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High Expectations

Donald Malovets
Regional Maintenance Superintendent
Waco, Texas

DONALD MALOVETS EXCELS WITH EXPERIENCE, DEDICATION, AND A STRONG TEAM

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IN MY WORDS:
Tapping into energy efficiency
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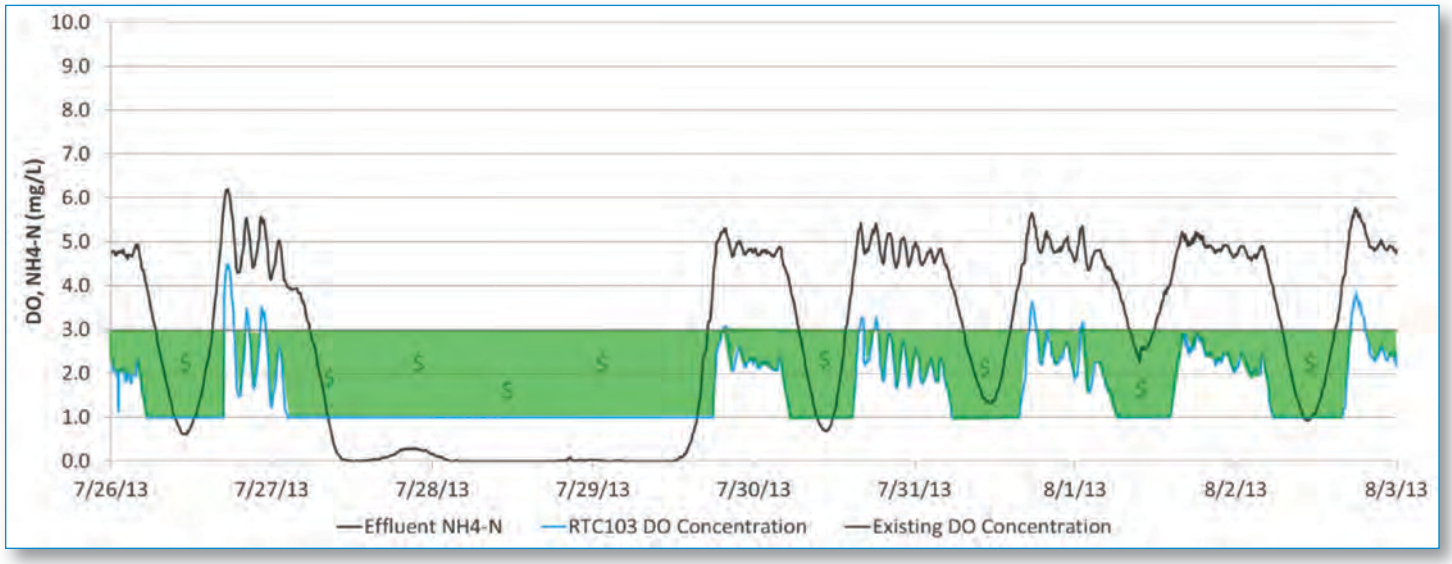

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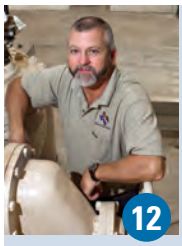

on the cover

Donald Malovets is known as the go-to guy at the Brazos River Authority (BRA). During his 25 years with the authority his troubleshooting, repair, supervisory and management skills have helped prolong equipment life significantly and save money. (Photography by Andy Sharp)

top performers:

coming next month: April 2016

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- Let's Be Clear: Reflections on Earth Day
- Top Performers:
  - Wastewater Plant: Florida Seminole Tribe, Hollywood Wastewater Treatment Plant
  - Wastewater Biosolids: Environmental management in Camden County, New Jersey
  - Wastewater Operator: David McAlpin, Blountsville (Alabama) Utility Board
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- How We Do It: Chemical phosphorus control in Virginia, Minnesota
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let's be clear

Great Medicine

A GLOBAL SURVEY SAYS THE BIGGEST MEDICAL MILESTONE OF THE LAST 150 YEARS IS NOT VACCINES, ANTIBIOTICS, OPEN-HEART SURGERY, OR THE DISCOVERY OF DNA

By Ted J. Rulseh, Editor

Quick: What's the greatest medical milestone of the last 150 years? Is it vaccines? Antibiotics like penicillin? X-ray and MRI imaging? Open-heart surgery? The discovery of DNA?

No, none of the above. The answer is: sanitation. At least that's the conclusion of a global survey conducted by the *British Medical Journal* several years ago. This survey isn't news to people in the water and wastewater business. When such favorable news comes out, those in the profession tend to share it widely, as they should.

Still, it's worthwhile to look at the survey and its results in a little more depth, in part because inadequate sanitation is still a major problem in parts of the world. Professor Johan Mackenbach of Erasmus University Medical Center in the Netherlands has noted, "In 2001, unsafe water, sanitation and hygiene accounted for over 1.5 million deaths from diarrheal disease in low- and middle-income countries."

AROUND THE WORLD

The *BMJ* survey attracted responses from all over the world and from different walks of life. Not surprisingly, since *BMJ* is a medical publication, doctors gave the most responses at 3,198. But the journal also heard from 2,438 members of the public, 1,582 students, 1,144 academic researchers, and others in a wide range of categories.

