that comes in from there is very high," Alana says. "The visitors may come from hundreds of miles away, and the wastewater has been sitting in the tanks for days. They dump it, and it comes right to the plant. I deal with a lot of very septic conditions."

The SBR plant (Fluidyne Corp.) has two basins that together handle average flows of 29,000 gpd in summer and 31,000 gpd in winter. Influent passes through a fine bar screen (Vulcan Industries) and enters a settling basin. When the water reaches a preset level, pumps deliver a



batch to whichever SBR is filling at the time. Mixing and aeration occurs in each SBR through jet aeration manifolds.

Treated water from the SBRs is delivered to a storage basin through a fixed wall mounted decanter in each SBR and then to two upflow sand filters (also Fluidyne). Final effluent passes through a chlorine contact chamber before injection down a 90-foot-deep well. Biosolids are transferred to the authority's Big Coppitt treatment plant, where they are dewatered with centrifuges. The material ultimately is landfilled.

CLOSE-UP LEARNING

Steadily fine-tuning that process has been a mission for Alana, who holds a Class C (third highest) wastewater operator license. Upon being hired, he received basic training through the authority's wastewater division. After

that, he says, "By looking outside the box I began discovering new ideas about how wastewater treatment could be practiced. I started down the road to improving upon the already well-established process of operating SBRs."

His journey has included mentoring from Tom Pfiester, FKAA wastewater division

manager; Theodore Knowles, operator at the authority's Big Coppitt Wastewater Treatment Plant; Tracie Finnegan at the Environmental Leverage consulting firm; and Tom Stirtzinger of the Florida Rural Water Association.

He also learned from books, from prowling on the Internet, from trial and error and, perhaps most important, from babysitting the plant. "I'm talking 24 to 48 hours at a time on site, testing all day long, every single cycle, to find out what was going on," he says. "When are the peak flows? When is the influent the strongest? When is the plant converting nutrients the most effectively? "Spending that amount of time gave me intimacy with the plant and knowledge of what goes on in the tanks. Before, the plant had to be run with an operator who had to be there seven days a week, eight hours a day, because it was so hard to control. Weekend flows would come in and demolish the process."

He changed the operating protocols, making adjustments to account for specific influent characteristics. He also changed out the plant's original programmable logic controller for a unit supplied by Aqua-Aerobic Systems: That changed the process from a level batch to time batch. This added flexibility to customize control of the plant.

"The original specifications said the plant should run at 2,500 mg/L mixed liquor suspended solids," Alana says. "My research says it runs best at almost 3,500 mg/L. We average 80 percent mixed liquor volatile suspended

From the day I came here, my goal has been to produce the best water I possibly can. That's the only way I know how to operate."

solids, which means 80 percent of the sludge in there is bugs — is alive. At that rate, we're able to treat heavy, heavy amounts of CBOD and ammonia. Having that big an army in there, nothing can stop it.

"Now I can walk away on the weekend and not even think twice. By understanding the different flows at different times of year, we can predict the heavier influent loadings during times of seasonal vacationing and foresee events that could wreak havoc on facility operation. The predictions enable process adjustments to be made before the loadings reach the facility and ensure a much smoother and well-maintained biology to handle those conditions."



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MONITORING AND TESTING

The plant accomplishes nutrient removal with oxic and anoxic cycle times in the SBR basins. In-line monitoring includes dissolved oxygen (DO), oxidation reduction potential (ORP) and total solids meters in each SBR, regulated by a Hach sc1000 controller. "The DO meters allow us to ensure that we are not over-aerating the oxic process, and the ORP meters ensure that we are reaching anoxic and anaerobic conditions for denitrification and luxury uptake for biological phosphorus removal," Alana says.

"The total solids meters are for quick measurements and help reduce labor when extra time is needed. Since a mixed liquor suspended solids [MLSS] sample can take well over an hour to run, the meters give us a quick look at the MLSS inventory."

Meanwhile, the plant's lab runs daily tests on influent, the oxic and anoxic cycles, and final effluent for ammonia, nitrate, phosphate, pH, alkalinity, salinity and chlorine residual. Daily settleometer tests are also conducted.

"We also test for COD and correlate that with CBOD₅ results that come from contracted certified laboratory," Alana says. "This correlation of two tests is needed because the CBOD₅ takes sometimes seven to 10 days to get the results back, whereas we can run the COD in a little over two hours and have real-time results to make more proactive process decisions.

"The COD test lets me know the influent strength coming into plant — the loading. By knowing this and trending the numbers, we can increase or decrease

LEFT: Upflow sand filters (Fluidyne Corp.) at the Layton Wastewater Treatment Plant. BELOW: Kanahou Alana at his office desk, surrounded by microbe identification posters.



PICTURES ON THE WALL

On Kanahou Alana's office wall you won't find pictures of sports stars or musicians or even photos of his favorite places. Instead you'll find pictures of microorganisms — the "bugs" that make his treatment plant's process work.

"We conduct microscopic evaluations daily on our MLSS to know exactly what our biology is doing," Alana says. "As operators, we are cultivating a healthy biology to treat wastewater, and the only way to truly manage your biology is with the aid of a microscope.

"When I look under a microscope, I'm interested first in what the floc looks like. What kind of formation do I have? In between the floc structure, is it clear? Are there spaghetti-like strings attached to it, which are called filamentous?

"The structure of a healthy floc would be tight and compact with a golden brown color. If the floc structure is broken up and dispersed, that indicates a higher TSS in the effluent, and the operator would need to make process adjustments to rejuvenate floc growth. Very dark or black floc indicates septic conditions are occurring somewhere in the process, and changes need to be made to ensure that adequate DO is maintained to keep a healthy biology."

He's also interested in which microorganisms are present and which are dominant: "The predominant organisms tell what the food-to-microorganism ratio is, and that information is used to make sludge wasting decisions, such as increasing or reducing the wasting interval. With a high population of bugs and a good floc formation, filamentous has a hard time living. All over my office I have pictures of every type of filament that is common in treatment plants.

"The more you do this, the more you're able to realize which bugs are present when treatment is working well. If you see something other than that, something is incorrect. Knowing what you need to look for — this is bad, this is good — really helps you be the best operator you can be."



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Layton Wastewater Treatment Plant PERMIT AND PERFORMANCE (annual averages)						
	INFLUENT	EFFLUENT	PERMIT			
CBOD	236 mg/L	3.54 mg/L	10 mg/L			
TSS	173 mg/L	3.1 mg/L	10 mg/L			
Total N	63 mg/L	3.01 mg/L	10 mg/L			
Total P	9 mg/L	0.69 mg/L	1 mg/L			
Total coliform	N/A	67/100 mL	200/100 mL			

By looking outside the box I began discovering new ideas about how wastewater treatment could be practiced. I started down the road to improving upon the already well-established process of operating SBRs."

air schemes proactively. So instead of getting hit with heavy loading and having a low air scheme, then spending days with the air cranked higher to catch up, we can trend when it is increasing and be ahead of the game."

PROCESS INNOVATION

Pushing the plant's performance took some added creativity. One thing Alana discovered was that batch processing time was limiting the capacity for nutrient removal. "Within any part of a wastewater system, time is of the essence," he says. "More wastewater keeps coming in, and you have to put it back out. So time management in the process is very important."

To lessen the time required for nutrient removal, Alana created an environment for simultaneous nitrification-denitrification — a condition in which DO in the aeration basin is maintained at just the right level so that the outer edges of bacterial floc remain aerobic, while the interior of the floc is kept anoxic. Nitrification occurs on the outside of the floc, and nitrate is then utilized (denitrified) within the floc. "Plants normally buy their nitrates," Alana says. "AWT plants usually use a carbon source, which is very expensive, to achieve what this plant is doing just by creating the right environment."

Making that process work meant overcoming low alkalinity that was limiting nitrification. "While the process is converting the ammonia, it's also denitrifying while the air is on in the system," Alana says. "Increased alkalinity will allow it to do that. The influent alkalinity was in the range of 200 to 250 mg/L, but going out the back in the effluent, it was 40 mg/L. So we spiked it with sodium hydroxide. We tripled the alkalinity at the beginning of the process so that the effluent

alkalinity was 140 mg/L.

"It took months and months of testing. I have a stack of probably 10 legal pads of data on every single cycle. I would go out and test the full range — NH_{35} , NO_{35} , alkalinity, pH. I would watch where and when the nitrates started reducing. The more alkalinity we put in, the faster the nitrates would be gone."

In the end it all comes down to a simple principle: "The more you know," says Alana, "the more power you have." It's not a bad lesson to learn for someone who, just a few short years ago, by his own admission didn't have a clue. **tpo**

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The Scoop on Poop

AN OHIO DISTRICT'S EARTHFEST DISPLAYS TEACH ATTENDEES ABOUT PROPER DISPOSAL OF PET WASTE AND THE IMPORTANCE OF CONSERVING AND PROTECTING WATER

By Craig Mandli

hey chew on our shoes, dig holes in our yards and slobber water across our kitchen floors, but they're also loyal, big-hearted and our best friends.

In the U.S., roughly 40 percent of homes have a dog. And all those dogs - 70 to 80 million of them — make a lot of poop. That might not make great dinner conversation, but for the staff of the Northeast Ohio Regional Sewer District, it's a great icebreaker.

Yes, the staff is more than happy to talk about dog poo, even at local festivals. In fact, that was the topic of choice at the district's educational booth

in April at EarthFest 2014 at the Cuyahoga County Fairgrounds. "The goal is to get the word out that keeping the water supply clean is a serious issue," says Jean Chapman, manager of media and community relations. "It's one of those things people take for granted. They think it just goes into the ground and disappears. That's not the case."

relations specialist. "We needed to create visibility. We wanted the population to know who we were and what we do. That's why we do events like EarthFest. It's a great coming together of the community." The overriding goal is to protect Lake Erie, once polluted to the point of

radar, and citizens took it for granted," says Mardele Cohen, community

toxicity, but cleaned up over the past 30 years and now a viable resource. "Our end goal is to keep our Great Lake great," says Chapman. "A clean Lake Erie is obviously a big symbol for us. It's in everyone's best interest that a big effort is made to protect it."

K The more outreach and education we do, the more receptive the people are to the business side of the district."

MARDELE COHEN

The district's PUP (Pick Up Poop) campaign delivers that message to pet owners. The district estimates that 90,000 dogs live in Cuyahoga County, producing 45 tons of poop each day. An average pile can contain up to 3 billion fecal coliform bacteria, nearly 10 times more than cow manure. The waste is also more acidic because of dogs' high-protein diets. It all means the waste can harm water quality, especially at beaches, which receive stormwater from wide areas.

"We urge people to take a biodegradable bag when they walk a dog, scoop up the waste, put it in the trash, and keep it out of the water," says Chapman. "EarthFest is a terrific way for us to get the word out about our PUP program." A district website, www.dogscantflush.org, provides more information.

SPREADING THE WORD

The district treats 94 billion gallons of wastewater per year, serving more than a million people in a 350-square-mile area in northern Ohio on the shores of Lake Erie. It has an operating budget of over \$200 million, employs more than 600 people and operates three treatment facilities.

"A decade ago, the work the district performed was very under the



A biological exhibit educates visitors on the wildlife found in local waterways.

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The district is a main sponsor of EarthFest, which draws a crowd of about 8,000. The staff sets up several interactive booths and displays. Besides the PUP campaign, the district displays an electro-shock boat used to test the health of fish in the district's waterways and a hands-on laboratory booth that lets children sample many of the same water-quality tests the district's lab staff performs.

NOT JUST FOR KIDS

"Many of the displays we offer are geared toward educating children, but we've found that a lot of adults are interested in the technology and laboratory testing too," says Chapman. "It's great that people get the opportunity to see and understand what we do. That helps us expand our footprint in a positive manner."



The district mixes education with humor. For example, the district distributes bathroom and portable restroom stickers that lightheartedly urge users to conserve water. The approach has been so successful that attendees seek out district staff at special events. "We are very creative on social media and hold lively community focus groups on watersheds, aquatic plants and trash and pet waste in the water supply," says Chapman. "People aren't surprised to see us out in the community anymore. They know us as 'that funny crew' now. We worked very hard to create that positive reputation."

The positive interaction pays off in public support, especially when it's time to make infrastructure improvements that may mean higher sewer bills. "The more outreach and education we do, the more receptive the people are to the business side of the district," Cohen says.

COMMUNITY SUPPORT

Local officials support the district's outreach programs and encourage more. "They expect us to be out in the community, interacting with people about what we do here," says Cohen. "We are respected for our opinions, and our programs get a huge amount of support. They realize that educating the public is a huge but extremely important undertaking."

As district personnel have seen attitudes about wastewater treatment and water conservation improve locally, other utility districts have used Northeast Ohio as an example of how to do education and outreach successfully. "We regularly have other districts bounce ideas off us or ask to use our ideas or materials in their districts, in particular our PUP campaign," says Chapman. "We get calls on that one all the time."

Many municipalities across the country have their own PUP programs. "That's such a huge compliment, and we love it," Chapman says. "Sewer districts can't be afraid to step out into their communities and let the issues come up to the surface, even something as simple as cleaning up after a pet. It all plays a part." **tpo**

Dearémont

Don't Fear The BNR

AN IOWA PLANT TEAM ADAPTS QUICKLY TO BIOLOGICAL NUTRIENT REMOVAL IN A BRAND-NEW ADVANCED TREATMENT FACILITY WITH A LIST OF AWARDS THAT SHOULD INSTILL COMMUNITY PRIDE

STORY: Ted J. Rulseh PHOTOGRAPHY: Mark Hirsch

EDITOR'S NOTE: Since this article was written, Clinton's water quality superintendent Dan Riney has retired from that community and has taken a position with the City of Topeka, Kan.

NUTRIENT REMOVAL IS A HOT TOPIC IN OPERATOR circles. There's worry about stricter nitrogen and phosphorus limits and the cost and difficulty of meeting them.

If you ask Dan Riney and Bob Milroy, the concerns are largely unfounded. They run the new Clinton (Iowa) Regional Water Reclamation Facility and its biological nutrient removal (BNR) process. The BNR added less than \$1 million to the plant's cost. The operations staff adapted easily to it. The process is heavily automated.

Best of all, the plant's effluent today meets what the Clinton team expects to be its permit standard in 2018: yearly averages of 10 mg/L total nitrogen and 1.0 mg/L total phosphorus. "It's nothing to be scared of," says Milroy, assistant plant superintendent. "It's just more concrete, a few more mixers and a few more mixed liquor pumps. The process happens by itself."

The BNR is a central feature of the new 8 mgd (design) facility, which went online in September 2012. The 18-member staff made a smooth transition from an antiquated plant to the new facility's modern technology. Among various honors, the plant earned the 2013 Governor's Environmental Excellence Award.

OUT WITH THE OLD

The City of Clinton (population 27,000) built the new facility in response to a consent decree imposed in 2009 by the state attorney general's office.

The old treatment plant was built in 1963 and upgraded in several stages to an activated sludge process in the 1970s.

In the mid-1990s, the aeration tanks were retrofitted with fine-bubble ceramic disc diffusers, and capacity was expanded with addition of a clarifier and a digester. Projects in the next decade included replacement of a failed digester cover, replace-

ment of influent pumps and addition of influent screening. "Starting in the late 1990s, there were some compliance issues," says Riney, water quality superintendent since 1985. "TSS and ammonia were the two big hitters."

Then there was the matter of overflows. "We have a combined sewer system, and flows would shoot up to nearly 26 mgd during major rain events," Riney says. "The consent decree mandated a new treatment plant and a longterm control plan to eliminate combined sewer overflow [CSO] discharges.

"The treatment plant project has cost us \$70 million. Our estimate for the 25 years we've been given to do collection system work is in the neighborhood of \$120 million. It involves separation of the sewers and replacement of at least four major pump stations that are more than 40 years old." The aim is to reduce CSOs to four to six per year.

At present, says Milroy, "There are spots along the river that overflow when the collection system gets overwhelmed. One lift station alone averages 25 to 30 CSOs per year."





WORKING TOGETHER

Because the old facility was landlocked, a rehabilitation and expansion project was not an option. "Building a new plant on virgin ground — that was a given," Riney says. "With that empty palette in front of us, we talked about how big to build it to allow for economic development."

During those discussions, the cities of Camanche (population 6,000) and Low Moor (500), facing major upgrades to their treatment systems, approached Clinton about taking their wastewater. Meanwhile, the state Department of Natural Resources had assembled a team to develop what is now known as the Iowa Nutrient Reduction Strategy.

In that environment, the firm, HDR, designed the facility and included the BNR process at an incremental cost of "probably less than \$1 million," says Riney. "It seemed like a logical thing to include. It was apparent that if we were to wait and add BNR on later it would cost a lot more," possibly more than \$4 million.

Clinton (Iowa) Regional Water Reclamation Facility

COMMISSIONED: 2012						
POPULATION SERVED: 33,500						

EMPLOYEES: | 18

FLOWS: | 8 mgd design, 5.3 mgd average, 17 mgd peak

TREATMENT LEVEL: | Secondary

TREATMENT PROCESS: | Oxidation ditch, biological nutrient removal RECEIVING WATER: | Beaver Slough (Mississippi River)

BIOSOLIDS: | Landfill cover

ANNUAL BUDGET: | **\$4 million (operations)**

WEBSITE: | www.ci.clinton.ia.us

GPS COORDINATES: | Latitude: 41°48′38.05″ N; longitude: 90°13′53.48″ W



Tracie Kelly conducts BOD in the lab at the old treatment plant.

Clinton Regional Water Reclamation Facility PERMIT AND PERFORMANCE NFLUEN PERMIT BOD 211 mg/L 40 mg/L 8.0 mg/L TSS 248 mg/L 13.0 mg/L 25 mg/L Ammonia 20.5 mg/L 0.8 mg/L 68.6 mg/L (Feb) Total N 7.7 mg/L 29.3 mg/L Monitor monthly **Total P** 5.0 mg/L 0.6 mg/L Monitor monthly

At present, the Clinton permit calls only for monthly monitoring of total nitrogen and total phosphorus. "Our monitoring shows that we are already in compliance with the 10 mg/L nitrogen and 1.0 mg/L phosphorus standards," Riney says.