It is interesting that, in such a diverse group, sanitation came out in first place. In developed countries, we take sanitation so much for granted that it would be easy to overlook it amid a list of medical miracles. The fact is, sanitation ranked a clear No. 1 with 1,795 responses: 15.8 percent.

It's also impressive that in a field of respondents led by physicians and researchers who focus on treating disease, so many remembered the importance of preventing it.

ERASING A MENACE

As part of the *BMJ* poll, leading doctors and scientists championed each of the 15 milestones. Mackenbach championed sanitation. The Industrial Revolution, starting in the 1780s, caused people to congregate in towns and cities where unplanned growth, poor working conditions and low wages led to a deterioration in public health. "Infectious diseases exacted a huge toll in morbidity and mortality, among them

British Medical Journal medical milestone poll results

Milestone	Votes	Percent
Sanitation (clean water and sewage disposal)	1,795	15.8
Antibiotics	1,642	14.5
Anesthesia	1,574	13.9
Vaccines	1,337	11.8
Discovery of DNA structure	1,000	8.8
Germ theory	843	7.4
Oral contraceptive pill	842	7.4
Evidence-based medicine	636	5.6
Medical imaging (X-rays, etc.)	471	4.2
Computers	405	3.6
Oral rehydration therapy	308	2.7
Risks of smoking	183	1.6
Immunology	182	1.6
Chlorpromazine	73	0.6
Tissue culture	50	0.4

tuberculosis, diphtheria, measles, smallpox, typhoid and typhus, as well as the 'enteric fevers,'" Mackenbach wrote.

Pandemics of cholera hit western Europe in the 1830s, 1850s and 1860s. A pioneer in sanitation was John Snow, who showed that cholera was spread by water and showed that the shut-off of a particular pump in London stopped the spread of the disease in that area. Another hero was Edwin Chadwick, who came up with the idea to pipe clean water into homes and build sewers to carry wastewater away.

> "In 2001, unsafe water, sanitation and hygiene accounted for over 1.5 million deaths from diarrheal disease in low- and middle-income countries."
>
> **JOHAN MACKENBACH**
> **ERASMUS UNIVERSITY MEDICAL CENTER**
> **THE NETHERLANDS**

PROOF IN RESULTS

The benefits of improved sanitation were substantial. "Britain took decades to implement these measures and they spread only slowly to the rest of Europe, but in the end they had a major effect on mortality," Mackenbach wrote.

"In the Netherlands, for example, the first large municipality with piped drinking water was Amsterdam (1854), followed by Rotterdam and The Hague in the 1870s. By the end of the century, around 40 percent of Dutch people had piped drinking water, and in the early 20th century, sewerage systems covered more than half the population.

"Between 1870 and 1970, age-standardized mortality in the Netherlands fell by almost 75 percent. An important contribution to this decline was a fall in the number of deaths from infectious diseases, including deaths from respiratory tuberculosis (down 15 percent), acute respiratory diseases (11 percent), and acute digestive diseases (8 percent)."

Between 1901 and 1970, when a more accurate classification of causes of death was used, a fall in mortality from "diarrhea and dysentery" accounted for 12 percent of the overall decline in mortality in the Netherlands. Similar figures were reported for England and Wales.

Maybe none of this is news to people in the profession. Still, it can only help to be reminded how critically important sanitation is. Things like the results of the *BMJ* poll can help put a little more spring in your step on the way to work. tpo

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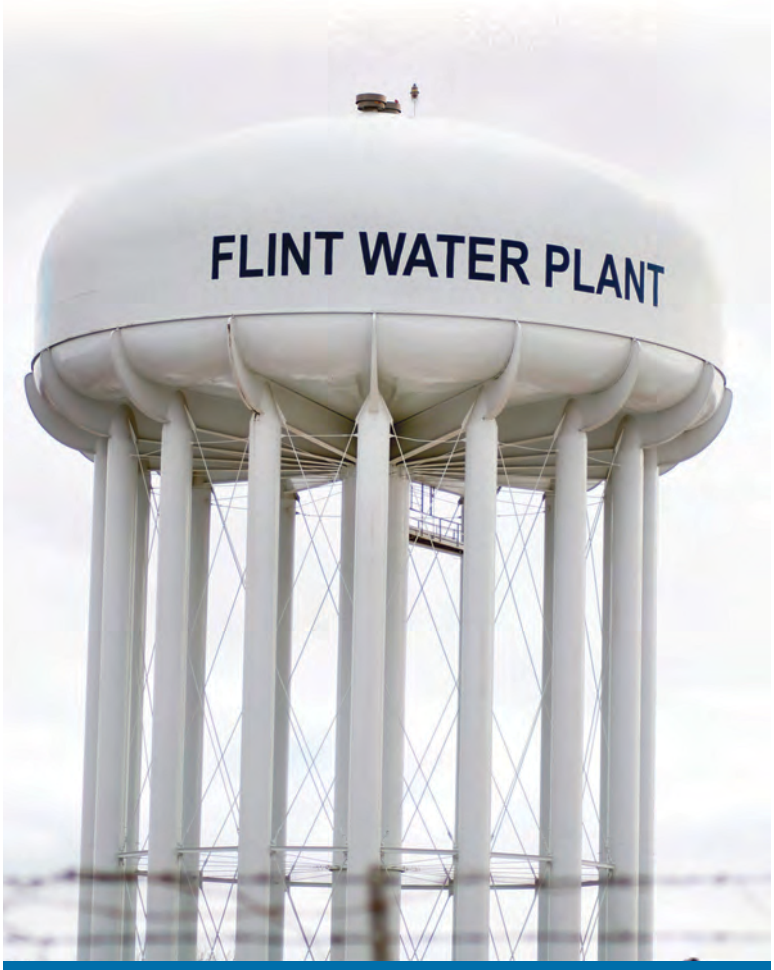

FLINT TIMELINE

Trouble in the Making

The water-quality crisis in Flint, Michigan, didn't happen overnight. Instead, its roots go back more than four years. In this online exclusive — a timeline of the Flint crisis — we've compiled many of the major political moments, pulling from various media sources. It's a chilling look at the who, what, when and where of this catastrophic manmade crisis.

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OVERHEARD ONLINE

"The lead poisoning in Flint is, at the end of the day, a failure of water treatment."

The (So Far) Untold Story of Flint Lead Pollution

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OH, DEER!

9-Point Buck Rescued From Clarifier

When a 9-point whitetail buck took a dive in a clarifier at Springfield City Water, Light & Power in Springfield, Illinois, an assistant operator's daily rounds become a little complicated. Take a look at this video, which has gone viral on social media, and see how plant staff and emergency rescue teams managed to free the water-trapped cervine.

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THEY SAID WHAT?

The Nitty-Gritty of Plant Tours

Water and wastewater plant tours are an essential part of any public education program. In this online exclusive, we get a glimpse into what it's like to explain wastewater to the public. Find out what grade school students ask while on a tour, learn why it's important to serve tap water to plant visitors and more.

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HIGH EXPECTATIONS

AWARD-WINNER DONALD MALOVETS EXCELS AT A LARGE TEXAS WATER AUTHORITY WITH EXPERIENCE, DEDICATION AND A SUPERB MAINTENANCE TEAM

STORY: **Trude Witham** | PHOTOGRAPHY: **Andy Sharp**

DONALD MALOVETS IS KNOWN AS THE GO-TO GUY AT THE BRAZOS River Authority (BRA), based in Waco, Texas. If equipment needs repair, his team gets it done. They handle two surface water treatment plants, one raw water intake pump station and eight wastewater treatment plants for seven counties.

During his more than 25 years with the BRA, his troubleshooting, repair, supervisory and management skills have helped prolong equipment life significantly and save money.

Malovets' contributions earned him the Operator's Meritorious Service Award from the American Water Works Association (AWWA) in 2014. As a licensed water and wastewater operator and the BRA's regional maintenance superintendent, he understands how maintenance affects plant operations.

His job is never dull: "I never have the same day twice. There is no routine in maintenance work." One of his most memorable achievements was dealing with a 2007 flood that damaged the intake at the East Williamson County Regional Water Treatment Plant.

"The flooding, along with trees being carried downriver, took the intake out," he recalls. "My team arranged for a temporary pump so the City of Taylor wouldn't run out of water. In less than 24 hours we had the pump in place, and we ran it for a few weeks until the intake could be repaired."

The team worked 18 hours straight to install the temporary pump; Malovets slept in the back of his pickup truck that night so he could keep an eye on the pump.

Donald Malovets, regional maintenance superintendent at the Brazos River Authority.

LONG-TERM JOB

Malovets came to the water and wastewater business with construction experience and a familiarity with farm machinery. "I lived in a farming community and was working in a factory building school furniture," he says. "I had worked in construction for a while, but it was up and down. I wanted something long term."

He applied at the BRA in 1988 and five months later was hired as a maintenance worker at the Temple-Belton Wastewater Treatment Plant. He received training in plant equipment repair, and his manager started letting the maintenance crew members do more of their own repair work, rebuilding pumps, fixing composting machinery, fabricating motor stands and running conduit.

In 1998, Malovets was promoted to maintenance crew leader, managing a staff of three. In the late 1990s, the BRA formed an alliance with the Lower Colorado River Authority and began operating several of its plants.

"After that influx of facilities, we had to be creative in covering all the plants with nearly the same number of staff," recalls Malovets. In 2001, he was promoted to his current position.

His mentors include Leonard Janke, the farmer he worked for near Davilla, Texas, during summers in 1981-84. "He was meticulous and taught me how to maintain things to last forever," Malovets says. Scott Bloedorn, his boss at the Temple-Belton plant, taught him the electrical and instrumentation side of the industry. He also learned from his future father-in-law, J.P. Morgan, while installing ceramic tile: "He made sure you did it right the first time, to make it last and to be proud of your work."

> “If I worked for someone who just looked at the bottom dollar, I probably wouldn’t still be doing this. The BRA has allowed me to make decisions and experiment to try and make things better.”
> **DONALD MALOVETS**

Malovets does a walk-through in the East Williamson County Regional Water Treatment Plant. His office is next to this plant, just north of Taylor, Texas. The water here is piped in from nearby Granger Lake.

Donald Malovets, Brazos River Authority, Waco, Texas

POSITION:	**Regional maintenance superintendent**
EXPERIENCE:	**25+ years**
AWARDS:	**2014 AWWA Operator’s Meritorious Service Award**
CERTIFICATION:	**Class C surface water and Class B wastewater**
GOAL:	**Work another five-seven years, then retire**
GPS COORDINATES:	**Latitude: 31°32’40.89”N; Longitude: 97°11’30.83”W**

Donald Malovets at the intake area building next to Granger Lake.