The consent decree said the new plant had to be online by the end of 2012 and in compliance by July 1, 2013. "The new plant first received flow on Sept. 21, 2012, and by that point we had actually managed to bring the old plant into compliance — it had been for about 14 months. We transitioned from the old plant to the new plant and never had a violation."

MAJOR IMPROVEMENT

The old treatment plant process included screening and grit removal, primary settling, activated sludge treatment and final clarification. Thickened biosolids were anaerobically digested. The new process actually starts at the old plant site. Influent arriving there passes through coarse bar screens (Vulcan Industries) and then is forced about 2.5 miles to the new facility (influent pumps from Pentair – Fairbanks Nijhuis).

At the headworks it passes through perforated plate fine screens (Huber Technology) and a PISTA Grit Chamber vortex grit removal system (Smith & Loveless). A splitter box then diverts the flow directly to three racetrack-

Our monitoring shows that we are already in compliance with the 10 mg/L nitrogen and 1.0 mg/L phosphorus standards." style oxidation ditches (designed by HDR). There is no primary settling step.

In the BNR process, the wastewater passes through anaerobic, anoxic and aerobic zones. Aeration is provided by three 150 hp HSI turbo blowers (Atlas Copco) and fine-bubble diffusers (Sanitaire – a Xylem Brand). Waste activated sludge is delivered to four aerobic digesters aerated by four 100 hp HSI turbo

BENEFICIAL USE – AT THE LANDFILL

The switch to a new treatment process in Clinton includes a change in the beneficial use for biosolids. While the old treatment plant operated, biosolids were applied as liquid to crops on 176 acres of city land overseen by the municipal airport. Now, Class B cake material is mixed 50-50 with topsoil and used for cover at the Clinton County landfill.

"When we designed the new plant, we decided to go with dewatered biosolids instead of liquid handling for the obvious reduction in volume and hauling cost," says Dan Riney, water quality superintendent. "At the time our fleet of tank trucks were beyond their life expectancy.

"We have enough covered concrete pad storage for an estimated year and a half of biosolids production. The original plan was to contract land-apply twice a year. A contractor would come in spring before planting and in fall after harvest. They would load the material, haul it and spread it — a turnkey operation. Then we got the idea of going to the landfill." Riney and Bob Milroy, assistant plant superintendent, raised the prospect with Brad Seward, landfill manager, who responded positively. They obtained the necessary permits from the state Department of Natural Resources and put the plan into action.

The hauling distance to the landfill is 5 miles, versus 7 miles to the farm site. "We pay a \$15-per-ton tipping fee to haul to the landfill," says Riney. "By my estimate, we are now paying about one-third what it would have cost to contract land-apply. We are saving more than \$100,000 a year."

The biosolids consist of aerobically digested waste activated sludge. Material leaving the digesters passes through rotary drum thickeners (Parkson Corp.) followed by dewatering to 18 percent solids on three banks of rotary presses (Fournier Industries). The plant's total production is about 465 dry tons per year.


During rain events at the old facility, we would wash out everything, and we would have to start all over and re-establish our floc and microbial activity. There was absolutely nothing we could do to keep the solids from going over the side and into the river." David Burn checks the polymer dosage for the biosolids presses.

blowers (Atlas Copco) and coarse-bubble diffusers (Sanitaire).

The aeration process is automated through a feedback loop. A dissolved oxygen probe (Hach Company) in each basin regulates blower activation and speed by way of upper and lower setpoints. The blowers are equipped with variable-frequency drives. The system is set to hold DO in the basins at about 2.0 mg/L.

After aeration, the flow passes to three final clarifiers (Evoqua Water Technologies). Final effluent flows to a pump station (Pentair - Fairbanks Nijhuis) and is sent back to outfall at the former facility. There is no disinfection now, but UV disinfection will be added by 2017 to comply with the consent decree.

RESULTS DELIVERED

The biggest improvement so far has been in process stability in the face of wet weather. The new plant can treat a maximum wet-weather flow of 17 mgd. As insur-

We're not in this business to lawyer up when a new standard comes down the pike. We're in this business to put out clean water."

ance against such events, the old plant's coarse bar screen, grit removal system and the three rectangular primary clarifiers have been converted to a wet-weather retention and treatment facility.

An adjustable weir can be set anywhere between 12 and 17 mgd. Any flow above the weir setting is diverted to the CSO facility for preliminary and primary treatment before discharge to the river. "There is essentially no limit on how much the old facility can take," says Riney. "We have seen more than 27 mgd."

Milroy recalls, "During rain events at the old facility, we would wash out everything, and we would have to start all over and re-establish our floc and microbial activity. There was absolutely nothing we could do to keep the solids from going over the side and into the river. It was the most helpless feeling I ever had in this business. Now we don't even have to think about it. We've experienced major rain events through this plant, and we don't even blink an eye."

Process automation and a well-trained team keep the

plant performing consistently. "The BNR process was new to everyone," says Riney. "The SCADA system was new. I can't say enough about the staff. They really did rise to the occasion." Besides Riney and Milroy, both Grade IV (highest) wastewater operators, the team includes:

- Mike Baker, pretreatment director/FOG enforcement
- · Rita Schaeffer, administrative assistant
- Jane Teney, laboratory superintendent (winner, 2011 Iowa Water Environment Association Laboratory Analyst Excellence Award) and Tracie Kelly, laboratory technician
- Plant operators David Burn, Ken Decker, Mark Krauss and Gaylon Pewe
- Maintenance operators Scott Shirley, Thomas Witt, Conner Galloway
 and Ken Jackson

- 3 Inurni
 - Collection system maintenance specialists Elijah Ball, Casey Green and Dan Millard

THOROUGHLY TRAINED

To get the team acclimated, Riney and Milroy, along with the plant equipment vendors and Lyle Johnson, process specialist with HDR, led an extensive program of classroom and hands-on training for operations and maintenance staff that ultimately encompassed more than 400 hours per person.

"The thing you have to realize is that every single part of this plant was a whole new method of doing things than we had ever done before," Milroy says. "We might have had a basic idea of grit removal, but this was a totally different kind of grit system. Oxidation ditches are similar to activated sludge, but they work a lot differently. All the technology was new to everybody.



It was as new to me as it was to them. It was a matter of working through it together."

The plant was constructed on a 32-month cycle, and the training began about halfway through. Says Riney, "We were still operating the old facility 24/7. So we shuffled guys in and out of the work schedule for training. We also made a point of taking them out every three months or so during construction and having them tour the new place. We wanted them to get a good view of the plant actually coming up out of the ground. I think that helped quite a bit with the buy-in.

"It has been challenging. Let's face it — nobody likes change. The staff was a little fearful, but some have been at this for quite a while, and the practices and principles weren't necessarily new. My hat is off to them for the way they embraced the change. I know they take a lot more pride in this facility than in the old one."

TAKING PROPER CARE

Operators are now more involved in basic housekeeping and light planned maintenance (like fluid checks and filter changes) than in the past. Major items like pump and motor rebuilds will remain the province of the maintenance staff. A computerized maintenance management system (AllMax Software) automatically churns out work orders. Plant team members shown outside the main building at the old plant are, front row, from left: Tracie Kelly, Rita Schaeffer and Jane Teney; back row, Mike Baker, Conner Galloway, Casey Green and Ken Jackson.

The team's biggest challenge was learning the SCADA system (with Wonderware software from Invensys). Automation at the old plant consisted of one programmable logic controller. Now operators can monitor and control the plant from human-machine interfaces in any of five locations, one in each building.

The plant is staffed seven days a week, eight hours a day. In the off hours, an on-call operator can access the SCADA system using a smartphone and in most cases address issues without reporting to the plant. "We went the smartphone route instead of a laptop because the on-call operator might want to go out to dinner with his family, and this way he's not lugging a laptop around," Milroy says.

GETTING NOTICE

Since startup, the Clinton plant has been earning recognition from multiple directions. Adam Schnieders, lead author of the Iowa DNR's Nutrient Reduction Strategy, nominated the plant for the Governor's Award, "because we were the first and I believe we are still the only BNR facility in Iowa," says Riney, the 2004 winner of the William D. Hatfield Award from the Iowa Water Environment Association.

The plant also has won the 2013 Project of the Year Award in the \$25 million to \$75 million category from the Iowa Chapter, American Public Works Association. In addition, it received a Grand Conceptor Award from the American Council of Engineering Companies. Clinton, Camanche and Low Moor earned a 2013 All Star Community Award from the Iowa League of Cities for their cooperation in completing the plant project.

An essential lesson from the experience with the plant is that nutrient removal should not be an object of dread, Riney and Milroy agree. "It's not the biological nightmare that people are afraid of," says Riney. "A lot of folks are fighting it. There are court actions against it.

"But we're not in this business to lawyer up when a new standard comes down the pike. We're in this business to put out clean water. Just go ahead and do it. Don't be afraid of it. It is part of the obligation we have to the environment." **tpo**

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To the Airwaves

A LOUISIANA WATER SYSTEM REAPS IMMEDIATE SAVINGS BY REPLACING A HARDWIRED PHONE CONNECTION WITH RADIO TRANSMITTER SYSTEM FOR COMMUNICATION BETWEEN TWO WELLS

By Steve Rice

he three most important factors in real estate are location, location and location. Apparently the same is true of telephone lines, based on the experience of the Sieper Area Water System (SAWS) in rural Rapides Parish, La.

The water system has two wells and a water tower to serve its 1,200 residents. The wells were connected to the water tower by a leased telephone line that carried the signal to activate and deactivate the pumps based on tank water level.

But since the line skirted two telephone exchanges, it cost about \$250 per month. In September 2013, SAWS eliminated that cost by replacing the hard-wired connection with a radio transmitter system. The savings on phone charges paid back the investment in one year.

TIME FOR A CHANGE

In the SAWS network, Well No. 1 is next to the water tower, which is equipped with a float switch. When the water level drops below that switch, a contact closure turns that well pump on. At the same time, under the old system, a voltage change was sent along the telephone line to Well No. 2, about half a mile away, starting that well's pump to help fill the tank.

n addition to fast payback, quick installation and reliable service in all weather, the wireless system allows for future expansion.

When the water in the tank reaches an adequate level, another float switch signals a contact closure at the tank, turning off Well No. 1, and again a voltage change was passed along the phone line to shut off the Well No. 2 pump.

The equipment was robust and working well but was expensive to operate. In addition, the phone line was vulnerable to severe weather, such as ice storms and hurricanes.

GOING WIRELESS

In investigating wireless communication, SAWS leaders considered it prudent to keep as much of the existing system as possible, including the contact closures and float switches. One challenge was that the voltage change passed along the telephone line was at 48 volts, far above the 0-5 volts DC typically used for sensors and relays. SAWS chose to keep the high-voltage capability, as replacing it would add cost and complexity. A TeleSwitch (Ritron) receives and decodes the DTMF tones sent from an RQT unit and opens the appropriate relays to start or stop well pumps.

Now the signals to start and stop the well pumps are sent by a Ritron QuickTalk RQT, a 2-watt industrialgrade radio transmitter with switch inputs and voice storage capability. A high-voltage relay capable of detecting a voltage change and converting this into a simple contact closure is now installed between the 48-volt DC power source and the Ritron QuickTalk at Well No. 1. The contact closure output feeds into the ROT switch input, and a change in the state of the switch tells the ROT to transmit. It then encodes and sends DTMF tones to Well No. 2.

The signal is received at Well No. 2 by a Ritron TeleSwitch with built-in relays. The TeleSwitch receives and decodes the DTMF tones and opens the appropriate relay to start the well's pump.

When the tank water reaches the desired level, the process is reversed. A float level switch triggers a contact closure to shut off the Well No. 1 pump, which sends another voltage change to the relay, which converts it to a contact closure fed into the RQT switch input. The RQT transmits, encoding and sending a different set of DTMF tones to Well No.





A low-level switch triggers a contact closure that feeds into this Ritron RQT 2-watt industrial-grade radio transmitter, which then encodes a signal and sends DTMF tones to the well pump.

2. There the TeleSwitch receives and decodes the DTMF tones, closing the appropriate relay to turn off the pump.

SAVINGS RING TRUE

The new system cost about \$3,000 and was installed in one day. Once it became operational, SAWS canceled the lease on the telephone line, saving \$250 per month. In addition to fast payback, quick installation and reliable service in all weather, the wireless system allows for future expansion.

SAWS plans to build another well and has already purchased the land. When the new Well No. 3 is drilled and brought online, it will be easily added to the system. Another RQT will signal a TeleSwitch at Well No. 3, and an alternating relay will allow Well No. 2 and Well No. 3 to engage alternately to help Well No. 1 fill the tank.

Local equipment company Mid-State Communication Services was helpful throughout the wireless conversion. In fact, it was the company's relationship with the local fire department that began the process. "Although the system is fairly rudimentary, there were some quirks, like the 48-volt



The wireless system had a payback of less than a year and allows future expansion.

voltage change," says Mid-State representative Frank J. Coe. "Once we found a relay that would accept that voltage and transform it to a contact closure, we were off and running."

HOW IT WORKS

SAWS officials opted for the 2-watt transmitter because of its 1-mile line-of-sight capability, though the heavily forested and hilly terrain required an upgrade to directional, high-gain Yagi antennas. The antennas operate on a UHF frequency in the 450 MHz spectrum, although VHF (150-165 MHz) and VHF License Free MURS (5 preselected MURS) are also available.

Housed in a gasketed and sealed polycarbonate enclosure with builtin mounting flanges, the RQT in Rapides Parish is powered by a 110volt AC adapter but also has batteries in case of power failures.

Although SAWS does not use the RQT's voice recorder function, each switch/sensor circuit can also be coupled with a unique voice recording that is broadcast when the switch/sensor state changes. For example, SAWS officials could receive a broadcast message on their hand-held (or base station) radios whenever the pump from Well No. 2 was signaled to start.

The Ritron TeleSwitch is a radio-controlled remote switch that includes a built-in VHF or UHF radio, RF telemetry radio and a dual-relay DTMF decoder. The decoder board responds to predetermined DTMF tones to activate or deactivate one or both relays, which in turn are hardwired to the pump at Well No. 2.

All electronics are housed in a sealed enclosure. Hardwire connection of an external device is made via Heyco strain relief. Each TeleSwitch includes an antenna with BNC, AC power supply and a narrow-band compliant DTX Series RF telemetry module.

SAWS officials have found that wireless radio controls offer a simple, economical alternative to leased phone lines. The new system, with its quick payback, helps the agency set aside money to fund the new well and seamlessly integrate it with the system.

ABOUT THE AUTHOR

Steve Rice is president of Ritron, a designer and manufacturer of twoway radio equipment and systems based in Carmel, Ind. He can be reached at 800/872-1872. tpo

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Where Do Chlorides Come From?

WHEN EXCESSIVE SODIUM AND CHLORIDE APPEAR IN SOURCE WATER FOR A DRINKING WATER SYSTEM, IT'S IMPORTANT TO PINPOINT THE SOURCE AND EXPLORE OPTIONS FOR TREATMENT

By John Rowe, Ph.D.

eaders of a small community water system in Florida inquired with specialists and Florida Gateway College about the origin of chlorides in source water.

College representatives explained that the majority of chloride ions found in groundwater near the coast are of marine origin. Chloride ions can be introduced to groundwater through mixing with salt water, either as lateral intrusion from saline water bodies or as highly mineralized water up-coning from deeper aquifers.

Sodium and chloride also occur in domestic wastewater, which means finding their source is important: Their presence may indicate nearby improper disposal of sewage. Elevated sodium and chloride must be considered an indication of increased risk of more serious bacterial or chemical pollution until a more detailed analysis identifies the actual origin.

FINDING THE SOURCE

Chloride concentrations in groundwater worldwide average close to 6 mg/L. Chlorides in Florida's groundwater are significantly higher because of saltwater intrusion and a marine aerosol effect. The average chloride concentration in seawater is 19,000 mg/L. The drinking water standard for chloride is 250 mg/L. At concentrations above 250 mg/L, chloride can impart a salty taste. Elevated sodium and chloride increase water's ionic conductance, and thus increase the potential for corrosive water damage to plumbing fixtures.

Sodium and chloride also occur in domestic wastewater, which means finding their source is important: Their presence may indicate nearby improper disposal of sewage.

The college explained to the community that its raw water source in the Floridan aquifer system moves from areas of high potential head to areas of low potential head. The potentiometric surface in 1960 ranged from more than 60 feet above sea level to about 30 feet above sea level in the depression in the south-central part of the county. In 1999, the potentiometric surface ranged from about 53 feet above sea level to 17 feet above sea level within that depression.

A comparison of 1960 potentiometric surface with that of 1999 showed that heads in most of the county had declined from 5 to 26 feet since 1960. The degree of decline in the potentiometric surface varies depending on the location. Long-term hydrographs of Floridan aquifer system monitoring wells indicate a downward trend of water levels in many wells in the county. Water levels showed declines of about 25 to 30 feet from 1940 to 2001.

The potentiometric surface of the Floridan aquifer system has gradu-

ally declined primarily as a result of increased pumping. Associated with this decline has been increased potential for movement of saline water into the freshwater zones of the aquifer system. Gradual but continual increases in chloride in water from the aquifer have been observed in a number of wells in the county. The potential for saltwater intrusion is expected to increase as population growth places greater demands on groundwater resources of northeastern Florida.

CONTROLLING CONCENTRATIONS

Chloride concentrations also have increased with time. At present, chlorides in samples from only a few wells exceed the 250 mg/L. However, continued declines in aquifer water levels increase the risk of further water-quality degradation. As water levels have declined about 24 feet in 70 years, chloride concentrations have increased by 63 mg/L.

The U.S. EPA has set a maximum contaminant level of 250 ppm chloride, which is the point at which water starts to taste salty. Typical background levels of sodium and chloride are less than 20 mg/L. At present, there are no health-based standards for sodium or chloride under the Federal Safe Drinking Water Act.

Normally, the best method to control sodium and chloride in drinking water is to better manage activities that add salt in the recharge area of the water supply source. A water resource management plan is paramount if saltwater intrusion is to be avoided. However, there are drinking water

treatment technologies that will remove chloride.

Reverse osmosis (RO) places water under pressure against a special membrane. The membrane allows water molecules to move through but prevents the passage of salt and other dissolved minerals. However, RO for high-volume needs is inefficient and costly.

Distillation first boils water to produce steam. The

steam is then condensed to produce purified drinking water. Salts and other mineral impurities stay in the boiling chamber, which requires periodic cleaning to remove the accumulated minerals. Distillation is not effective for organic contaminants. It is also costly to operate and is only feasible for small volumes.

Deionization is a method similar to water softening, but this process uses strong acids and bases rather than salt to regenerate the system. It is an effective method for removing chlorides from raw water. Bottled water is also an option while long-term treatment solutions are being investigated.

ABOUT THE AUTHOR

John Rowe, Ph.D., is a professor of water resources at Florida Gateway College in Lake City, Fla. He can be reached at john.rowe@fgc.edu. tpo





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A Step Ahead

INSTEAD OF WAITING FOR TOUGHER NITROGEN PERMIT LIMITS, OPERATORS IN ASHEBORO, N.C., PROACTIVELY ADVANCED THE NUTRIENT REMOVAL CAPACITY OF EXISTING PLANT AND EQUIPMENT

STORY: Ted J. Rulseh PHOTOGRAPHY: Al Drago

MIKE WISEMAN AND HIS OPERATIONS TEAM KNEW THEY WOULD FACE A TOTAL nitrogen limit in their new permit, due in 2016.

So, instead of waiting to see the actual limit, and instead of resigning themselves to a costly plant upgrade, they set out last year to see how low they could push nitrogen output at the Asheboro (N.C.) Wastewater Treatment Plant with a biological nutrient removal process using existing equipment.

They've driven it down as low as 5 mg/L with adjustments to the aeration schedule and the addition of a carbon source supplied by a food producer. And they've done it while facing other challenges that go with operating a 9 mgd (design) plant that has seen its average flow drop from 6 mgd to 3 mgd after the closing of local industries.

The team's innovations have earned recognitions that include:

• A 2010 Central Region Operations and Maintenance Excellence Award from the North Carolina American Water Works Association and Water Environment Association

- A 2010 Wilbur E. Long Operator of the Year Award from the same organization for John Stake, assistant plant manager
- A 2013 Wilbur E. Long Operator of the Year Award for Chris Schadt, lead operator

MULTISTEP PROCESS

The Asheboro plant was built in 1962 with primary settling tanks and trickling filters. Upgrades followed in 1975, 1986 and 1996. The 1986 upgrade added an activated sludge process for ammonia removal to meet federal Clean Water Act requirements, according to Wiseman, plant manager.

In today's process, influent passes through an automatic-cleaning Flex Rake bar screen (Duperon Corp.) installed six years ago. "It picks up anything from household toilet paper to tree limbs and tires," says Wiseman.

Proud of their product, John Stake, Chris Schadt and Mike Wiseman watch final effluent on its way to Hasketts Creek from the Asheboro Wastewater Treatment Plant.

City of Asheboro (N.C.) Wastewater Treatment Plant

 BUILT: | 1962, upgraded 1975, 1986, 1996

 POPULATION SERVED: | 25,000

 EMPLOYEES: | 30

 FLOWS: | 9 mgd design, 3 mgd average

 TREATMENT LEVEL: | Tertiary

 TREATMENT PROCESS: | Extended aeration activated sludge, sand filtration

 RÉCEIVING WATER: | Hasketts Creek

 BIOSOLIDS: | Land applied

 ANNUAL BUDGET: | \$2.5 million (operations)

 WEBSITE: | www.ci.asheboro.nc.us

 GPS COORDINATES: Latitude: 35°45′58.40″ N; longitude: 79°47′08.89″ W



If you look back 10 years, our flow was 70 percent industrial and 30 percent domestic. Now it's flip-flopped — we're 70 percent domestic and 30 percent industrial. Ten years ago, our average flow was 6 mgd. Now we're treating 3 mgd." MIKE WISEMAN

"Since it has been in service, we haven't had to do a thing to it."

The wastewater then passes through grit removal (PISTA grit system from Smith & Loveless), six rectangular primary clarifiers with chain and flight scrapers and three trickling filters (Ovivo), two from the original plant and one added in 1986.

After passing through four secondary clarifiers with the same mechanical system as the primaries, the water is lifted by Fairbanks-Nijhuis pumps to the two aeration basins (Schreiber). Six 40 hp blowers (Aerzen) and three centrifugal blowers (Hoffman & Lamson) — two 300 hp units and one 85 hp — provide airflow. New fine-bubble diffusers (Schreiber) were installed two years ago.

After aeration, the flow passes through three final clarifiers (Envirex/ Evoqua Water Technologies) and a DynaSand deep-bed sand filter (Parkson Corp.) before discharge to Hasketts Creek.

IMPACTS OF ECONOMY

For years, the plant hummed along, taking a substantial industrial flow along with domestic wastewater from a population of about 25,000. Then the economy took a turn, and textile plants that formed most of the industrial base began moving out.

"If you look back 10 years, our flow was 70 percent industrial and 30 percent domestic," says Wiseman. "Now it's flip-flopped — we're 70 percent domestic and 30 percent industrial. Ten years ago, our average flow was 6 mgd. Now we're treating 3 mgd."

That has posed significant challenges. "In losing half our flow, we also lost a lot of alkalinity," says Wiseman. "Now we have lower-pH influent com-

City of Asheboro (N.C.) Wastewater Treatment Plant PERMIT AND PERFORMANCE			
	INFLUENT	EFFLUENT	PERMIT*
BOD	326 mg/L	2.5 mg/L	5.0 mg/L Apr-Oct 10.0 mg/L Nov-Mar
TSS	374 mg/L	3.6 mg/L	30 mg/L
Ammonia	20 mg/L	0.15 mg/L	2.0 mg/L Apr-Oct 4.0 mg/L Nov-Mar
Total N	40 mg/L	4.0 mg/L	Monitor
Total P	7.5 mg/L	0.2 mg/L	Monitor
Fecal coliform		7.7/100 mL	200/100 mL

*Monthly averages



Members of the Asheboro team include, from left, Chris Schadt, lead operator; Mike Wiseman, plant manager; and John Stake, assistant plant manager.

ing in. The textile makers had been sending us chemicals and solids that were high in pH, and we didn't have to add alkalinity to sustain our process. We had been averaging pH 7 to 7.5. When the textile mills left town, our pH dropped to 6 to 6.5. We had to find a chemical to supplement that cost-effectively."

They tried caustic soda until a team member was injured in handling it, then switched to magnesium hydroxide — safer and effective, but costly. "Now we use a lime slurry, which is very cheap and does exactly what we need it to do," says Wiseman.

LOW-FLOW CHALLENGES

The flow reduction alone required process adjustments. "When we lost half our flow, the detention time through the plant increased more than twofold," Wiseman recalls. "We



went from 24 hours to about 52 hours. That created an issue with tanks going septic." In addition, the trickling filters removed BOD so effectively that too little nutrient was available to feed the microorganisms in the aeration basins.

They experimented with taking tanks out of service to shorten detention times. "But when you take tanks offline, if you don't exercise the mechanics in them, they can rust up and freeze," Wiseman says. "In addition, it's difficult to put tanks back into service, and we have a big problem with I&I. In a high-flow situation we could go from 3 mgd to 20 mgd in about two hours, so the operators were scrambling to put tanks back online so we could handle the flows without losing solids from the aeration basins."

Another challenge related to the solids process: Biosolids were batch-fed to the belt filter presses for dewatering and the filtrate sent back to the head-works. "At 6 mgd, the flow gave us enough dilution so that the high-ammonia filtrate didn't cause problems as it went through the plant," says Wiseman. "But at 3 mgd, it caused huge spikes in air demand, and we ended up with more ammonia leaving the plant than we cared for."

So in 2010, Stake stepped up with a plan to use a primary clarifier that had been taken out of service as an equalization basin for the press filtrate. "Now we pump our filtrate to that empty tank and use a pump to feed it into the process at a steady rate," Wiseman says. "So instead of having slug loads of filtrate going through and disrupting the process, we are feeding in a low dose all the time. It has helped tremendously.

"The tank also serves as an equalization basin during high flows. At 275,000 gallons, it doesn't last long at high flows, but it does enough to take the edge off. Most of our high flows are short-lived — two hours or less."

THE NITROGEN CHALLENGE

Perhaps the biggest challenge still lies ahead. Plant personnel expect the plant's 2016 permit to include a total nitrogen limit. Schadt, lead operator, observes, "We had been averaging about 20 mg/L total nitrogen leaving the plant. Facilities similar to ours that have a nitrogen limit are at about 4 to 5 mg/L. We're looking to reduce ours down to something close to what we think our permit might be.

"We wanted to be proactive in what we could do with the tanks and equipment we had and see if it was possible to get our nitrogen down. If not, we

THE ASHEBORO TEAM

Thirty people manage, operate and maintain the Asheboro Wastewater Treatment Plant.

Michael Rhoney is the city's Water Resources Director; Wendy Sawyer is office assistant.

Besides Mike Wiseman, plant manager, John Stake, assistant plant manager, and Chris Schadt, lead operator, the plant team includes operators Tim Williamson, Tommy Joyce, Greg Hamilton, Greg Abernethy, Bruce Tuttle, Andrew Marley and Travis Rich. The technical services staff includes Michele Dawes, manager; and Sarah Warner, specialist.

Other team members are:

Systems maintenance: Jeff Cagle, manager; Barry Lewis, assistant manager; Bryan Reeder, Jerry Cox, Travis Phillips, Bobby Cain, Travis Joyce, Chuck Jordan, Richard Stanley and Rodger Davis, mechanics.

Water quality (laboratory): Bernadine Wardlaw, manager; Judy Smith, assistant manager; Dina Tutterow and Jay Ledwell, lab technicians; and Joe Thatcher, biologist.

would be looking at some kind of upgrade, probably costing upward of a million dollars."

The key was to establish an effective nitrification-denitrification process in the circular aeration basins, which include a traveling bridge and perimeter air diffusers. That in turn depended on creating an anoxic zone where denitrification could occur.

"In reading and talking to equipment manufacturers, we learned that by cutting the air off for a specified period, and then aerating for a specified period, we could achieve the necessary conditions," says Schadt. "We then discovered that we didn't have enough carbon source to allow the microor-

THE SOLIDS SIDE

While fine-tuning the biological nutrient removal process, the Asheboro treatment plant team is also exploring innovations on the solids side of the process.

The plant has two 400,000-gallon anaerobic digesters. Digested biosolids are dewatered on a pair of belt filter presses (Alfa Laval Ashbrook Simon-Hartley) to 20-21 percent solids. Contractor Synagro land-applies the cake. Biogas fuels boilers that heat the digestion process by way of heat exchangers. About 20 percent of the biogas is flared.

"Right now we are bidding out a new gas holder cover for one of our digesters," says Mike Wiseman, plant manager. "The old one was installed in 1962 and has reached the end of its life. The digesters now use a mesophilic process at 99 degrees F.

"With the new cover, we hope to go to thermophilic digestion, which operates at about 130 degrees F, and then feed grease and oils into it. Another possibility is a food-to-fuel program, where we would collect and co-digest food scraps from local schools and restaurants. We're also looking at feeding our excess sugar water directly to the digesters to generate even more methane. The additional gas would allow us to run a generator to provide power for the entire plant.

"A bonus benefit of going to thermophilic digestion is generating Class A biosolids, a product we could possibly sell to the public. There are all kinds of possibilities."

We wanted to be proactive in what we could do with the tanks and equipment we had and see if it was possible to get our nitrogen down. If not, we would be looking at some kind of upgrade, probably costing upward of a million dollars." CHRIS SCHADT

ganisms to feed and drive the oxygen down.

"Fortunately, we have a cereal company in Asheboro, MOM Brands, that has a sugar water byproduct. We were able to work out a deal where we receive that byproduct in tanker form to use as our carbon source. Using one of our old existing caustic soda tanks and a pump from one of our old plate-andframe dewatering presses, we put together a feed system for the sugar water. We feed it continuously at 1 to 2 gpm, depending on the strength of the sugar water. By trial and error, we came up with feed rates that work."

The process is simple: The air is on for two hours (nitrifying), then cut off for two hours (denitrifying). That amounts to eight four-hour on-off cycles over a 32-hour detention time in the basins. At present, while the system is still in an experimental stage, control is manual. "Now is the time to experiment, since we don't have a permit limit yet," says Schadt. "Right now, we're trying to adapt the process to cold weather."

SATISFYING OUTCOME

While dropping effluent total nitrogen from 20 mg/L to 4 mg/L, the biological nutrient removal process has affected phosphorus, as well — that parameter has dropped from 1 mg/L to 0.2 mg/L, measured after sand filtration. "We're still trying to fine-tune the process," Schadt says. "If we can cut the nitrogen in half from where we are now, that would be great."

Wiseman calls the arrangement with MOM Brands a win for the com-



Mike Wiseman inspects the facility's Schreiber Counter Current Aeration system.

To learn more about the Asheboro Wastewater Treatment Plant, view the video at www.tpomag.com.

pany, the plant and the community: "They had been using a private con-

tractor to dispose of the sugar water. We needed a carbon source to make our biological nutrient removal work. They first gave us samples so we could experiment with it. When we proved it could work, we sat down with them and worked out an arrangement that was beneficial to everybody. It is a very good example of a treatment plant and an industry working together.

"We've got about \$150,000 invested in our BNR system, versus having to do a major plant upgrade. And it was all done inhouse." It simply proves once again what can happen with a little operator ingenuity. **tpo**

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Education Day Sessions

Monday, February 23, 2015

NAWT

National Association of Wastewater Technicians Room 234-236

8 a.m.	Pre-Trip Inspections
9:30 a.m.	Hours of Service (HOS) Overview
11 a.m.	Roadside Inspections
1:30 p.m.	Environmental Impact Study: Effects of
	Water Softener on Septic Tank Performance
3 p.m.	A Study of Microbiological Induced Corrosion
4 p.m.	Ask the Expert Q & A

WJTA-IMCA

Water Jet Technology Association Industrial Municipal Cleaning Association Room 140-142

8 a.m.	Hydroexcavation — Tools to Stay Current
	in a Changing Marketplace
9:30 a.m.	Maximizing Productivity on Vacuum/
	Air Mover Projects
11 a.m.	Waterblast Safety Can Enhance Productivity,
	Quality and Profits!

SSCSC

Southern Section Collection Systems Committee Room 231-233

8 a.m.	Combination Vacuum Unit Operation Overview
9:30 a.m.	Been There, Done That, Got The T-Shirt
	(Small Business From a Hands-on Perspective)
11 a.m.	So You Think You Are the Best?
	CCTV Inspection In Its Highest Form
1:30 p.m.	Avoid the Pitfalls — Trenchless Pipeline Repair
	and Renewal
3 p.m.	NOZZLES, NOZZLES, NOZZLES!
4:30 p.m.	Ask the Experts Q & A

SSPMA

Sump and Sewage Pump Manufacturers Association Room 243-245

1:30 p.m.	Sizing Guidelines for New or
	Replacement Sewage Pumps
3 p.m.	Backup Battery and Combination Pump Systems
	Evaluation and Installation
4 p.m.	Specifying Pumps: Why Do Pumps Fail?

NASSCO

National Association of Sewer Service Companies Room 130-132

8 a.m.	Overview of Manhole Rehabilitation Technologies
9:30 a.m.	When, Why and How to Defeat
	Infiltration Cost Effectively
11 a.m.	New Opportunities in Small-Pipe Relining
	and Reinstatement
1:30 p.m.	Pipeline cleaning Best Practices
3 p.m.	Large-Diameter Pipe and Drain Rehabilitation
-	Technologies
4:30 p.m.	Ask the Experts Q & A

NEHA

National Environmental Health Association Room 237-239

8 a.m.	New Technologies for Non-Potable Water Use
9:30 a.m.	Rules & Regulations with New Technologies
	and Working with Regulators
11 a.m.	New Technologies for Non-Potable Water Use Part 2
1:30 p.m.	OSHA Regulations and Smart Business
3 p.m.	Sales & Marketing with New Technologies
4 p.m.	Ask the Experts Q & A

NOWRA

National Onsite Wastewater Recycling Association Room 240-242

8 a.m.	Lobbying
9:30 a.m.	Field Inspections Part One
11 a.m.	Field Inspections Part Two
1:30 p.m.	Septic Tank Safety — Lethal Lids
3 p.m.	Time Dosing
4:30 p.m.	Ask the Experts Q & A

Portable Restroom Track

Beverly Lewis Room 243-245

8 a.m.	Mastering the Busy Season
9:30 a.m.	A Great Customer Experience
11 a.m.	Employee Retention and Recruitment

Business Track

Kelly Newcomb, Ellen Rohr, Women's Roundtable Room 136-138

8 a.m.	Grow or Go! Why Most Companies Fail to Grow
	Effectively and What You Can Do to Keep
	Your Company From Failing
9:30 a.m.	Target Marketing: How to Effectively and
	Efficiently Grow Your Sales
11 a.m.	Effective Branding and How it Can Help Your Business
1:30 p.m.	Business Basics 101
3 p.m.	Build the Business You REALLY Want
4:30 p.m.	Women in Wastewater Roundtable Discussion

Gil Longwell Room 140-142

1:30 p.m. Protecting Private Enterprise

Mark	eting Track
Susan Chin Room 13	33-135
8 a.m.	Ladies and Gentleman: Create Your Personal Brand and Strategic Network for Success in 5 Easy Steps
9:30 a.m.	Effective Website Design and Engaging Customers in the Digital Age
11 a.m.	Tapping into the Power of Social Media and Content Marketing
Road	Rules & Safety Track
John Conley Room 13	33-135

1:30 p.m.	A Trucker's Guide to Washington Speak
3 p.m.	Cargo Tank Safety and Regulatory Report
4:30 p.m.	Compliance with Part 180 and Preparing for
	a Tank Truck CT Shop Audit

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Tuesday Sessions

Detailed session information available at: wwett.com

February 24, 2015

NAWT Track

Room 234-236

8 a.m.	Septage Processing Introduction:
	Working with an Engineer
9:30 a.m.	Analyzing Your Resources:
	What Goes on Around You is Important!
11 a.m.	Introduction to Odor Control

Installer Track

Room 231-233

8 a.m.	Soils, Design, O&M: What Every Installer
	Should Know
9:30 a.m.	Best Installation Practices for Trouble-Free Pump Controls
11 a.m.	Introduction to Effluent Filters

MSW Track

Room 237-239

8 a.m.	Mapping Solutions for Repair and
	Maintenance of Water Distribution Systems
9:30 a.m.	The Shift from Reactive to Proactive
	Wastewater Management Best Practices
11 a.m.	Why Hasn't Your Sewer System Evaluation
	Survey Testing Worked?