OUTDOOR ADVENTURES

When Donald Malovets isn't taking care of business as regional maintenance superintendent at the Brazos River Authority, you may find him on his property moving hay, cutting wood or hunting deer: "There are lots of good deer out there. I once killed an 8-pointer that scored right at 135."

He enjoys camping with his family several times a year at area lakes and Goose Island State Park on the coast. He also takes his center-console bay boat to the coast for trout fishing or to the region's lakes for catfish. "Fishing gives me the chance to relax and enjoy the outdoors. And to get away from it all — especially from that cellphone!"

Malovets has seen many changes in the water business. "In the beginning, it seemed like just a job, but people are now more involved and more educated about the environment," he says. "They understand that what we do can have a huge effect. If I worked for someone who just looked at the bottom dollar, I probably wouldn't still be doing this. The BRA has allowed me to make decisions and experiment to try to make things better. It keeps my mind working and I never get bored."

MULTIPLE PLANTS

The BRA is the oldest river authority in Texas. It owns and operates the 13.8 mgd East Williamson County Regional Water Treatment Plant, which sells water to the City of Taylor and Jonah Specialty Utility District.

The authority also operates the 12 mgd Sandy Creek surface water treatment plant for the City of Leander and a raw water pump station on Lake Stillhouse that transfers water through 26 miles of pipeline to Lake Georgetown. In addition, the BRA operates and maintains 30 lift stations for the City of Temple and one for the City of Belton, plus eight wastewater treatment facilities:

- City of Sugar Land North (6 mgd) and South (7.5 mgd) plants
- City of Hutto Central plant (1.5 mgd)
- City of Round Rock Brushy Creek West plant (3 mgd)
- Cities of Round Rock, Cedar Park, Austin and Leander Brushy Creek East Regional plant (22 mgd)
- Cities of Temple and Belton plant (10 mgd) and composting facility
- City of Temple Doshier Farms plant (7.5 mgd)
- Cities of Clute and Richwood plant (4 mgd)

The maintenance team rebuilds pumps, changes out bearings and seals, orders parts, and welds, cuts and lays out parts for fabrication. They also perform plumbing and electrical troubleshooting and repair; backhoe, trenching and tractor work; plus carpentry, painting and Sheetrocking. They maintain the biosolids composting equipment, grind the brush and screen the product.

"They can do pretty much everything except rewind motors or perform actual machine work, which we send outside," says Malovets. His own duties are broad: maintenance and pipeline personnel management, plant safety inspections and repair, emergency response, budget preparation, vehicle fleet management, and employee training and development. He also fills in for Jay Middleton, regional operations superintendent, and Kyle Headley, deputy regional superintendent.

GREATER EFFICIENCY

On a typical day, Malovets may visit one of the plants, attend a meeting or go to his office. His staff sends him reports with scheduled jobs for the week ahead and a list of crew members on call and off duty.

"With this report and my calendar in hand, I decide where I will spend my time that week," Malovets says. "I usually visit the plants and look at things the maintenance crew leaders need to add to the weekly work schedule. Or I may just walk the plants and discuss how and when we will schedule larger projects."

Malovets also works with the purchasing department to plan the larger projects' scope and prepare bids. "My job depends on surrounding myself with good people in the organization," he says. "There are many who play different roles and who make everything come together. They allow me to succeed along with them." His boss, David Collinsworth, Central and Lower Basin manager, is strongly supportive.

> "My job depends on surrounding myself with good people in the organization. There are many who play different roles and who make everything come together."
> **DONALD MALOVETS**

Malovets is always looking for more efficient ways to do his job. "Our Sandy Creek surface water plant has a floating intake, which is a barge that sits in a cove on Lake Travis," he says. "The water in the cove is usually 75 to 80 feet deep. When the lake level dropped 50 feet during a drought that began in 2010, we shortened the seven vertical turbine pumps so they could stay on the barge longer and we could leave the barge in the cove." Team members pulled one pump at a time over two months, saving the City of Leander several thousand dollars by doing the work themselves.

Regular training helps the team do the best possible job. "We receive regular equipment training either through the licensing agencies or by bringing the trainers to us," Malovets says.

DESERVING RECOGNITION

Malovets describes his management style as straightforward: "I have high expectations and expect good results. I also hold people to what they say. Sometimes I may come across as too harsh, but I feel that I am fair and try to follow the rules. Basically, I want to make things better and am kind of a perfectionist."

This dedication won him the Operator's Meritorious Service Award. Cathy Dominguez, regional government and customer relations manager for the BRA's Lower Basin, nominated him. Malovets was surprised to win: "Here I am on the maintenance side and I don't consider myself an operator. I'm not one who expects a pat on the back."

After he received the award, his boss wanted to take him to a BRA board of directors meeting. "I said that was fine as long as I could take my supervisors with me, because they deserve the recognition, too."

Malovets was a member of the operating team at the Temple-Belton facility, which won a U.S. EPA award for beneficial use of biosolids and innovative technology. The facility was one of the first in the country to establish a mulch and compost product made from biosolids and the city brush collections.