Treatment Plant Operator Track

Room 240-242

8 a.m.	An Emerging Technology for Lagoon-Based
	Nutrient Removal
9:30 a.m.	The New Wastewater: Collection System
	Challenges Caused by Today's Modern Trash
11 a.m.	Wastewater Microbiology

Industry Safety Track Room 243-245

8 a.m.	New Trends and Technology in Equipment
	for Excavation Safety
9:30 a.m.	Best Practices: Use, Care and Repair of
	High-Pressure Sewer Cleaning Hose
11 a.m.	Development and Execution of a Cross-Bore
	Prevention Program
9:30 a.m. 11 a.m.	Best Practices: Use, Care and Repair of High-Pressure Sewer Cleaning Hose Development and Execution of a Cross-Bore Prevention Program

Business Track Room 130-132

8 a.m.	How to Position Your Company in the Market Today
9:30 a.m.	Six Proven Tactics to Generate Leads and
	Turn Them Into Revenue
11 a.m.	Growth by Acquisition or Exiting Gracefully:
	Buying or Selling a Septic or Sewer Business

Cleaner Track Room 133-135

8 a.m.	Drain Cleaning Methods - Then and Now
9:30 a.m.	The Physics of Pipe Cleaning Tools and
	How I Make it Work for Me
11 a.m.	Lateral Lining — Are You Using the Right Tool?

Industry Technology Track

Room 136-138

8 a.m.	How to Manage Septic Systems
	using Remote Monitoring
9:30 a.m.	GPS Tracking: Hype Vs. Reality
11 a.m.	Wireless Controls in the Waterjet Industry:
	Sacrificing Safety for Convenience

Pumper Track

Room 140-142

8 a.m.	True Crime Scene Stories: How to Inspect
	and Troubleshoot Suspect Onsite Systems
9:30 a.m.	One Man's Waste is Another Man's Treasure
11 a.m.	Dewatering Options for Roll-Off Containers



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Wednesday Sessions

Detailed session information available at: wwett.com

February 25, 2015

Pumper Track Room 140-142

8 a.m.	Considerations in Building Your Next Vacuum Truck
9:30 a.m.	Grease Collection and Treatment:
	Raising the Bar Via Resource Recovery
11 a.m.	Analyzing Common Onsite Septic System
	Malfunctions and Options for Prevention & Correction

MSW Case Study Track Room 231-233

8 a.m.	Retrofit of the Lansdowne Sanitary P/S
9:30 a.m.	Huntington Beach Successfully Navigates
	Emergency Repair of Fragile Storm Drain
11 a.m.	Collection System Rehabilitation —
	Alternative Technology

MSW Technology Track

Room 237-239

8 a.m.	Implementation of Acoustic Inspection Technology
	at the City of Augusta
9:30 a.m.	Highlights from the 7th Edition of Operation
	and Maintenance of Wastewater Collection
	Systems Manual
11 a.m.	Technological Advancements Fulfill the
	Promise of Zoom Survey Paradiam

Portable Sanitation Track

Room 136-138

3 a.m.	Portable Sanitation - Special Events
):30 a.m.	Making Your Portable Restroom Business Lean
	and Mean — How to Boost Productivity and
	Increase Your Bottom Line
1 a.m.	Building and Coaching Your Portable Sanitation Team

Treatment Plant Operator Track

Room 240-242

a.m.	Utility Regulation Basics for Grease Haulers
:30 a.m.	The Waste in Our Wastewater
1 a.m.	Security Issues and Best Practices for Water/
	Wastewater Facilities

Pipe Rehab Track Room 243-245

8 a.m.	Integrating Temperature Sensor Technology within Lateral Pipeline CIPP Installations
9:30 a.m.	CIPP Calibration and Vacuuming
11 a.m.	Extending Life Expectancies with Corrosion-
	Resistant Coatings and Linings

Business Track Room 133-135

8 a.m.	Team Building for Profit
9:30 a.m.	Ten Commonsense Ways to Grow and
	Improve Your Business
11 a.m.	Setting Expectations — The Key to Sales
	and Customer Satisfaction

Advanced Installer Course Room 234-236 8 a.m. - 5 p.m.

- Introduction and Site Evaluation
- System Sizing and Basic Design Principles
- Pumping to Systems
- Installations of ATUs
- Installing for Management
- Troubleshooting Systems

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The bird viewing preserve ponds (irregular-shaped) are shown in the foreground. The water reclamation facility is at the upper left. The rectangular lagoons in upper right are no longer in service.

Creating an Oasis

HENDERSON'S TREATMENT PLANT PONDS PROVIDE SUPERB BIRD WATCHING AND WILDLIFE VIEWING IN THE MIDDLE OF SOUTHERN NEVADA'S DESERT COUNTI

By Jeff Smith

he two lagoons that made up the Henderson Wastewater Treatment Plant during the 1980s were merely well-manicured evaporative and percolating ponds serving a Nevada community of about 25,000.

Today those ponds are part of a nine-pond outfall system at a modern 32 mgd activated sludge facility that treats wastewater for more than 275,000 residents and entertains bird watchers and other outdoor enthusiasts from all over the world.

"No one would have believed it would become so popular," says Adrian Edwards, manager of water and wastewater operations. Covering more than 100 acres and located about 20 minutes southeast of Las Vegas, the ponds attract nearly 290 species of migratory and local birds, along with coyotes, raccoons, opossums, rabbits, snakes and other wildlife. More than 10,000 people visit the ponds each year.

CONVENIENT TRAILS

Formally known as the Henderson Bird Viewing Preserve, the ponds attract birds such as Abert's towhee, Gambel's quail, crissal thrasher, greater roadrunner and black-tailed

gnatcatcher. More than 7 miles of natural, graveled and asphalt trails provide visitor access. A 20-foot-tall observation tower, six duck blinds and a 40-foot-long, 8-foot-wide dock provide viewing spots.

The site includes more than 10 rest areas with benches. For those who choose not to travel by foot, a custom-made golf cart called the "Bird Mobile" hauls six visitors at a time on guided tours. A map of the world that hangs on a wall in a nearby welcome center has pins that identify visitors' homelands.

"It wasn't always like this," says Edwards. Years ago, the original two ponds created one of the largest bodies of water in the southern Nevada desert. Gradually, natural growth of plants and trees formed a marsh habitat that attracted native and migratory birds, including 12 duck species, geese, tundra swans, raptors, flycatchers, swallows, sparrows, warblers, pied-billed and eared grebes, black-necked stilt, American avocet, common moorhen, black and Say's phoebes, and black-chinned and Anna's hummingbirds.

MAKING IT WORK

Local birders took notice, and soon the ponds became a prime birding site. But mixing plant operations with the needs of the birds was not always easy. "There is a lot of water in the ponds, and moving it around is a slow and steady process," says Edwards. "It has taken great communication between plant and parks operations to make the program work."

There is a lot of water in the ponds, and moving it around is a slow and steady process. It has taken great communication between plant and parks operations to make the program work."

> In 1994, when the new treatment facility was being built, the Red Rock Audubon Society and others petitioned the city to enhance the ponds as bird and wildlife habitat. The treatment plant staff changed some maintenance procedures, such as habitat landscape management and pond waterlevel targets. Trees and plants that improved bird habitat were added.

> "Today we treat the water and fill the ponds, then move the water around in the ponds to regulate the flow," says Lloyd Reardon, unit supervisor of wastewater operations. "We maintain the valves and piping, but the rest is handled by the Public Works, Parks and Recreation Department."

Chuck Ashby, city outdoor recreation supervisor who manages the preserve,

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The team at the Henderson Wastewater Treatment Plant includes, bottom row, from left: Janice Landers, James Brown, Frank Ficarrotta, Brian Carlson, Lee Beard, DJ McBride, Lloyd Reardon and Art Porreca; back row: Adrian Edwards, Mark Schrader, Vance Fleming, Dave Wilson, James Koloskie, Mario LaRossa, Jason Scoble, Bob Cota, Paul Neumiller, Chris Baker and Zoltan Revay.

says, "The plant operators do a great job. They do their best to accommodate our requests for lower water levels during nesting season and provide higher levels in the fall when the ducks are around."

FORMAL INSTRUCTION

A security fence separates the treatment facility from the preserve, but visitors often tour the plant to understand the source of the large volume of water, not a common sight in the desert. "We also train the Public Works, Parks and Recreation staff so they can

Share Your Ideas

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

explain where all that water is coming from," says Edwards.

Visitors can take classes conducted by staff about birding and the preserve's plants and wildlife. Popular offerings include a night birding class and Boy Scout and Girl Scout merit badge courses. "In the last quarter alone, we held 20 classes," Ashby says.

Edwards observes, "It has been an amazing transition. The quality of the water we supply to the preserve today compared to what we put out in the late 1970s is remarkable. I could never have seen it getting this good."

And the setting provides quite a contrast to its surroundings: "You can hear the slots ringing in the casinos of Las Vegas and then drive for 20 minutes and hear the birds chirping in the wild." **tpo**



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TECHNOLOGY



A Twist on Dewatering

AN ADVANCED DEWATERING TECHNOLOGY BASED ON A PISTON PRESS OFFERS HIGH-EFFICIENCY BATCH PROCESSING OF WATER AND WASTEWATER TREATMENT RESIDUALS

By Ted J. Rulseh

here are many ways to dewater residuals from drinking water treatment and wastewater treatment. Infilco Degremont offers one of the newer approaches in its Dehydris Twist technology, based on a piston press.

The technology was designed for the liquid-solid separation in the agribusiness and food processing sectors but is now being deployed in water and wastewater applications. The manufacturer states that the process is fully automated, can operate continuously with low maintenance, reaches high levels of dryness without lime addition, is energy efficient and has a relatively compact footprint.

Infilco Degremont offers the technology in a partnership with Bucher Unipektin of Germany. Hao Pham, product manager for biosolids with Infilco Degremont, talked about the process in an interview with Treatment Plant Operator.

tpo: What is the history of this technology?

Pham: What we are offering is not a novel technology but a reapplication of an existing technology. It has been used in food processing, specifically for the juicing industry, producing products like grape juice, apple juice and apple cider. It extracts the maximum juice from the fruit. So we thought, why not use the same process in water and wastewater? Here, instead of throwing away the extracted fruit pulp, we're discarding the filtrate and keeping the solids.

tpo: What percent solids can this technology achieve in the wastewater sector?

Pham: That depends on the sludge characteristics, which vary with the upstream process. For mixed sludge at 60 percent primary and 40 percent secondary, we expect to see percent dry solids in the mid- to upper-30s. If it's mixed digested biosolids, we typically see 30 percent dry solids, and we

✓ Of course, water is heavy, so dryer material means lower transportation costs and landfill tipping fees. In addition, our process yields a homogeneous material that breaks apart readily and is easy to handle and land-apply." HAO PHAM

have seen up to 34 or 35 percent. On pure biological sludge, which is the most difficult to dewater, we see dry solids in the mid-20s.

tpo: How does it perform on residuals from drinking water treatment plants?

Pham: It does very well. We did a pilot study at a plant in Seneca, S.C., that had been using a plate-and-frame filter press on a dissolved air flotation sludge with alum floc, which is tough to dewater. We achieved up to 50 percent dry solids average performance.

tpo: What are the advantages to incremental improvements in drvness?

Pham: Of course, water is heavy, so dryer material means lower transportation costs and landfill tipping fees. In addition, our process yields a homogeneous material that breaks apart readily and is easy to handle and land-apply.

tpo: Are there benefits for facilities that dry or incinerate biosolids? **Pham:** If we introduce this process upstream of thermal processes, there is a huge payback. Evaporating water requires about 1,400 to 1,500 Btu per pound. We can remove that water mechanically at a fraction of that cost. We



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did a study for a large city with an incineration process handling digested biosolids at 44 dry tons per day. They were getting 22 percent solids using centrifuges, and the fuel oil needed to achieve autothermal conditions in the incinerator cost \$2 million a year. We determined that we could mechanically dewater to that autothermal condition. That represents \$2 million in savings per year.

It's the same principle for drying. Less moisture means less to evaporate and less energy cost. In addition, less need for evaporation means you can reduce the size of a dryer, and so the capital cost to build a plant is lower. If you have an existing plant, you can increase the dryer's capacity to accommodate growth.

tpo: In summary, how does this process work?

Pham: It uses a hydraulic piston in a cylindrical chamber that rotates at 6 rpm. A batch cycle takes about two hours. The first hour is filling and pressing. The chamber fills with thickened sludge at about 3 percent solids. The piston moves to press the sludge as the chamber rotates, removing the water through polypropylene filter cloth elements strung across the length of the chamber. The water is channeled out through a polyurethane core. That process repeats until enough solids accumulate in the chamber — about one hour.

The second hour involves continuous rotation and pressing. That's where we get the additional moisture removal. The cylinder rotates until the system senses a point of diminishing returns where very little water is being removed. Then the process stops. The chamber opens but continues to rotate to break up the material inside. Meanwhile the piston pushes the material out into a container or onto a conveyor.

tpo: What is the importance of chamber rotation to the process?

Pham: While the piston presses the material and removes the water, the rotation breaks up the sludge so that the end product has consistent dryness. We remove the interstitial moisture inside the sludge. As an analogy,

consider a wet towel. If you wring it once, you remove a lot of water. But if you want to remove more moisture, you release it and re-wring it. That rewringing compares to the effect of the chamber rotation.

tpo: What operator attention does the technology require?

Pham: The process is fully automated, but operators have flexibility to choose different automatic setpoints. They can set the machine to dewater to the maximum. If they are backlogged and need to move inventory, they can set it for a lower level of dry solids and save some time. They can also program for a specific cycle time, or for a certain volume of moisture removal from a batch.

The process is fully automated, but operators have flexibility to choose different automatic setpoints."

tpo: What about operating costs, such as for maintenance and energy? **Pham:** It's a slow-moving machine, so there is low wear and tear and low electricity consumption. For processing 1,500 dry pounds per hour, the electricity usage is less than 30 kilowatt-hours.

tpo: How large is this equipment?

Pham: There are four standard sizes that range from 8.5 to 10 feet wide, from the low 20s to 30 feet long, and from 8 to 10 feet tall.

tpo: What kinds of capacities can the system accommodate?

Pham: We can process as low as 250 to 300 dry pounds per hour. Our largest unit can treat up to 1,500 dry pounds per hour, and of course users can add more machines for larger volumes. **tpo**

Getting Two for One

AS CLEAN-WATER PLANTS INCREASINGLY LOOK TO SAVE ENERGY AND MAXIMIZE ENERGY PRODUCTION, THE US EPA OFFERS ASSISTANCE ON COMBINED HEAT AND POWER

nergy is top of mind with

today's clean-water plant oper-

ators. They're looking not just to save energy but to produce it,

The most efficient way to pro-

mainly using biogas from anaero-

duce energy from biogas is combined

heat and power (CHP), also called

cogeneration. By using engines or

turbines to generate electricity, and

capturing heat from the prime mover,

plants can extract the maximum

bic digestion of biosolids.

By Ted J. Rulseh



Valerie Breznicky

energy from their biogas.

The U.S. EPA promotes biogas-fueled CHP as a source of clean, renewable energy. The agency's Office of Infrastructure and Assistance, as part of its charter, offers clean-water plants information and technical assistance on CHP projects. Valerie Breznicky, a project officer, shared information about CHP and the EPA's resources with *Treatment Plant Operator*.

tpo: What is the basic value proposition for CHP?

Breznicky: It is an efficient and clean approach to generating electric power and useful thermal energy from a single fuel source. CHP can produce energy twice as efficiently as older electric-generating systems. And because the energy is generated close to where it is needed, very little is lost in transmission. CHP can be a reliable, cost-effective option for WWTPs that have or are planning to install anaerobic digesters. For most treatment plants, a biogas-fueled CHP system has potential to offset energy consumption by up to 40 percent.

CPD: How does CHP using biogas affect greenhouse gas (GHG) emissions?

Breznicky: A CHP system can significantly reduce a plant's direct and indirect GHG emissions. According to the EPA's 2004 Clean Watershed Needs Survey data, a total of 2.3 million metric tons of carbon dioxide emission reductions could be achieved through increased use of CHP at wastewater treatment plants. These reductions

are equivalent to planting about 640,000 acres of forest, or eliminating the emissions of about 430,000 cars.

CPO: Does biogas-fueled CHP qualify as renewable energy under utility and government incentive programs?

Breznicky: Yes. The use of biogas is often eligible for renewable fuel credits and clean energy funding. For example, biogas-fueled electricity generation qualifies as a renewable energy source in the District of Columbia and the 22 states that have renewable portfolio standards. National voluntary renewable energy credit [REC] programs also consider new electricity

generation fueled by biogas from wastewater treatment plants as eligible sources for RECs.

tpo: What exactly are renewable energy credits?