"We produce a Class A biosolids product that the BRA sells for the cities to help offset the cost of running the facility," Malovets says. His team maintains the composting equipment, which includes a wood grinder, windrow turner, compost screen and several front-end loaders. *(continued)*

Visits to BRA facilities are often part of a day's work for Donald Malovets, who is always on the lookout for ways to improve efficiency.

EXPERIENCED CREW

Most of his team members have water and wastewater certifications. All are well experienced. They work 10-hour shifts four days a week and rotate on-call weekend duty. They interact regularly with plant operators. "The operators understand and appreciate what we do," Malovets says. "I feel that they are our customers."

> "In wastewater treatment, we see a huge amount of trash in the sewer system, especially rags. More public education is needed to inform everyone about what they can and cannot flush."
> **DONALD MALOVETS**

Malovets holds Class C surface water and Class B wastewater certification. Reporting to him are:

- David Koslovsky, pipeline/maintenance crew leader (10 years with the BRA)
- Maintenance crew leaders John Heaps (Class A wastewater, 28 years), Dirk Bland (Class B wastewater, 26 years) and Greg Graf (Class B wastewater, 17 years)
- David Lesikar, maintenance floater (Class D wastewater, one year)

The crew leaders supervise 17 maintenance technicians.

FUTURE CHALLENGES

Malovets says his greatest challenge is dealing with trash. "In wastewater treatment, we see a huge amount of trash in the sewer system, especially rags," he says. "More public education is needed to inform everyone about what they can and cannot flush."

His crews are constantly pulling rags out of the lift station pumps: "The rags seem to form into a ball and they get sucked up into the pump. We even found a radial tire in a pump one time." The BRA is starting to work with the cities toward a solution.

Another challenge is finding parts for older equipment. "When I started in this field, you could buy parts needed to fix things, but no one is stocking those anymore," Malovets says.

Malovets plans to stay with the BRA for five to seven more years, then retire and "perform minor tractor or road work to keep busy." Looking back, he is happy with his career choice: "I've seen a lot, but I'm sure there are things I haven't seen yet. It's been fun, I tell you." tpo

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Too Much Air?

EXCESSIVE AERATION IN ACTIVATED SLUDGE AND AEROBIC DIGESTION PROCESSES CAN WASTE ENERGY AND IMPEDE TREATMENT PERFORMANCE

By Walter Higgins and Jim Kern, P.E.

Wastewater operators today are saving energy, using fewer chemicals and improving control of their activated sludge process by optimizing their aeration systems, including aerobic digestion.

Aeration zones are critical in the activated sludge process, which includes secondary treatment and nitrogen and phosphorus removal. The question is: Can you over-aerate that process? Many operators would say, "No, the more the better!" But the real answer is: "Yes."

TOO MUCH IS NOT GOOD

Over-aeration wastes energy and can negatively affect process performance. Most wastewater treatment plants operate their aeration zones and aerobic digesters at 1-3 mg/L dissolved oxygen (DO). Anything more may waste DO and energy. Even aerating at 1 or 2 mg/L over the DO setpoint can be extremely wasteful.

Over-aeration can also cause operational problems. Operators love a mixed liquor that settles well. This happens when the microorganisms in the aeration tank excrete a sticky film around their cells as their food gets depleted. Aeration keeps the bugs in suspension, allowing them to collide and ultimately stick together, forming a floc. The floc exhibits a snowball effect: By the time it reaches the secondary clarifier, it is denser than water and settles. Over-aeration can break this floc apart, causing pin floc or small, dispersed floc that does not settle well.

Anoxic zones used for denitrification can also turn partially aerobic, or oxic, due to the high DO in the internal (nitrate) recycle flow. In a biological nutrient removal facility, internal recycle flow can be 400 percent or more of the influent flow. This recycle flow pulls liquid that is high in nitrates from the end of the aerobic zone, then discharges it back to the head of the anoxic zone, where there should be very little or no DO.

Aeration timer at Borough of Pottstown (Pennsylvania) Wastewater Treatment Plant.

An internal recycle saturated with DO could stop the denitrification process because the bugs use the free oxygen (DO) rather than the chemically bound oxygen attached to the nitrate (NO_3) ion to respire. The presence of DO inhibits some desirable biological processes, particularly denitrification.

Operators rely on denitrification not only for nitrogen removal, but also for the alkalinity that is released in the denitrification process. If denitrification is inhibited, the operator may have to add chemicals to keep the alkalinity and pH in check. Alkalinity is so important that many operators add a denitrification step even if it's not needed for nitrogen removal, just to bring back some free alkalinity and oxygen to the system and save money on chemicals.

Hallstead Great Bend (Pennsylvania) Joint Sewer Authority.

HOW MUCH IS NEEDED?

It's a myth that the bugs need air 24/7. Here are two quick points that refute the myth:

- DO may not deplete immediately after the air is shut off. This depends on the time of day, organic loading, temperature, and the type of diffusers. It may take half an hour or more for the DO to be reduced to zero.
- Oxygen exists in three main forms in a treatment plant: DO (O_2), nitrite/nitrate ions (NO_2, NO_3), and sulfate ions (SO_4). After the air is shut off and DO approaches zero, there still may be plenty of chemically bound oxygen (NO_3) available for BOD removal (denitrification).

Another myth is that the mixed liquor suspended solids (MLSS) will not re-suspend if the aeration system is shut down. All scenarios are case-specific, but many facilities can re-suspend the solids even if the air has been off for an hour or so. In general, the required DO for solids processing is 0.5 mg/L in the floc and 2.0 mg/L in the mixed liquor.

WHAT TO DO

If you are like the many operators who enjoy finding creative and better ways to do things, fine-tuning aeration may be another opportunity to make process improvements and save money. Aeration design and control can get very complex, but it can also be done in low-tech, energy-efficient ways. Let's start with the basics.

MONITOR DO

Probably the easiest way to monitor DO is with a hand-held meter with a data logging function. Set the probe in the mixed liquor for as long as the data logger will collect data (one reading per half hour, 48 readings per day as a starting point). Plot the DO for a week or so on a chart. If the DO is over or under your ideal setpoint, reprogram the controls to increase or decrease aeration, or even turn off the aeration at a high DO setpoint for a certain period. Where you put the probe in the aeration tank matters. Think about the ideal setpoint for the location you are measuring to get the desired treatment. Also, ask your consulting engineer what your DO setpoints should be.

IF YOU NITRIFY, WHY NOT DENITRIFY?

What kind of question is this? Why would you want to do more work? The short answer is that adding a denitrification step may save energy and chemicals and benefit the environment. The nitrification process consumes a lot of energy through aeration and also consumes alkalinity. What's needed to nitrify?

- DO range: >2 mg/L [1]
- ORP range: +100 mv to +350 mv [2]
- About 4.57 pounds of oxygen consumed per pound of ammonia nitrified
- About 7.14 pounds of alkalinity consumed per pound of ammonia nitrified
- Time

On the other hand, denitrification occurs under anoxic conditions. By decreasing the DO, nitrate is further reduced to nitrogen gas. Important points about denitrification:

- DO range: <0.2 mg/L [3]
- ORP range: +50 mv to -50 mv [3]
- About 2.86 pounds of oxygen released per pound of nitrate denitrified
- About 3.57 pounds of alkalinity released per pound of nitrate denitrified

Denitrification is often thought of as a method to decrease effluent nitrogen, but it's also a great way to gain back some of the oxygen and alkalinity consumed in the nitrification process.

SUCCESS STORIES

Here are a few real-life examples of treatment plants improving aeration efficiency:

1. Hamilton Township

The operator of the Hamilton Township Wastewater Treatment Plant in Ludlow, Pennsylvania, applied knowledge gained from an energy efficiency training conducted by the U.S. EPA Region 3 and the Pennsylvania Department of Environmental Protection. The plant's 0.07 mgd activated sludge process includes ammonia removal. The operator chose to cut DO from 6-9 mg/L to 2 mg/L.

He first cut back the runtime of two 15 hp blowers from 24 hours per day to 12 hours by alternating the blowers on and off. Over time, he saw that he could cut runtime to nine hours per day while maintaining permit compliance. The electric bill dropped almost 40 percent, from $13,000 to $8,000 per year.

2. Exeter Township Authority

Optimization was more complex for this 7.1 mgd plant in Pennsylvania, which also has an activated sludge process with ammonia removal. During the warm summer months, the aeration tank detention time was more than enough to achieve ammonia compliance. The operations manager knew that if he could denitrify at the front end of the aeration tank by closing some air-supply valves, he would bring back alkalinity, reducing chemical costs and saving energy.

The aeration system consisted of a multistage centrifugal blower with an automated inlet valve controlled by the header pressure. By closing the aeration drop leg ball valves to about 90 percent (to allow some air for mixing) in the first third of the tank, a successful anoxic zone was created. Closing off one-third of the diffusers raised the air header pressure, thus automatically closing the blower inlet valve somewhat to keep the header pressure constant. A partially closed inlet valve admits less air, reducing energy required by the blower.

A power logger installed on the blower during the cold season (100 percent aerated tank) and warm season (66 percent aerated, 34 percent anoxic tank) recorded the savings. Energy use was cut almost in half, saving about $5,000 per month. To achieve further savings, the plant is investing $100,000

to upgrade its aeration system and controls to automated DO control and "most open valve" control technology.

REMEMBER THE DIGESTERS

Aeration efficiency improvements also apply to solids digestion. The main function of aerobic digesters is to reduce the amount of solids to be managed. To reduce the solids in the digester, operators must treat it in a manner similar to the activated sludge process: maintain 1-2 mg/L DO and the proper pH and alkalinity.

Aerobic digesters often accumulate a large amount of nitrate. As the bugs consume each other (endogenous respiration), there is a release of nitrogen compounds. These compounds are oxidized, nitrate is formed and acid is released (alkalinity consumed). This represents another opportunity for on/off aeration to reduce the nitrate and maintain alkalinity levels.

Over-aeration wastes energy and can negatively affect process performance. Most wastewater treatment plants operate their aeration zones and aerobic digesters at 1-3 mg/L dissolved oxygen (DO). Anything more may waste DO and energy. Even aerating at 1 or 2 mg/L over the DO setpoint can be extremely wasteful.

Here are two success stories:

1. Hallstead Great Bend Joint Sewer Authority

This agency in Pennsylvania upgraded from conventional secondary treatment to a four-stage Bardenpho process with chemical phosphorus removal and denitrification filters. The digester decant levels for nitrate-nitrogen (NO_3-N) during summer 2014 were over 80 mg/L. The operator experimented with on/off instead of continuous aeration, setting the blowers to run two hours on and two hours off. This reduced the NO_3-N discharged back to the main process to 0.18 mg/L, saving 54,000 kW ($4,300) per year. Added benefits are a reduction in concentrated nitrate in the supernatant and the restoration of alkalinity to the system.