Breznicky: A renewable energy credit [sometimes called a renewable energy certificate or "greentag"] is a commodity that represents the added value, environmental benefits and cost of renewable energy above conventional methods of producing electricity. Purchase of these credits is a widely accepted way to reduce the environmental footprint of a facility's electricity consumption and help fund renewable energy development.

CPO: What factors determine how much biogas and energy can be recovered from anaerobic digesters?

Breznicky: The overall energy recovery depends on a combination of factors, including the effectiveness of the digestion process, the efficiency of the CHP system, the type of treatment processes, and the efficiency of the treatment plant's liquid stream treatment. The addition of fats, oils and grease [FOG] and other highly digestible waste streams to the anaerobic digestion process can dramatically enhance digester gas production.

Regardless of their capacity, treatment plants operating or considering CHP should evaluate the potential to add FOG or other digester feedstocks to the digestion process. The increased gas production translates directly into cost offsets for electric power and greater heat production for processes. Additional process heat can offset a large portion of supplemental fuel needs.

GPO: How can a facility determine whether a CHP system would be technically feasible and economically beneficial?

Breznicky: A feasibility analysis is a first step in determining the viability of CHP. Whether a system is economically viable depends on site-spe-

A feasibility analysis is a first step in determining the viability of CHP. ... The analysis can provide enough information on project economics to allow plant personnel to decide whether to make the investment, while minimizing up-front time and expense." VALERIE BREZNICKY

> cific factors such as the facility's energy consumption, the prices of fuel and retail electricity, and the cost of installing and maintaining the CHP equipment. The analysis can provide enough information on project economics to allow plant personnel to decide whether to make the investment, while minimizing up-front time and expense. The EPA's CHP Partnership can assist with a feasibility analysis.

tpo: In summary, what does a feasibility analysis include?

Breznicky: The first step is to identify the system size and electrical demand of the treatment plant. Electrical demand can be determined from

a utility bill analysis, available plant data and site information. This information is used to determine which type of CHP technology will be best for the facility.

An economic analysis included with the study is usually a simple payback calculation. It considers the amount of power to be produced by the CHP system and the amount to be used on site, the expected savings from offsetting purchased energy, the energy and cost associated with running the CHP system, and the cost to install and maintain the system. Further analysis may show the benefits of available grants or incentives and the costs and benefits of being able to use the system to provide backup power during utility outages.

Regardless of their capacity, treatment plants operating or considering CHP should evaluate the potential to add FOG or other digester feedstocks to the digestion process. The increased gas production translates directly into cost offsets for electric power and greater heat production for processes." VALERIE BREZNICKY

CPO: What are the preferred prime mover technologies for CHP in clean-water plants?

Breznicky: Treatment facilities have successfully incorporated CHP systems using a variety of technologies. Internal combustion engines are the most widely used. Combustion gas turbines are another common technology. Microturbines, a relatively new CHP technology, have become more popular in recent years due to their clean emissions and relatively small sizes. Microturbines are fully packaged modular machines that comprise the smallest-capacity CHP units available.

CPO: What kinds of funding resources are available to support CHP project development?

Breznicky: Energy efficiency upgrades at water and wastewater treatment facilities are eligible for low-interest rate loans through the EPA's Clean Water [CW] and Drinking Water [DW] State Revolving Fund [SRF] programs. These upgrades can be individual projects or part of a larger overall upgrade.

Many states implementing the CWSRF and DWSRF programs award priority ranking points for applications that include energy-efficient upgrades and other sustainability, climate change and resiliency elements. In the past few years, the CWSRF program has required states to provide a percentage of its EPA capitalization grants to projects that meet "green reserve" criteria. These include green infrastructure, energy efficiency, water conservation and environmentally innovative projects. The priority ranking points and green reserve requirements have led to many projects receiving lowinterest financing and subsidies. General information and specific state contacts for the programs can be found at:

http://water.epa.gov/grants_funding/cwsrf/cwsrf_index.cfm http://water.epa.gov/grants_funding/dwsrf/index.cfm

GPO: What are some basic technical resources clean-water plants can turn to as they evaluate the potential of CHP?

Breznicky: An interim report, "Evaluation of Combined Heat and Power Technologies for Wastewater Facilities," serves as a planning tool and examines commonly used and emerging CHP technologies for converting biogas to electric power and process heat. The EPA has also established the CHP Partnership [www.epa.gov/chp], a voluntary program that promotes efficient CHP technologies. The Partnership works closely with energy users, the CHP industry, state and local governments, and other clean-energy stakeholders to facilitate the development of new projects and to promote their environmental and economic benefits.



LPO: What specific kinds of resources does the CHP Partnership provide?

Breznicky: It offers a variety of tools and services designed to facilitate and promote CHP development. For example, CHP project qualification tools help to determine whether CHP is worth considering at a particular facility. The CHP Emissions Calculator compares the anticipated CH_4 , CO_2 , CO_2e , SO_2 , N_2O , and NO_x emissions from a CHP system to the emissions from a separate heat and power system.

The CHP Partnership also offers resources for education and outreach, such as information for regulators, policymakers and utilities to encourage energy efficiency and CHP; peer-to-peer marketing and networking at workshops and conferences; examples of model state policies for promoting CHP; information about CHP markets; and topical email announcements highlighting Partnership activities, funding opportunities and upcoming events.

Other resources include information about the CHP project development process, including access to tools and recommendations to facilitate successful projects, information about CHP prime movers including cost and performance characteristics, current information on state and federal incentives applicable to CHP, and technical white papers and other clean energy resource documents.

LPD: In a nutshell, what words of encouragement would you offer to clean-water agencies considering CHP?

Breznicky: As a cost-effective means of making energy-efficiency gains, CHP represents a tremendous opportunity. The ability to add this technology to a wastewater treatment plant — and the benefits that can be gained through energy generation using the byproducts of an existing treatment process — is an opportunity that cannot be wasted. **tpo**



A Show Worth Exploring

THE WATER & WASTEWATER EQUIPMENT, TREATMENT & TRANSPORT SHOW OFFERS KNOWLEDGE AND TECHNOLOGIES TO HELP WATER PROFESSIONALS ENHANCE PERFORMANCE

By Craig Mandli

he 2015 Water & Wastewater Equipment, Treatment & Transport (WWETT) Show in Indianapolis provides plenty to see and learn for professionals in charge of wastewater and drinking water infrastructure. Formerly called the Pumper & Cleaner Environmental Expo International, the show has a 35-year history of assembling the best in equipment, education and networking for a wide variety of professionals in environmental ser-

vices. It is of particular interest to drinking water and wastewater operators whose duties include caring for collection and distribution infrastructure.

Many in the environmental services — including municipal and utility professionals — consider the show a must to attend each year. A key to its appeal is the mingling of varied disciplines from both the private and public sectors, all with ideas and best practices to share.

The show's new name reflects the attendees' diversity. "It broadens the scope of the show and amplifies the professionalism of the industry," says Bob Kendall, founder of COLE Publishing. "It enhances the image of the water and wastewater trades as services that are essential to public health and safety."



FEBRUARY 23-26

Water & Wastewater Equipment, Treatment & Transport Show

The WWETT show, Feb. 23-26, will encompass 560,000-plus square feet at the Indiana Convention Center. Vendors will display the latest products and technologies, and dozens of educational seminars led by industry professionals will describe new techniques and best practices. The 2014 show drew more than 8,700 attendees representing 3,800 companies and communities.

> The WWETT name was chosen because it includes all segments of the industry reached by COLE Publishing magazines, including *Treatment Plant Operator* and *Municipal Sewer & Water*. "We want those readers to know the show is theirs too," says Jeff Bruss, COLE Publishing president.

MUCH TO LEARN

Education kicks off the show's first day (Mon-

day), with more than 50 seminars given by experts from trade associations. Most notable for water and wastewater operators are seminar series by the Southern Section Collection Systems Committee (SSCSC) and the National Association of Sewer Service Companies (NASSCO). A highlight of the day will be an afternoon Women in Wastewater Roundtable.

Dewatering Made Simple





Learning continues with seminars from exhibitors on Tuesday and Wednesday. WWETT courses may count toward continuing education credits — attendees can visit www.wwett.com for specifics by state.

The exhibit hall, open Tuesday through Thursday, includes more than 500 booths. Of special interest to operators are multiple technologies for

The new name broadens the scope of the show and amplifies the professionalism of the industry. It enhances the image of the water and wastewater trades as services that are essential to public health and safety." **BOB KENDALL**

inspecting, testing, cleaning and repairing water and sewer piping. Among these are trenchless rehabilitation methods like pipe bursting and various approaches to pipe lining for I&I control.

ENTERTAINING, TOO

Attendees and families can expect red-carpet treatment from the city of Indianapolis, with its numerous museums, entertainment venues, shops and restaurants, many within easy walking distance of the Convention Center. With some 4,700 rooms in hotels connected by heated skyways to the Convention Center, weather will not be an issue.

The show includes the annual Industry Appreciation Party on Wednesday evening. 25-cent tap beers will be served, and country singer/songwriter Cole Swindell will give a free private concert. Swindell's 2013 hit, "Chillin' It," reached the top spot on the country charts, and 2014's "Hope You Get Lonely Tonight" made the Top 10.



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BIGGER AND BROADER

Kendall hopes the show's new identity opens the door to an even larger and more inclusive event. While proud of what the show has become, he says the time was right for an update. "Over the last several years, we realized that the former name no longer covered the entirety of the industry we're reaching," he says.

> "It has been the Pumper Show for a long time, and that definitely isn't a negative. To many of us, including me, it will always be the Pumper Show at heart. But it's so much more, too, and now the name reflects that.

> "Last year in Indianapolis, I called 30 wastewater service companies within a short drive of our trade show, and many said they weren't planning to attend because they weren't septic system pumpers. They thought the show wasn't for them. We want them to know that it is." Visit www.wwett.com for details and the latest schedule of events. tpo



Treatment and Filtration

By Craig Mandli

Additives

ACTIVATED CARBON

AquaSorb activated carbon from Jacobi Carbons is manufactured from coal, coconut shell and wood raw materials by steam activation. It is supplied as granules,

extruded pellets and powders and is designed for use in liquid-phase treatment to absorb remaining COD and toxics. **215/546-3900; www. jacobi.net.**

Aeration Equipment



Aeration Technologies

(Aertec)

COARSE BUBBLE FLOOR GRID SYSTEM

The AerGrid high-efficiency coarse bubble floor grid system from Aeration Technologies (Aertec) suits multiple applications, including high solids suspension. It gives designers flexibility to put aeration where it is needed, including in dry and wet environments. Efficiency improves as airflow increases

AquaSorb activated carbon

from Jacobi Carbons

using full-floor or tapered coverage. Basic elements include diffuser laterals with engineered orifices, attached to the bottom of the tank or basin with a yoke support assembly fixed to the floor or ballasted. The maintenance-free system includes a non-clogging, self-draining design,

a wide airflow operating range and corrosion-free HDPE and stainless steel construction. **978/475-6385;** www.aertec.com.

LOW-SPEED CONICAL MIXER/AERATOR

The combination AER-GS/Mix-GS low-speed conical mixer/aerator from Aquaturbo Systems has a conical geometry that assures thorough tank mixing without leaving hard-to-get-to remote areas of a vessel in deep tank applications. Operators are able to con-



trol power consumption closely since the mixing and aeration are independent from each other. **479/927-1300; www.aquaturbousa.com.**

AER-GS/Mix-GS mixer/aerator from Aquaturbo Systems



MB aeration blowers from Eurus Blower

BI-LOBE AERATION BLOWER

MB bi-lobe aeration blowers for MBBR, sludge and equalization tanks from Eurus Blower are rated to 15 psig and flows to 3,950 cfm. They have integral-shaft ductile iron impellers, dual-splash lubrication, oversized roller bearings, piston ring air seals, viton lip seals, and low vibration and noise. Packages have integrated intake filter/silencers with washable filter media, heavy-duty base/integrated discharge silencers, vibration dampers, OSHA guard and a V-belt drive with automatic belt tensioner. Options include motors, check valves, safety valves, flexible connectors and sound enclosures. **630/221-8282; www.eurusblower.com.**

OXIDATION DITCH AERATOR

Fuchs Oxystar oxidation ditch aerators from Kusters Water, division of Kusters Zima Corp., are offered as self-aspirating or blower-

assisted, and can be installed in new or existing oxidation ditches. Units are low-maintenance

and highly efficient and eliminate surface

spray. Replacement of existing brushes or

vertical-style aerators is simple and cost-effec-



Fuchs Oxystar aerators from Kusters Water, division of Kusters Zima Corp.

OXIDATION DITCH

The OxyStream oxidation ditch from WesTech Engineering combines vertically mounted, low-speed surface aerators with an oxidation ditch design to maximize oxygen transfer efficiency while maintaining flexibility for power turndown.

tive. **205/987-8976; www.kusterswater.com.**

OxyStream oxidation ditch from WesTech Engineering

In addition, it has high side water depths and few required aerators. The vertical slow-speed surface aerator eliminates maintenance-prone horizontal shafts, pillow block bearings and drive units near the water surface. It provides energy savings and produces predictable, high-quality effluent. **801/265-1000; www.westech-inc.com**.



Blowers

REGENERATIVE BLOWER

Regenerative blowers from FPZ have high-efficiency impeller construction with no belts and no lubrication requirements. They are low-maintenance and quiet,

thus suited for treatment plants in residential areas. Inverter-duty motors can be tied to DO2 sensors that allow the

Regenerative blowers from FPZ

blower to operate at various speeds to maximize efficiency. **262/268-0180;** www.fpz.com.

MULTISTAGE CENTRIFUGAL BLOWER

Multi-stage centrifugal blower systems from Universal Blower Pac are optimized for efficiency with DC motors, variable-speed controllers and Hibon-Ingersoll Rand Performer/High Performance series multi-

stage centrifugal blowers. They come complete with total process control and



Centrifugal blower systems from Universal Blower Pac

acoustical enclosures. The optimized systems can be combined with EE-PAC high-efficiency screw blower systems for widely fluctuating process demands. Models can deliver airflow to 34,000 cfm and a pressure rise of 16 psig. **317/773-7256; www.universalblowerpac.com**.

Desalination and Water Reuse Equipment

FILTRATION AND WASTEWATER REUSE SYSTEM The Hydrotech Discfilter from Kruger USA provides high capacity,



from Kruger USA

low energy usage and a small footprint. Woven cloth elements on multiple discs provide a large filtration area. An oscillating backwash spray header cleans media efficiently with low water consumption. Models including the 1700, 2200 and 2600 series can process up to 20 mgd. The filters are suited for effluent polishing, producing reuse water and removing phosphorus. They can be used for membrane pre-

treatment, primary wastewater filtration and CSO/SSO treatment. 919/677-8310; www.krugerusa.com.

REVERSE OSMOSIS PUMP UNIT

The SALINO Pressure Center reverse osmosis pump unit from KSB combines

a high-pressure pump, energyrecovery device, booster pump and electric motor in a compact system.



SALINO Pressure Center reverse osmosis pump unit from KSB

The technology fits well in small- and medium-sized containerized systems. Few components mean low cost and low maintenance. Integrated energy recovery maximizes efficiency. A plug-and-desalt design enables straightforward, fast installation and operation. Oil-free, water-based lubrication and proven axial piston technology make the system reliable. safe and environmentally friendly. 804/222-1818; www.ksbusa.com.



PACKAGED WASTEWATER TREATMENT SYSTEM

The PCS packaged system from Pollution Control Systems treats wastewater on site in a variety of applications. The pre-engineered and prefabricated biological treatment systems meet or exceed typical effluent standards. Sys-

PCS packaged system from **Pollution Control Systems**

tems are compact and easy to operate, and remove at least 90 percent of contaminants when properly operated and maintained. Final effluent can be used in agriculture and aquaculture, industrial processes, irrigation and washdown. 513/831-1165; www.pollutioncontrolsystem.com.

UV TRANSMITTANCE MONITOR

The Real UV254 M1500 probe from Real Tech is accurate and reliable in openchannel or non-pressurized wastewater UV disinfection. It monitors UV transmittance between 15 and 100 percent. An optional Real



Real UV254 M1500 probe from Real Tech

Controller wall-mounted operator interface allows convenient control and display. The 4-20 mA output links real-time UVT measurements with the operator or UV reactor to enhance treatment goals while saving operator time and money. 877/779-2888; www.realtechwater.com.



Titan MBR Qube wastewater treatment plant from Smith & Loveless

PACKAGED WASTEWATER TREATMENT PLANT

The Titan MBR Qube factory-built packaged wastewater treatment plant from Smith & Loveless produces high-quality effluent, including for water reuse. Constructed as a standard 40-foot-high cubed shipping con-

tainer, it is delivered to the job site, requiring minimal assembly. It is available in three standard models based on capacity requirements from 2,500 to 20,000 gpd. Optional compact anoxic and biosolids storage zones are available. 913/888-5201; www.smithandloveless.com.

Dredges/Components

CABLE-OPERATED SAFETY STOP

The Model RS heavy-duty safety stop control from Conveyor Components

Company, Division of Material Control provides a quick. positive emergency shut-off. It is activated with a pull cable.



Model RS safety stop control from **Conveyor Components Company, Division of Material Control**

The outputs can control up to four circuits, and can include one for machinery shutdown and one for alarm. It has a corrosion-resistant aluminum housing, stainless steel hardware, a red powder-coated actuation handle and stainless steel actuation shaft. Epoxy coating is available. 810/679-4211; www.conveyorcomponents.com.



MOTION-SENSING MAN-DOWN DEVICE

The TPASS 3 motion-sensing man-down device from Grace Industries helps protect workers during confined-space entry. It has an audible out-of-range indicator, and work-

TPASS 3 motion-sensing man-down device from Grace Industries

ers can deploy a range-extending microrepeater. The portable work site alarm is placed at the confined-space entry point. The confined-space attendant carries the

monitor. The confined-space worker's unit automatically transmits a direct wireless alarm upon lack of motion or by manual activation to the portable work site alarm and to the attendant. A plus-100 dBA siren and intense strobe light are activated, while the attendant receives the alarm indicating which worker is in alarm. The device can also transmit an evacuation signal to the confined-space worker. 724/962-9231; www.graceindustries.com.