2. Borough of Pottstown

This 12.85 mgd plant in Pennsylvania has been investing in energy efficiency for several years.

In 2008, the borough replaced the aerobic digester coarse-bubble diffusers with fine-bubble diffusers. By cutting the need for two 250 hp blowers in half, the plant saved $72,000 per year and achieved payback in four months. In 2010, new positive displacement blowers with variable-frequency drive controls were installed in the aerobic digester. The more efficient blowers supply air at lower horsepower. The added aeration capacity enabled the plant to haul in more waste and increase revenue. Net savings are $36,000 per year.

The latest investment was a $200 timer for the activated sludge blower. The plant electrician wired the timer and set the "on" cycle for four hours and the "off" cycle for four hours, reducing energy usage by half. This enabled the creation of an anoxic environment for denitrification. The change saved $10,000 per year on energy and $50,000 per year by eliminating lime and soda ash addition for pH and alkalinity adjustment. To top it off, mixed liquor settling characteristics improved.

MONITOR THE CHANGES

With any process change, it is necessary to involve the plant staff, the regulatory agency and the consulting engineer. It is best to make small, incremental changes and wait for the results. It is important to collect data, including DO levels, ORP readings and alkalinity concentrations to be sure you're on track.

Hamilton Township (Pennsylvania) Wastewater Treatment Plant.

When aiming for low to no DO in anoxic zones, low-DO filaments could begin to thrive, slowing down settling. Changes require frequent monitoring.

When considering a project to save on energy and chemicals, discuss it with management. One way to amplify the savings is to invest them in other efficiency projects. It is important to have a champion to lead each project, to communicate and win buy-in up and down the chain of command, and to adhere to a "plan, do, check, act" approach.

Although decreasing aeration to improve performance may seem counterintuitive, the success stories show what can be achieved. There are numerous benefits to implementing energy- and chemical-saving projects sooner rather than later. **tpo**

References:
[1] WEF and ASCE 2006, p 42
[2] *ORP Management in Wastewater as an Indicator of Process Efficiency*, YSI Environmental
[3] WEF and ASCE 2006, p 183

Find out more

For more information about optimizing aeration processes to save energy and improve process performance, readers may contact the U.S. EPA Region 3 Energy/Optimization Team.

- Walter Higgins, 215/814-5476, higgins.walter@epa.gov
- Jim Kern, P.E., 215/814-5788, kern.jim@epa.gov

Other resources include:

- Website: water.epa.gov/infrastructure/sustain/waterefficiency.cfm.
- *Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities:* http://www.deq.virginia.gov/Portals/0/DEQ/PollutionPrevention/EPA_WWTP_guidebook_si_energymanagement.pdf

For funding opportunities, readers may contact their State Revolving Fund office: water.epa.gov/grants_funding/cwsrf/contacts.cfm.

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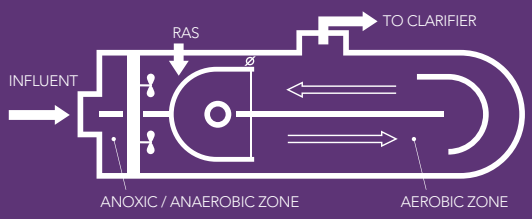

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Why Not the *Best?*

A PRESIDENTS AWARD FROM THE PARTNERSHIP FOR SAFE WATER WAS A NATURAL RESULT OF COMMITMENT TO EXCELLENCE BY THE ENTIRE TRUCKEE MEADOWS TEAM

STORY: **Ted J. Rulseh**
PHOTOGRAPHY: **David Calvert**

The Truckee Meadows Water Authority Chalk Bluff Water Treatment Facility in Reno, Nevada.

SOMETIMES THE TRUCKEE RIVER FLOWS CLEAR. Other times it flows like chocolate milk. The change can take place within minutes. Whatever the river water's condition, the Truckee Meadows Water Authority turns it into drinking water at no more than 0.08 NTU.

The river water's variability is one big challenge facing the TMWA, which serves about 400,000 residents of the Reno-Sparks area in northern Nevada. Another is a drought that has persisted for four years, putting stress on water supplies. On both counts, the utility's 16-member operations team has come through, with lots of help from the rest of the 190-member staff and from customers who know the value of water in a high desert environment.

Most water heading to customers passes through conventional treatment at the 90 mgd (design) Chalk Bluff Water Treatment Facility. That plant, commissioned in 1994, received a 2015 Presidents Award for excellence in water treatment from the Partnership for Safe Water.

Paul Miller, manager, operations and water quality, says the award is a natural outcome of his team's dedication to quality. "It's a tribute to the operators and a testament to their pursuit of excellence," he says. "That pursuit of excellence is shared throughout the entire company."

NEWLY EXPANDED

The TMWA was formed in 2001. In January 2015, the utility completed a consolidation with the Washoe County Department of Water Resources and the South Truckee Meadows General Improvement District. The merger aimed to reduce the cost of service and to maximize use of surface water resources across the region.