Filtration Systems

BIOFILTRATION SYSTEM

The Compact Monafil zeroenergy biofiltration system from Anua uses specialized media to remove odors, VOCs and sulfur- and nitrogen-based com-



Compact Monafil biofiltration system from Anua

pounds. The properties of the granular, high-density peat media help achieve high-performance removal and extended media life. It uses recycled shell-based media to maintain a neutral pH within the prepackaged biofilter. The peat and shells ensure optimal odor control while simplifying operation and enhancing reliability. 800/787-2356; www.anua-us.com.



Disposal Systems

OPEN-TOP ROLL-OFF DEWATERING UNIT

The 30-yard Dewatering Unit from Aqua-Zyme Disposal Systems can be filled with 22,000 to 25,000 gallons of **Dewatering Unit from Aqua-Zyme** grease trap or septic waste at 1 to 2 percent solids in about two hours. (continued)

product focus Treatment and Filtration

After draining 24 hours, the unit can be hauled to a landfill or other permitted facility for disposal. Sludge volume can be reduced by 80 percent with reductions to 98 percent in BOD, COD, FOG and TSS. Effluent is clear and sewerable. The unit has few moving parts. Standard equipment includes a roll-over tarp system; side, floor and center screens; ¹/₄-inch floor plate; 7 gauge side plates; four door binder ratchets; eight drain ports; two inlet ports; and long-handle scraper. It can be hauled with a standard capacity roll-off truck. Models are also available in a 15-yard size. **979/245-5656; www.aqua-zyme.com.**

DEWATERING CONTAINER FILTER

Sludge Mate container filters from Flo Trend Systems can dewater wastes such as alum, ferric, lagoon and digested sludge, septage, grease-trap and slaughterhouse waste, wastewater residuals and sump bottoms. The closed-system



design provides total odor control with no spillage, reduced maintenance and weather independence. Units have 10-gauge reinforced walls and seven-gauge carbon steel floor. Options include peaked roofs with gasketed bolted-down access hatches, drainage ports, inlet manifolds, floor filters and side-to-side rolling tarps. Units dewater on site and are available as roll-offs and trailer and tipping-stand mounted. Capacities range from 5 to 40 cubic yards. **713/699-0152; www.flotrend.com.**



IN-LINE GRINDER

The Muffin Monster 30004T in-line grinder from JWC Environmental cleanly and easily shreds through wipes, rags, plastics and other waste materials to help prevent pump problems and sewer backups. The unit has a low-speed, high-torque design that keeps waste flowing freely, eliminating the danger of clearing pumps by hand. The cutters and spacers are constructed from durable heat-treated alloy steel. It quickly adapts to existing pipeline applications with little or no modification, and the compact design of the cutter and reducer

Muffin Monster 30004T grinder from JWC Environmental

FILTRATION SYSTEM

The FilterWorx filtration system from Leopold – a Xylem Brand, is designed to achieve performance requirements for water and wastewater filtration. Systems are customized to accomplish maximum

filtration efficiency at the longest



allows the use of small, energy-efficient

3 to 10 hp motors. 800/331-2277; www.

FilterWorx filtration system from Leopold – a Xylem Brand

possible filtration cycles. Optimum suspended solids removal is achieved through customized filter media. Filter run times, filter life and filtrate quality are optimized at the lowest cost through continuous monitoring. The backwash system restores original headloss and solids storage conditions, increases filter runs and reduces backwash waste. **855/995-4261; www.fbleopold.com.**

jwce.com.

BIOLOGICAL TRICKLING FILTER

The STAAR (Smart Trickling Anaerobic/Aerobic Recirculating) filter system from SeptiTech, a subsidiary of Bio-Microbics, uses an enhanced, unsaturated media filter technology to treat high organic loads. The 500



STAAR filter system from SeptiTech, a subsidiary of Bio-Microbics

to 18,000 gpd systems use a simple, automatic equalization and clarification process to maintain low levels of nitrate with all below-grade components that fit in concrete, plastic or fiberglass tanks. Smart

controllers deal with peak, low, intermittent or no-flow conditions. **800/318-7967; www.septitech.com**.

UF MODULES

Hollow-fiber 775-square-foot ultrafiltration modules from Toray Membrane USA contain high-strength PVDF fibers. The fibers can operate in high fluxes with reduced fouling and high reliability. When used with reverse osmosis elements at water reclamation plants, they validate the feasibility of indirect potable reuse. Systems

have recorded greater than 4-log reduction in somatic bacteriophage through a combination of chloramines and ultrafiltration. **858/218-2390; www.toraywater.com.**



Ultrafiltration modules from Toray Membrane USA

George Constant of the second second

SELF-CLEANING SCREEN FILTRATION SYSTEM

The V-Series self-cleaning screen filtration system from VAF Filtration Systems has a mechanically driven cleaning process. The bidirectional hydrodynamic drive mechanism

V-Series screen filtration system from VAF Filtration Systems has no limit switches or pistons. It offers simple controls, a low-flush flow, cleaning efficiency and low maintenance. The

12- to 15-second flush cycle is automatically initiated when a pressure differential across the screen increases to 7 psi. The filter remains online and the filtration process remains uninterrupted during the brief cleaning process. The flush discharge results in minimal waste. **303/425-4242;** www.vafusa.com.

SCREW SCREEN

The SPECO WASTEMASTER GCP screw screen from WAM USA combines actions to separate solids in effluent and compact screened solids. It consists of a perforated screen basket, a conveyor screw and a compacting module. The GCE version, without the compacting zone, is suitable for applications where screenings do not need compaction. The unit will not clog, even with fibers,

due to its shaftless screw design. It is easy to install and maintain, with low operating costs and low energy con-

sumption. 770/339-6767; www.waminc.com.

Lagoons/Lagoon Components

EXTENDED AERATION LAGOON



Intermittently Discharged Extended Aeration Lagoon (IDEAL) from Environmental Dynamics International The Intermittently Discharged Extended Aeration Lagoon (IDEAL) from Environmental Dynamics International combines extended aeration with batch treatment to effectively remove ammonia and a significant portion of nitrate/nitrite in an earthen basin. It was tested through the winter of 2013-14 for a variety of common pollutants (i.e., BOD, TSS, ammonia, etc.), and consistently demonstrated the ability to remove high amounts of BOD, TSS, and ammonia-nitrogen, with 66 percent total nitrogen removal, at liquor temperatures less than 3 degrees C. **877/334-2478; www.lagoon-solutions.com.**

ODOR, TEMPERATURE AND ALGAE-CONTROLLING COVER

Tank and lagoon cover systems from Geomembrane Technologies control odor and temperature and block sunlight to control algae growth and chlorine loss. Their high-strength, UV-protected coated fabric is tensioned across lowprofile aluminum arches that span



Cover systems from Geomembrane Technologies

tank and lagoon openings. The cover is secure, yet detaches easily for access for inspection or maintenance. Rainwater runs to the tank perimeter. The fabric is durable and resistant to wastewater environments. Aluminum hatches can be located in the walkways for inspection or sampling, or fabric hatches can be located in the covers. **506/452-7304;** www.gticovers.com.



Sludge Gun blanket level

detector from Markland

Specialty Engineering

PORTABLE BIOSOLIDS BLANKET LEVEL DETECTOR

The Sludge Gun hand-held biosolids blanket level detector from Markland Specialty Engineering measures silt or biosolids interface levels in clarifiers, tanks and lagoons and helps provide biosolids level profiles. It lets users eliminate unnecessary pumping/dredging and monitor bed depth for regulatory com-

pliance and prevention of carryover. The unit uses high-intensity infrared light to locate the biosolids blanket and overlying cloudy layer, in concentrations ranging from light flocs to thick blankets. Compact and weatherproof, it is suited for use on boats and catwalks. No calibration is required. **855/873-7791; www.sludgecontrols.com.**

MBBRs

VERSATILE MBBR SYSTEM

gpd. The system is suitable for the

effluent discharge criteria that must

meet at least 20/20 levels in BOD₅

Versatile and simple to operate, the Ecoprocess MBBR wastewater treatment system from Premier Tech Aqua is designed for a wide variety of commercial, institutional applications and municipal projects with a flow rate up to 55,000



Ecoprocess MBBR wastewater treatment system from Premier Tech Aqua

and TSS, and require nitrogen removal. It is available in concrete, steel or robust large-capacity rotomolded polyethylene tanks that can be assembled in single reservoirs up to 12,000 gallons, offering ease of installation and flexibility. The system can be used for retrofit designs or integrated in multi-phase projects. An Ecoprocess Coco Filter Polishing Unit, a compact, virtually no-maintenance biofiltration process using a 100-percent organic filtering media that treats wastewater with no energy, can be installed downstream when a more stringent discharge criteria of below 10/10 must be achieved. **604/346-8199; www.premiertechaqua.com.**

MBRs

MEMBRANE BIOREACTOR PACKAGE

BioBarrier MBR (500 to 3,000 gpd) and HSMBR (1,500 to 18,000 gpd) systems from Bio-Microbics are easy to install, operate and maintain. The membranes and processes act as a physical



BioBarrier MBR and HSMBR systems from Bio-Microbics

barrier for nearly all common wastewater pollutants. Approved for water reuse (NSF/ANSI Std 350), the pre-engineered modular systems ship installation-ready to fit into new or existing tanks. They meet state regulatory requirements and produce effluent with BOD less than 2 mg/L, TSS less than 2 mg/L and ammonia less than 1 mg/L. They effectively remove pathogens while reducing fecal coliform to less than 10 colony forming units per 100 mL. **800/753-3278;** www.biomicrobics.com.

Membrane/Media Filters



Aqua MegaDisk filter from Aqua-Aerobic Systems

CLOTH MEDIA FILTER

The Aqua MegaDisk cloth media filter from Aqua-Aerobic Systems has 30 percent larger diameter disks than the original AquaDisk filter and treats up to 24 mgd in a single unit. Each disk is 10 feet in diameter with eight lightweight, removable segments for ease of maintenance. It uses up to 24

disks in a single filter and uses OptiFiber cloth media. It has a fully automatic PLC control system and a low hydraulic profile. Because fewer filters are required, the footprint is small. It has low energy consumption. **815/654-2501; www.aquamegadisk.com.**

CONCRETE FILTER UNDERDRAIN

The Monolithic Concrete Filter Underdrain from Orthos Liquid Systems efficiently allows the in situ construction of new or retrofit suspended floors that become part of the civil structure. A broad range of filter nozzles enables optimum performance on back-

wash and air scour cycles. The filter nozzle density across the filter floor can be engineered to specific requirements; stan-



Monolithic Concrete Filter Underdrain from Orthos Liquid Systems

dard spacings are 6- or 8-inch centers. Higher filter nozzle density reduces problems such as rat-holing and mud-balling and reduces the need for specialized support media. Higher density is particularly useful where finer media is in direct contact with the filter nozzles, and where refurbishment requires deeper filtration media. **843/987-7200; www.orthosnozzles.com.**



Mixers

WASTEWATER TREATMENT MIXER

Combining the Model 20 HT/GT mixer with the RL-3 impeller from Chemineer creates a mixer for anoxic, aeration, sludge and digester basin applica-

Model 20 HT/GT mixer with the RL-3 impeller from Chemineer tions that contain fibrous material. The ragless impeller prevents fibrous

product focus **Treatment and Filtration**

material buildup on the rotating impeller of the agitator. The mixer's modular design package enables reduced replacement parts inventory. 800/643-0641; www.chemineer.com.

LOW-SPEED MIXER

The 4400 low-speed mixer from Flygt - a Xylem Brand can gently mix large volumes. Engineered for efficient thrust and bulk flow, low energy consumption and positioning flexibility, the large-diameter unit provides mixing for activated sludge treatment, including aerobic, anoxic and anaerobic zones, and oxidation ditches. The



4400 mixer from Flygt a Xylem Brand

low-speed, gear-driven combination provides efficient, clog-free continuous duty. It has an efficient hydraulically optimized propeller and an easy-access design and installation method for simple maintenance. 855/995-4261; www.flygtus.com.



MULTIPURPOSE MIXER

Knight 3100 Series Reel Auggie mixers from Kuhn North America provide fast, thorough mixing for many organic and manmade materials. With trailer, truck and stationary models, municipalities can choose

Knight 3100 Series Reel Auggie mixers from Kuhn North America

the machine and setup that best fits the specific blending situation. Multipurpose trailer- and truck-mounted

machines offer convenient transport, while stationary models are suited for central mixing. 608/897-2131; www.kuhnnorthamerica.com.

AIR-POWERED MIXER

Long-distance circulation technology combined with air-powered pumping makes GridBee AP Air-Powered Mixers from Medora Corporation well-suited for mixing aerated and anoxic wastewater treatment basins with high mixed-

liquor suspended solids (MLSS). In aerated basins once the oxygen demand is met, the aeration intensity can be reduced without



GridBee AP mixers from Medora Corporation

losing the MLSS, leading to energy savings. In anoxic basins, the nonclog design mixes thoroughly to enhance denitrification while significantly reducing maintenance. Units have no impeller and no moving parts. They have a high flow rate and are self-cleaning; stringy material and rags flow through. Pedestal and floating models are available. All are portable, compact, lightweight and easy to install. 866/437-8076;

www.medoraco.com.



HIGH-CAPACITY ROTARY FAN PRESS

The high-capacity, compact Rotary Fan Press 2.0 from Prime Solution provides dry cake and is maintenance-friendly. It adds internal mixing to the company's rotary fan press technology to enable dewatering of difficult biosolids. 269/694-6666; www.psirotary.com.

from Prime Solution

LIME AND BIOSOLIDS MIXER

The MBV lime and biosolids mixer from Sodimate has paddle blades that efficiently mix lime and dewatered sludge. The mixer can be com-



bined with conveyors, pumps and lime feed systems for effective stabilization to produce Class B biosolids. Stainless steel construction makes the unit suitable for many harsh municipal and industrial applications. Units can be trailermounted for remote treatment areas. 773/665-8800; www.sodimate-inc.com.

MBV lime and biosolids mixer from Sodimate

Nutrient Removal

DECANTER CENTRIFUGE

The ALDEC G3 decanter centrifuge from Alfa Laval is equipped with a 2Touch control package, making it is easy to monitor and adjust.



The RoFAS Septage Receiving Station from

hauler stations with card key access, quick

connect and data logging features. 704/949-

1010; http://huberforum.net.

The smaller conveyor diameter makes room for more liquid in the pond and allows higher bowl wall pressures, boosting processing capacity or yielding drier cake. Power plates reduce power consumption by up to 40 percent. 866/253-2528; www.alfalaval.us/wastewater.



RoFAS Septage Receiving Station from Huber Technology

ROTATING BIOLOGICAL CONTACTOR

The Rotating Biological Contactor from Walker Process Equipment, A Division of McNish Corp., is a low energy consuming, low maintenance process designed to achieve

low-nutrient effluents. It is suited for facilities that plan to modify a secondary treatment scheme for phosphorus removal to as low as

Intermittent Cycle Extended

Aeration System from Sanitaire -

a Xylem Brand



Rotating Biological Contactor from Walker Process Equipment, A Division of McNish Corp.

0.1 to 1.0 mg/L, or for significant reductions in nitrogen or ammonia. 630/892-7921; www.walker-process.com.



SBRs

ADVANCED SBR SYSTEM

The Intermittent Cycle Extended Aeration System continuous-fill advanced sequencing batch reactor process from Sanitaire - a Xylem Brand, handles small to large flows. All treat-

ment steps occur within a single tank. The process can accomplish biological nutrient removal in a simple-to-operate process system. It produces effluent quality to less than 5 mg/L BOD, 5 mg/L TSS, 3 mg/L TN and 1 mg/L TP and can be converted to meet future, more stringent limits. It has a maintenance-free stainless steel decanter, simplified operation with equal flow and load distribution, and continuous flow capability that allows single-basin operation for periods of low flow and maintenance. 855/995-4261; www.sanitaire.com. too

Your partner for sustainable solutions in water treatment

BASF understands today's global water management challenges and is responding by delivering world-class technologies and sustainable solutions. From water production, through water use, through water purification, BASF has leveraged its expertise and extensive capabilities to protect, conserve and sustain the earth's most precious resource, that being water. As the world's leading chemical company, we are dedicated to your success by bringing to you over 100 years of comprehensive experience, technology, innovation and commitment. At BASF, we create chemistry.

www.watersolutions.basf.com



Bar screen effectively prevents pumps from clogging

Problem

New Jersey's Lower Township Municipal Utilities Authority operates a 5 mgd wastewater treatment plant. Influent arrives through a 48-inch pipe 23 feet below grade. The manual inflow pump screening setup was difficult and hazardous to clean, and the 2.5-inch screen spacing let too much non-dispersible waste through. The 3,000 gpm non-clog pumps clogged constantly, and each day two or three workers had to descend a 26-foot stairwell into a dark, hazardous environment to remove debris from the screen. Matthew Ecker, executive director, calculated the labor cost alone at over \$26,000 a year.

Solution

Aqualitec fabricated its **Screentec bar screen** on a customized bracket, secured to the wall by guiderails and attached at its upper base by a single pair of brackets. The screen has no moving parts. To allow easy

removal, it was installed with no attachments at the bottom of the lift station structure. "We installed the Screentec unit with our own forces in two days with a four-man crew and an electrician," Ecker says. "We used a pickup truck crane and hand tools. Other than removing a small handrail section, installation required no modifications to the inflow structure."



RESULT

The design has exceeded expectations. "Our new vertically installed screen with a 3/4-inch bar spacing does the job much bet-

ter, cheaper and much more safely than our old system," Ecker says. The solution saves the utility more than \$72 per day. **855/650-2214;** www.aqualitec.com.

Pump and mixer team to treat wastewater

Problem

Serving 11,000 residents, the Stafford (Conn.) Water Pollution Control Facility needed an upgrade.

Solution

To improve maintenance and equipment service life, plant personnel installed six 1.8 hp **Landia mixers** in the anoxic tanks as part of a new activated sludge process. Three 2.4 hp Landia axial flow pumps were added to the aeration basins to return nitrified mixed liquor to the anoxic tanks for denitrification. "Landia sent one of their skilled engineers to show our maintenance staff how to look after the pumps and mixers, which means we provide a better service to the people of Stafford," says Rick Hartenstein, chief operator.



RESULT

"We've become more efficient, had no downtime, saved money and had no hassle," says Hartenstein. **www.landia.co.uk**.

Aerators and mixers enable cost savings, reduce biosolids buildup

Problem

The Town of Monroeville, Ala., faced aeration and mixing issues, sludge buildup in one of its wastewater lagoons, and power bills of \$12,500 per month after a major employer relocated its garment manufacturing facility. The company had generated about 90 percent of the wastewater entering the lagoon, and its fees covered 90 percent of the operation and maintenance

cost, which included \$1,500 per month for aerator maintenance. The lagoon was 80 percent full of biosolids, and the estimated cost to dredge was over \$1.6 million. The lagoon had to remain operational and the town needed to reduce costs.



Solution

DO2E Waste Water Treatment installed two 5 hp high-volume floating aerators and two 3 hp floating mixers.

RESULT

In four years of operation, the equipment saved the town some \$513,000 in electricity and \$72,000 in maintenance, while reducing biosolids buildup by 90 percent. **251/626-6550; www.do2e.com**.

Reactor assists in cold-weather lagoon ammonia removal

Problem

The three-cell lagoon system at the City of DeSoto, Iowa, consistently met its permit until new effluent limits on ammonia required an upgrade. The city needed to nitrify efficiently in winter without the prohibitive expense and disruption of replacing the lagoon system.

Solution

DeSoto selected the **NitrOx System** from **Triplepoint Water Technologies.** The system leveraged the existing lagoon system and required no new land. The reactor was installed between cells two and three, allowing the lagoon system to treat BOD to 20 to 30 mg/L, at which point bacteria begin to nitrify. Influent from the aerated cell is pumped into the first tank of the reactor at an average rate of 0.5 gpm. Sensors and a digital controller optimize temperature during the coldest months, and an insulated cover retains heat. High surface area media are mixed and aerated

via a full-floor grid to foster the growth of nitrifying bacteria. After eight hours of retention time, effluent is released into the polishing cell.

RESULT

Despite subzero temperatures, the installation achieved more



than 99 percent ammonia removal at influent temperatures barely over 32 degrees F. It has consistently held that removal rate since installation. **800/654-9307; www.triplepointenv.com.**



Aerator retrofit enables city to meet nitrogen limits

Problem

The City of Ocala, Fla., faced tighter effluent nitrogen limits due to the presence of springs in the St. Johns River basin. The city operates an Ovivo Carrousel plant.

Solution

Rather than add basins, the city retrofitted the Carrousel basins with dual-impeller **Excell aerators** and the automated internal recycle **EliminatIR gate** from **Ovivo USA**.

RESULT

The retrofits have allowed the city to more tightly control dissolved oxygen and nitrate recycles and reduce total nitrogen to near the limits of technology. **512/834-6000;** www.ovivowater.com.

Screening system enables plant to increase treatment capacity

Problem

The activated sludge wastewater treatment plant in Kiel, Wis., treats high-strength wastewater from cheese production. When dissolved oxygen in the aeration basins dropped too low, the cheese waste influent was turned down or shut off. Operators wanted the plant to process more cheese waste,

SLUDGE INTERFACE DETECTION

SBR's, primary, secondary and tertiary clarifiers as well as settlement tanks/basins.

- Remote monitoring no need for site visit
- On screen echo and tank profiles, status and level, in up to two tanks simultaneously
- Self cleaning and maintenance free



accept waste from septic haulers, increase biological treatment capacity, reduce biosolids costs, eliminate additional processing of primary solids, and reduce capital, operation and maintenance costs.

Solution

Plant operators ordered a demonstration of the **MicroScreen** from **M2 Renewables.** A submersible pump was placed in the splitter box that feeds the two primary clarifiers. The effluent from the unit flowed by grav-

ity into aeration. The solids were compressed and sent to the lab for testing. Then the solids compactor was removed, and a 2 to 3 percent solids stream went straight to aerobic digestion.

RESULT

Performance results indicated a TSS reduction of 32 percent on average, BOD reduction



of 20 percent, and 41 percent dry solids content of discharged material. For the cheese waste, TSS removal was 13 percent on average, BOD removal 16 percent on average, and volatile suspended solids 8 percent on average. The unit allowed the plant to process five times more cheese waste, accept waste from four septic haulers, and increase the heat recovered from the aerobic digester flare's thermal recovery loop. It also increased plant loading capacity for TSS and BOD, reduced biosolids production, increased biological treatment capacity and minimized odors. The city plans to incorporate the unit into its 2014 plant expansion. **949/380-9800; www.m2renewables.com.**

Plant upgrades to cloth media filter system

Problem

A coastal development in eastern North Carolina had aging traveling bridge sand filters that were failing and required extensive mechanical maintenance. The plant was also upgrading from chlorination to UV disinfection, which required consistently low levels of TSS.

Solution

The facility installed **Fluidyne's Fixed Plate cloth media filter system,** meeting requirements for tertiary reuse-quality treatment. The systems use simple open-close pneumatic valves and gravity head to control filtering and backwash. No pumps are needed to create backwash flow; media panels remain fixed in place instead of being rotated past a spray or suction manifold. Media elements can be isolated and removed from the

flow stream for maintenance or inspection without discontinuing flow to the entire filter or diverting flow.

RESULT

The system eliminated moving parts and wear items and allowed elements to be square or rectangular (versus circular), easing manufacture, installation, removal and main-

tenance, while maximizing treatment area within the tankage. The tertiary solution produced reuse-quality effluent. **319/266-9967; www. fluidynecorp.com.**

Filter helps city meet phosphorus limits

Problem

The operators at the Lakes Area Sewer Authority treatment plant in Cass County, Mich., sought an efficient filtration system to meet stringent summer phosphorus limits. The plant wanted a high-rate filtration system with a small footprint to fit inside a small building, with low wash water usage, easy cleaning and low maintenance cost.

Solution

Based on a successful pilot test, the operators chose the **Fuzzy Filter** from **Schreiber** for its ability to achieve high phosphorus removal efficiency by capturing very small flocs (less than 5 microns) and reducing

chemical consumption. The high-rate (30-plus gpm per square foot) filter has a small footprint and reduces heating requirements of the filter building.

RESULT

The unit consistently produced effluent with phosphorus below 0.2 mg/L (more than 98 percent removal efficiency). It provided more than 60 percent chemical savings and pro-



duced less than 2 percent wash water return. The operators are satisfied with its performance and ease of operation and maintenance. 205/665-7466; www.schreiberwater.com.



Problem

The 3.3 mgd (average) activated sludge Charleston (III.) Wastewater Treatment Plant needed upgrades to old equipment to reduce operating costs. That included replacing Hoffman multistage aeration blowers, which had served for 40 years with no failures.

Solution

Superintendent Dave Collard worked with the Hoffman & Lamson, Gardner Denver Products team to install an RO7 Model Hoffman

Revolution high-speed blower. Its small footprint

fits tight spaces. It is rated at below 80 dBA and 1 meter. A human machine interface with a smart touch screen makes it easy to use.



RESULT

In the first month, the city saved \$8,604, and over

the next three years savings totaled about \$100,000 annually. **866/238-6393; www.hoffmanandlamson.com.**

Membrane retrofit maintains safe drinking water production

Problem

The ultrafiltration (UF) membrane cartridges used in the City of Del Rio (Texas) Water Treatment Plant needed frequent fiber repairs and had reached the end of their useful life. However, replacement using the existing specified membranes was beyond the facility's budget, forcing the city to pursue a retrofit. Most potential replacements either could not fit the existing footprint or were too costly.

Solution

After a comprehensive pilot test, Koch Membrane Systems custom-

engineered a drop-in retrofit using its **TARGA II hollow fiber UF cartridges.** The custom racks included manifolds, connectors and membrane cartridges that fit within the original system and used existing components and controls. The company also assisted with installation and startup.



RESULT

The membranes performed cost-effectively. Robust fibers experienced minimal breakage. Systems engineers developed a custom retrofit design and incorporated spare positions into each rack for future additional membrane cartridges, providing an additional 5 mgd capacity. **978/694-7000; www.kochmembrane.com.**

Turbo blowers provide aeration for holding basins

Problem

The Frank E. VanLare Wastewater Treatment Facility in Rochester, N.Y., required an efficient aeration solution for its six holding basins.

Solution

Ten model **NX350-C080 blowers** from **APG-Neuros** were purchased by the county and commissioned in three phases over a nearly threeyear period. The blowers have Schneider Modicon PLCs with hardwired controls from the AER PLC with Ethernet connections as backup. Aside

from the reliable design, the clean operating environment is important to longevity and reliability.

RESULT

The site has been commissioned and the blowers have run reliably since their startup without incident. The availability level of the blowers has

exceeded 99 percent during the past three years. **866/592-9482; www.** apg-neuros.com. tpo







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The Brentwood-engineered AccuFAS system incorporates structured-sheet media as a fixed-film surface to support biofilm growth, a process which removes the biologically degradable pollutants in wastewater. AccuFAS provides low-cost aerobic treatment for highly concentrated industrial wastewater applications, and the system's flexible treatment capabilities allow for a single-pass FBBR configuration — an ideal solution for plants requiring a simple biological treatment system.



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1. NEXTTEQ DOSIMETER TUBE SYSTEM

The Gastec dosimeter tube system from Nextteq provides on-thespot, time-weighted average monitoring of air contaminants. The tubes perform STEL, TWA or long-term sampling up to 48 hours, as well as measure workplace exposures from 30 minutes to 10 hours. 877/312-2333; www.nextteq.com.

2. GLOBAL GLOVE DISPOSABLE HAND PROTECTION

The PantherGuard line of high-tech disposable hand protection from Global Glove & Safety Manufacturing is available in three styles. The 675PF is a 6 mil orange nitrile disposable with a long cuff. The 775PF is a 6 mil orange nitrile disposable in a regular length. Both styles have freeze-dried aloe that activates during use to moisturize cracked and chapped hands. The 800F is an 8 mil, black flock-lined long cuff disposable. The lining keeps hands warm in cold conditions and absorbs perspiration in warm conditions. **763/450-0110; www.globalglove.com**.

3. BLUE-WHITE METAL-FREE FLOWMETERS

Metal-free flowmeters from Blue-White feature floats constructed of PTFE which make them suited for applications where no metals can enter the fluid patch, as well as applications that are highly corrosive. Adapters are made of polysulfone, PVC or PVDF, depending on model. O-ring seals are FKM (EP is optional). **714/893-8529; www.blue-white.com.**

4. BEACON RAILING SAFETY SYSTEM

The BSQ series railing safety system from Beacon is designed to meet OSHA and ANSI standards. The steel railings can be installed at loading docks, walkways, mezzanines and floor openings. Featuring a bright yellow powder-coat finish, the railings are 42 inches high with a mid rail at 21 inches and can be equipped with 4-inch toe boards. Options include sliding gates, bumpers, end caps, anchor bolts, connection tubing, corner connectors and bolted-on wire mesh. **800/454-7159;** www.beacontechnology.com.

5. FCI ST50 AIRFLOW METER

The ST50 airflow meter from Fluid Components International is designed for compressed airflow measurement. The meter has a flow range of 0.75 sfps to 400 sfps for air, compressed air or nitrogen. Flow range can be field configured in standard mass flow or volumetric engineering units. **800/854-1993; www.fluidcomponents.com.**

6. WILDEN CHEMICAL RESISTANCE GUIDE APP

The chemical resistance guide mobile app from Wilden Pump & Engineering is available at www.wildendiaphragms.com. The app provides one-click access to information regarding the chemical resistance of various types of diaphragm materials. The app works on any modern mobile device. **909/422-1730; www.wildenpump.com.**

7. ELECTRO STATIC IPRO MONITORING RING

The AEGIS iPRO-MR monitoring ring from Electro Static Technology combines shaft voltage protection with continuous monitoring of shaft voltage levels from a remote location. The ring is designed for protecting motors in remote locations that cannot be easily monitored or maintained. **866/738-1857; www.est-aegis.com.**

8. HACH FSDATA DESKTOP INSTRUMENT MANAGER

FSData instrument manager software from Hach is designed for field crews to reduce the time needed to set up, download and maintain Hach FL900 Series flow loggers and sensors. The free download (available at www.hachflow.com) includes dashboard, intuitive user interface, setup wizards and layered error reduction. **800/368-2723; www.hachflow.com**.

9. McCROMETER ELECTROMAGNETIC FLOWMETERS

The FPI-X dual-sensor electromagnetic flowmeter from McCrometer is designed for close proximity to cascading or multiple pump arrays, while the Ultra Mag flowmeter is designed for the specific needs of the water and wastewater industries. **800/220-2279; www.mccrometer.com**.


wastewater: product spotlight

No batteries to change, solar-powered flowmeter works for days without sun

By Ed Wodalski

The **Enduro Series EF12** solar-powered ultrasonic flowmeter from **Spire Metering Technology** is designed for remote areas where electrical power is not available.

The 6-pound, 17-inch by 17-inch by 1-inch solar panel is rated at 20 watts and has a built-in 17AH rechargeable battery and charging circuit that's able to maintain seven days of operation without sun. No other power supply is needed. The mono-crystalline panel is designed to operate in 100 percent humidity and temperatures from -40 to 176 degrees F.

All components, except the solar panel and transducers, are housed in a 12-inch by 10-inch by 4-inch weather-proof NEMA/UL 50 Type 4X enclosure.

The solid state, maintenance-free flowmeter has no moving parts to wear out. Data is recorded to a flash memory stick that can save the last 512 daily net flow values and the last 128 monthly net flow values.

Based on ultrasonic transit-time technology, the meter is able to conduct accurate flow measurement on a closed pipe carrying pure liquids or liquids with some suspended solids.

"In terms of the ultrasonic capabilities, there is no maintenance or moving parts that you might have in other types of meters," says Gerry Harrington, director of sales and marketing for Spire Metering Technology. "From a standpoint of long-term use, you do not have any maintenance expenses and the accuracy remains stable over time."

10. CAT PUMPS MOBILE PHONE PRODUCT APP

The mobile app for iOS/Apple and Android smartphones from the Cat Pumps website enables users to find product and technical information, size and select pumps and accessories, and convert flow, pressure, volume, temperature, torque, length and area to the needed units. The app can also be used to calculate flow rate, horsepower, rpms, pump and motor pulley diameters. **763/780-5440; www.catpumps.com.**

11. GREYLINE BATTERY-POWERED AREA-VELOCITY FLOW LOGGER

The Stingray 2.0 battery-powered, area-velocity flow logger from Greyline Instruments records level, velocity and water temperature readings through open channels, partially full sewer pipes and surcharged pipes. Rated for operation in temperatures from -4 to 140 degrees F, the logger operates up to four years on standard alkaline D-cell batteries. **888/473-9546; www.greyline.com.**

12. ELECTRONIC SYSTEMS UV LAMP FAIL-SAFE SWITCH

The Model 910210 UV lamp fail-safe switch from Electronic Systems Design monitors the line current into the UV lamp power supply to determine the lamp is functioning properly. The switch can be used to control an alarm or shut down a water vending machine. The normal primary line current range is 0.51 amps at 115 VAC. **888/326-0864; www.esdi.net.** *(continued)*



The flowmeter can be equipped with clamp-on or wetted (insertion or flow-cell) type transducers.

A tracking mechanism analyzes signal quality and automatically tunes the system for optimal performance.

The optional GSM/GPRS modem can be connected to an RS-485 port, enabling flow and alarm information (leakage, no flow) detected by the meter to be transmitted to cellphones or a central office. The meter can also be programmed or controlled remotely from the office. **888/738-0188;** www.spiremt.com.

product news



13. HAYWARD FLOW CONTROL BUTTERFLY VALVE

The BYV Series butterfly valve from Hayward Flow Control is available in sizes from 2 through 12 inches and constructed from multiple thermoplastic materials. The hand level features a 72-spline interlock for stopping positions every 5 degrees. Available in ANSI 150 and DIN/ EN PN10 flange patterns, the valve has a pressure rating of 150 psi at 70 degrees F. Options include 316 stainless steel lugs, gear operators, pneumatic or electric actuators, manual limit switches, stem extensions, 2-inch square operating nut and chain operator for gearboxes. **888/429-4635; www.haywardflowcontrol.com.**

14. XYLEM MODULAR, MICRO CONTROLLERS

Flygt MyConnect and Flygt MyConnect Wall micro controllers from Xylem are modular in design for expanding the monitoring system. MyConnect functions as a remote terminal unit controlling one to four pumps. The unit can be built into an existing electrical control panel and enables operators to monitor operations and control energy consumption of a water or wastewater facility. The MyConnect app for iOS and Android phones allows for remote monitoring. The MyConnect Wall controller can be located outdoors and features a sump cleaning function. **704/409-9700; www.flygtus.com**.

15. BBA ELECTRICALLY DRIVEN PUMPS

Electrically driven, auto-prime, solids-handling pumps from BBA Pumps deliver from 100 to 6,500 cubic meters per hour (26,000 to 171,000 gph). Available in 3- to 24-inch sizes, the pumps can be used in sewage or dewatering applications. **843/849-3676; www.bbapumps.com/us.**

SWAN ANALYTICAL DRINKING WATER SERVICE PROGRAM

The water service program from SWAN Analytical USA is designed for drinking water facilities and clarified or filtered wastewater applications. The program includes startup training, scheduled maintenance and retrofit services for online analytical water quality monitors and controllers. **847/229-1290; www.swan-analytical-usa.com. tpo**

product spotlight



Coupling and flange adapter allow pipe movement while maintaining seal

By Ed Wodalski

The **HYMAX GRIP** pipe coupling and flange adapter from **Krausz USA** is designed to connect plastic and metal pipes (not recommended for asbestos cement or fiberglass pipe). Universal teeth increase grip as pressure is applied.

Made for new piping as well as repair, the coupling and adapter feature the HYMAX hydraulic sealing system that enables joined pipes to move up to 4 degrees on each end of the coupling (up to 8 degrees of deflection).

Mechanical clasps grip the pipe, while hydraulic sealing provides increased sealing force. Flowing water pressure allows dynamic deflection as the restraining element tightens, preventing pipe pullout and future breaks.

Applications include wastewater lift stations, wastewater treatment plants, water treatment plants and wells where restraint is required, says Doug Riseden, technical support manager with Krausz USA.

"In some areas of the United States there's a lot of ground movement, so being able to restrain that pipe in these applications is very valuable," he says. "The ground is always moving, so the purpose of this is not only to join the pipe but to restrain it so it won't pull out."

Riseden says the coupling is much like the toy finger cuffs of years past: The harder you tried to get out of the finger cuff, the harder it held.

"Ground is shifting all the time, especially during the spring thaw, and that puts a great deal of pressure for pipes to absorb," he says. "When pipe couplings offer dynamic deflection capabilities, more leaks are going to be prevented farther down the line."

The coupling restraint has a working pressure of 232 psi and test pressure of 465 psi. Both the coupling restraint and flange adapter have a pipe diameter range of 4 to 12 inches. **855/457-2879; www. krauszusa.com.**

industry news

Yaskawa launches mobile-friendly website

Yaskawa America launched its mobile-friendly website, www.yaskawa.com. The product site includes improved navigation, news and announcements, a modified search tool and the ability to rate content and provide feedback.

Kaeser Kompressoren expands facility

Kaeser Kompressoren, international headquarters of Kaeser Compressors, began construction of a 200,000-square-foot manufacturing facility in Coburg, Germany. The building is scheduled for completion in 2016.

Hydro-Dyne acquires manufacturing facility

Hydro-Dyne Engineering acquired a 107,500-square-foot manufacturing facility in Pinellas County, Fla. Located in the Tampa Bay area, capital investments totaling more than \$1 million will be made in manufacturing equipment, computer system and building renovations.

AWWA presents college scholarship

The American Water Works Association presented its 2014 American Water Scholarship to Michael Rose, a doctoral student at Johns Hopkins University. The \$5,000 annual scholarship is presented to a graduate level student to assist



with the development of professionals interested in service to the water industry. Rose's research focuses on iodine-containing disinfection byproducts that may be formed during treatment of hydraulic fracturing wastewater generated during natural gas drilling.

Mazzei Injector names president

Mazzei Injector Company, manufacturer of high-efficiency venture injectors, promoted Geoffrey Whynot to president. He joined the company as chief financial officer in 2012.

Inliner Technologies launches website

Inliner Technologies launched www.inliner.com, an information and product website for the wastewater rehabilitation industry.

Armchem names senior vice president

Armchem International named Gregory Langston senior vice president of sales. He will be responsible for all global sales of Armchem and its sister company Handi-Clean, including inside, outside, Internet, wholesale and retail.

Huber Technology names president

Huber Technology promoted Henk-Jan van Ettekoven to president and CEO of the Huntersville, N.C., subsidiary of Huber SE. He had served as director of marketing and service since 2007, responsible for strategic growth opportunities, program and product development, along with aftermarket sales in North America.

Tintometer names vice president

Tintometer, manufacturer and supplier of water testing equipment and reagents, named Dan Thompson vice president of operations for its North American facility.

Neptune's ETS-UV receives conditional acceptance

Neptune-Benson's closed-vessel ETS-UV system received conditional acceptance from the California State Water Resources Control Board. The approved unit is an 800-watt, low-pressure, high-output, closed-vessel UV system designed for high level reuse water disinfection. **tpo**



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worth noting

people/awards

Don Skinner of Kendallville, Ind., was named superintendent of the Ligonier Wastewater Treatment Plant.

The **McKim & Creed** engineering firm was named the Wastewater and Water Consultant of the Year by the Florida chapter of the American Public Works Association.

The **Bemidji (Minn.) Wastewater Treatment Plant** will have a mural painted on its side by local artist Wesley May.

Dennis Duryea was named plant manager for the Kiski Valley (Pa.) Water Pollution Control Authority.

Scott Andry was named public works director for the City of Waldport, Ore. He had been the city's wastewater treatment operator.

The **City of Florence (S.C.) Regional Wastewater Management Facility** was honored by the Municipal Association of South Carolina for demonstrating that "wastewater treatment facilities, appropriately designed, can coexist with surrounding land uses and substantially benefit the community."

The **Clifton C. Williams Wastewater Treatment Plant** and the **Wright Smith Jr. Wastewater Treatment Plant**, part of the Mobile (Ala.) Area Water and Sewer System, were honored by the National Association of Clean Water Agencies for perfect compliance.

Fuller Industries of Great Bend, Kan., received the Kansas Water Environment Association's Gold Pretreatment Compliance Award. The company was nominated by the Great Bend City Wastewater Treatment Plant.

The **City of Mesa** received a Wastewater Collection System Award of Merit from the Arizona Water Association.

The **Ilwaco** and **Long Beach wastewater treatment plants** received Outstanding Wastewater Treatment Plant Awards from the Washington Department of Ecology for perfect performance in 2013.

Scott Getchell was named director of operational services for the George, Miles & Buhr engineering and architectural firm in Salisbury, Md. He will lead a new service sector within the firm's wastewater/water engineering group that focuses on the operations and maintenance of municipal projects.

Iowa Gov. Terry Branstad proclaimed July 20-26, 2014, as **Water and Wastewater Workers of Iowa Week** to honor those workers for their daily environmental efforts.

The Public Policy Forum of Southeast Wisconsin gave its Norman N. Gill Award for Individual Excellence to **Kevin Shafer**, executive director of the Milwaukee Metropolitan Sewerage District, for adherence to good government principles of collaboration, cooperation and diligence.

The American Water Works Company received four Partnership for Safe Water Awards. One plant received a Presidents Award, another received an award for maintaining Phase III certification for five years, and two systems were presented with the company's first-ever Phase III Directors Awards for Distribution System Optimization Programs.

The National Water Research Institute named David Sedlak as the 21st

recipient of the Athalie Richardson Irvine Clarke Prize for excellence in water research.

The AWWA honored **Bruce Manning**, CH2M HILL fellow water treatment technologist, with the Fuller Award, its highest award for engineering skill, diplomatic talent and leadership prowess. Manning was recognized for his 36 years of providing industry expertise and leadership skills to the water treatment workforce.

The **Del Valle (Calif.) Water Treatment Plant** received the Directors Award of Recognition from the Partnership for Safe Water for the 15th consecutive year, an honor achieved by only 30 other water utilities.

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.

education

AWWA

The American Water Works Association is offering these courses:

- Nov. 5 Distribution System Issues Part 3 of 3: Nitrification Control Strategies Webinar
- Nov. 6-7 Lake Management Training, Rutgers University
- Nov. 12 Measuring and Addressing Water/Wastewater Bills Affordability Webinar

Visit www.awwa.org.

Alaska

- The Alaska AWWA section is offering these courses in Anchorage:
- Nov. 3-7 Introduction to Small Wastewater Systems
- Nov. 17-20 PLC Workshop: From Introduction to Application
- Nov. 17-18 PLCs for Non-Programmers
- Nov. 19-20 PLC Programming and Applications
- Visit www.dec.alaska.gov.

Arkansas

The Arkansas Environmental Training Academy is offering the following courses:

- Nov. 1-15 Advanced Water Treatment, online
- Nov. 4-6 Advanced Water Treatment, Maumelle
- Nov. 16-30 Advanced Water Distribution, online
- Nov. 18-20 Basic Water Treatment, Fayetteville

Visit www.sautech.edu/aeta.

The Arkansas Rural Water Association is offering an Advanced Water Treatment course Nov. 18-20 in Lonoke. Visit www.arkansasruralwater.org.

California

The California-Nevada Section of AWWA is offering these courses:

- Nov. 3 Water Quality Workshop, Vista
- Nov. 4 Regulations Workshop, Vista
- Nov. 4 T1-T2 Review, Riverside
- Nov. 5 T1-T2 Math Review, Riverside
- Nov. 5 T3-T4 Math Review, Riverside
- Nov. 5 Water Use Efficiency Grade 3 Workshop, West Sacramento
- Nov. 6 T3-T4 Review, Riverside
- Nov. 7 Backflow Refresher, West Sacramento
- Nov. 12 T1-T2 Review, West Sacramento
- Nov. 13 T1-T2 Math Review, West Sacramento
- Nov. 13 T3-T4 Math Review, West Sacramento
- Nov. 14 T3-T4 Review, West Sacramento

Visit www.ca-nv-awwa.org.

Florida

The Florida Water Environment Association is offering an Innovations and Energy Savings in Wastewater Treatment Seminar Nov. 6 in Boca Raton. Visit www.fwea.org.

Illinois

The Illinois Section of AWWA is offering these courses:

- Nov. 4 Complying with Stage 2 DBP Requirements, Westmont
- Nov. 13 Effective Backflow Programs, O'Fallon
- Nov. 13 Complying with Stage 2 DBP Requirement, St. Charles

• Nov. 20 – Complying with Stage 2 DBP Requirements, Danville Visit www.isawwa.org.

The Southern Illinois University Environmental Resources Training Center is offering these courses:

- Nov. 4-7 Cross Connection Control, Peoria
- Nov. 12 Backflow Prevention Symposium, Bloomington
- Nov. 17 Class B Water Operations 1, Geneva
- Nov. 18 Class B Water Operations 2, Geneva

• Nov. 19-20 – Class 1 & 2 Wastewater Operations, Edwardsville

Visit www.siue.edu/ertc.

Indiana

The Alliance of Indiana Rural Water is offering a GIS Mapping course Nov. 6 in Cloverdale. Visit www.inh2o.org.

Kansas

The Kansas Water Environment Association is offering these courses:

- Nov. 7 Wastewater Certification Preparation, Liberal
- Nov. 12 Wastewater Certification Preparation, Liberal
- Nov. 12 Asset Management, Russell
- Nov. 18-19 Wastewater Certification Preparation, Phillipsburg
- Nov. 19-20 Utility Management Skills, Topeka
- Nov. 21 Special Topics: Introduction to Water and Wastewater Chemistry, Hugoton

Visit www.kwea.net.

Michigan

The Michigan Water Environment Association is offering these courses:

- Nov. 5 Process Seminar, East Lansing
- Nov. 12 Electrical System Maintenance Seminar, Grand Rapids Visit www.mi-wea.org.

New York

The New York Water Environment Association is offering these courses:

- Nov. 5 Solids Handling and Dewatering, Syracuse
- Nov. 13 Disinfection Optimization, Chautauqua
- Nov. 20 Sequencing Batch Reactor Design and Operations, Babylon Visit www.nywea.org.

The New York Section of AWWA is offering these courses: Nov. 4 – Topics in Wastewater Treatment and Distribution, Peru Nov. 5 – Basic Laboratory Skills, Peru Visit www.nysawwa.org.

Oklahoma

Rose State College is offering these courses:

- Nov. 3-6 C Water Lab Operator, Midwest City
- Nov. 3-6 A/B Wastewater Operator, Midwest City
- Nov. 4 Trenching/Excavation, Midwest City
- Nov. 5 Confined Space Entry, Midwest City
- Nov. 10-14 OSHA 40-hr Hazwoper Class, Midwest City
- Nov. 17-21 D Water and D Wastewater Operator, Midwest City
- Dec. 15-16 C Water Operator, Midwest City

events

Nov. 4-7

Nebraska Water Environment Association and American Water Works Association Joint Fall Conference, Younes Convention Center, Kearney. Visit www.ne-wea.org.

Nov. 6

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

Nov. 10-14

AWWA Mexico Section 2014 Annual Conference, Yucatan. Visit www.awwa.org.

Nov. 16-19

AWWA North Carolina Section 2014 Annual Conference, Winston-Salem. Visit www.ncsafewater.org.

Nov. 16-20

2014 AWWA Water Quality Technology Conference & Exposition, New Orleans. Visit www.awwa.org.

Nov. 19

Central States Water Environment Association-Minnesota Section Conference on the Environment, University of Minnesota-St. Paul. Visit www.cswea.org.

Nov. 19-21

Indiana Water Environment Association Annual Conference, Indianapolis. Visit www.indianawea.org.

Nov. 30-Dec. 4

AWWA Florida Section 2014 Annual Conference, Champions-Gate. Visit www.fsawwa.org.

• Dec. 17-18 – C Wastewater Operator, Midwest City Visit www.rose.edu/oklahoma-environmental-training-center.

Accurate Environmental is offering the following courses:

- Nov. 4-6 D Water and Wastewater Operator, Stillwater
- Nov. 10-11 C Wastewater Operator, Stillwater
- Nov. 12-13 C Water Operator, Tulsa

• Nov. 17-20 – A/B Water Laboratory, Stillwater Visit www.accuratelabs.com/classschedule.php.

Texas

- The Texas Water Utilities Association is offering these courses:
- Nov. 18-20 Basic Wastewater, Victoria
- Nov. 18-20 Basic Water, San Marcos
- Nov. 18-20 Wastewater Lab, Longview
- Visit www.twua.org.

Utah

- The Intermountain Section of AWWA is offering these courses:
- Nov. 4-5 Southern Utah Special Pre-certification Test Review, St. George
- Nov. 6 Administrative Professionals Training: Leadership, West Jordan
- Nov. 20 Water System Operator Training, Delta

Visit www.ims-awwa.org.

West Virginia

The West Virginia Water Environment Association and the West Virginia Environmental Training Center are co-hosting an Activated Sludge: Microbiology and Process Control course Nov. 4-6 in Parkersburg. Visit www. wv-wea.org. (continued)

MARKETPLACE ADVERTISING



Wisconsin

The University of Wisconsin- Madison Department of Engineering Professional Development is offering a Leadership Skills for Supervisors course Nov. 12 in Madison. Visit www.epdweb.engr.wisc.edu.

The Wisconsin Department of Natural Resources is offering these courses:

- Nov. 3-4 Distribution Certification, Fond du Lac
- Nov. 3-4 Disinfection, Oconomowoc
- Nov. 4-6 Water Industry Professional Prep, Milwaukee
- Nov. 11-13 Fundamentals of Modern Wastewater Treatment Process, Milwaukee
- Nov. 18-20 Safe and Efficient Fresh Water Transport and Distribution, Milwaukee
- Nov. 21 Water Purification Processes in Modern Waterworks, Milwaukee
- Nov. 24-26 Key Processes of Wastewater Transport and Control, Milwaukee
- Nov. 25-26 Monitoring, Controlling, and Optimizing Operations in Water, Milwaukee

Visit http://dnr.wi.gov/elcpublic/EventCal.aspx?pc=1#.U7Gq cawhaG. tpo

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Field Service Specialist: Aqua-Aerobic Systems, Inc. is hiring a Field Service Specialist. Refer to http://www.aquaaerobic.com/index.cfm/contact-us/careers/; No phone calls; EOE. Location: Rockford, IL 011

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AQUA-AEROBIC SYSTEMS, INC. 1969 - 2014 Carl Naumann W&WW Superintendent City of Justin WWTP Justin, TX

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At the City of Justin's Wastewater Treatment Facility, Superintendent Carl Naumann is helping his team by sharing his immense knowledge of the treatment process. "I've never been one to say, 'If it's not broke, don't fix it.' By making small adjustments throughout the plant, you'll understand the effects, and know how to fix things in the future," he shared.

Carl's dedication to helping his up-and-coming operators hone their craft is invaluable to the City of Justin. "It starts

with understanding, and then really getting into it. I'm always asking the guys to name different process levels from around the plant. When they know the answers off the tops of their heads, I say, 'Bingo! You just learned how to be an operator.'"

Another way Carl is helping to improve the plant is by performing select laboratory testing in-house. "When I came here [to Justin], we were outsourcing our TSS (total suspended solids) testing, something I knew we could be doing ourselves. When I priced out the ovens, paper and analytical balance from you guys [USABlueBook], it was a no-brainer. Once we brought everything in-house, my TSS testing costs were reduced by \$11,000 annually, and it was all thanks to USABlueBook!"

"My TSS testing costs were reduced by \$11,000 annually, and it was all thanks to USABlueBook!"

USABlueBook is proud to assist Carl and his team with everything they need for their plant. As he put it best, "It's always an adventure, and there's always something. It's nice to know I can just grab my USABlueBook."

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Adding select bacteria to your biological wastewater system helps to maximize overall performance at reduced operating costs. These strains are created specifically for collection systems and treatment plants.

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Use for better sludge settling and dewatering, control of surface foam and filamentous growth, reduction of total sludge volume, and improved plant performance. Packaged in ¹/₂-lb water-soluble pouches in 25-lb containers.

STOCK #

45044

45046

DESCRIPTION D-500A for Large Plants D-500C for Smaller Plants



Formula D-220

Reduces grease and sulfides in sewers and lift stations, lowers maintenance costs for grease control, reduces sewer corrosion while improving sewer flow, and increases pump life. Packaged in 1/2-lb water-soluble pouches in 25-lb containers.

 DESCRIPTION
 STOCK #
 EACH

 D-220
 45042
 \$ 281.95



Formula Nitro

Use for fast compliance and ammonia control. This formula removes ammonia, nitrite and nitrate, using selected strains of *Nitrosomonas* spp and *Nitrobacter* spp that function over a widerthan-normal range of pH values.

DESCRIPTION	STOCK #	EACH
1 Gallon	46953	\$ 131.95
5 Gallons	46954	594.95
55 Gallons	46955	6,135.95



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For more information, including recommended dosing schedules, see page 1653 in USABlueBook Catalog 125.

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SAP-041114-00