During non-drought years, the TMWA draws about 90 percent of its water from the Truckee River and the rest from 92 groundwater wells. Demand averages about 62.5 mgd but can peak at 125 mgd in summer. At such times, the utility calls on its 27 mgd (design) Glendale Water Treatment Facility.

Truckee Meadows Water Authority, Reno, Nevada

FOUNDED: |	**2001**
POPULATION SERVED: |	**400,000 (120,000 connections)**
SERVICE AREA: |	**8 communities, 2 water districts**
SOURCE WATER: |	**Truckee River, 92 groundwater wells**
CAPACITY: |	**65 mgd average, 125 mgd peak**
TREATMENT PROCESS: |	**Conventional**
DISTRIBUTION: |	**1,900 miles of pipeline**
SYSTEM STORAGE: |	**150 million gallons**
KEY CHALLENGE: |	**Maintaining supply during drought**
WEBSITE: |	**www.tmwa.com**
GPS COORDINATES: |	**Latitude: 39°30'23.67"N; longitude: 119°45'4.85"W**

"During periods of drought such as this, we rely much more heavily on groundwater. We have a drought plan that we are following, and everything is going according to plan."
PAUL MILLER

> "You wouldn't achieve this without having a committed team of people. It took an operations team fully on board to achieve this high standard 100 percent of the time."
> **PAUL MILLER**

Truckee Meadows Water Authority team members include, from left, James Bryant, apprentice operator; Jeremy Keele, operator; Paul Miller, operations and water quality manager; Will Raymond, water operations supervisor; Eric Mothershead, operations and maintenance supervisor; and Scott Knecht and Bill Hovda, operators.

TOMORROW'S OPERATORS

The Truckee Meadows Water Authority helps fill the pipeline for water operators through a state-certified apprenticeship program, in cooperation with the International Brotherhood of Electrical Workers union.

"We put candidates through a two-year program that includes the Sacramento State University curriculum," says Scott Knecht, operator III. "There are numerous milestones of achievement to be met each month. Work hours are aligned to the different disciplines in water treatment and distribution.

"All the hours are carefully calculated and recorded to enable participants to qualify for state certification. There are milestone tests that each apprentice has to take and pass. It's a very rigorous program." Apprentices rotate through day and night shifts and among four crews, gaining exposure to all facets of the processes.

"After the two years, they should have their Grade 2 state treatment and distribution licenses and be ready to go to work," Knecht says.

Openings for apprentices attract multiple applicants, from high school graduates on up to people with bachelor's and master's degrees in a variety of fields, says Knecht. "We look for people who want more than just a job. It takes a big commitment to make it work, but it's worthwhile. It's satisfying, it's a great career, and it's a great company."

"During periods of drought such as this, we rely much more heavily on groundwater," says Miller. "We have a drought plan that we are following, and everything is going according to plan. The best thing for this community is that we have stored surface water upstream in a number of reservoirs. We have used about 20 percent of that stored water during this drought. We've also asked our customers for a voluntary 10 percent reduction in usage. They have responded even better than we've requested."

All members of the operations team are dual-certified, licensed in treatment and distribution. Foremen are required to have Grade 4 certifications; all operators are certified to Grade 3. The team includes:

- Will Raymond, water operations supervisor
- Working foremen Tim Flanagan, Pat Kuykendall, Brian Luczkow and Ted Saxe
- Treatment plant operators III Kurtis Arnold, Mike Bryant, Travis Bunkowski, Darrin Garland, Ben Goodrich, Bill Hovda, Jeremy Keele, Scott Knecht, Michael Nevarez and Jimmy Winters (James Bryant is an apprentice operator)

RIVER'S CHALLENGES

Operating the Chalk Bluff plant means constantly watching raw water quality. The Truckee River flows out of Lake Tahoe and drains part of the high Sierra Nevadas. "You can imagine flowing from a mountain watershed with snow melt, how variable the raw water can be," says operator Knecht. "We get heavy thunderstorms in spring, and we have a fire-scarred watershed.

"Combine those two and you can get huge runoffs very quickly. We get some seriously dirty water. In minutes, we can go from 2 NTU up to 5,000 NTU — that's like thick chocolate milk. We continuously surveil the upstream watershed conditions for any problems coming down toward us so we can decide how to treat it, or even close the plant intakes and let the slug go by, if we can afford to. Usually, though, we treat the water."

Seasonally low raw water temperatures and wide diurnal pH swings add to the treatment challenges. The pH, driven by algae, can exceed 9 in the early evening and bottom out below 7 in the early morning. Despite all this, the imperative is to produce water that never exceeds 0.08 NTU.

TREATING WITH PRECISION

Water comes to the Chalk Bluff plant in a 6 1/2-mile concrete-lined canal and passes through coarse screens before entering two 2-million-gallon pretreatment ponds. Although their main purpose is gravity settling, the ponds

Frequent sampling and analysis helps the Chalk Bluff team know when to adjust the process to keep finished water quality consistent.

can be chlorinated to oxidize taste and odor (which can be caused by algae blooms in the river) or fed primary coagulant to speed settling (such as when the raw water is extremely turbid).

The water then passes through a pair of Envirex and Link-Belt fine, mechanically cleaned screens (WSG & Solutions) and is dosed with carbon dioxide as needed to bring the pH below 7.7. Next, the water enters two treatment trains where polyaluminum chloride coagulant is added. After flash mixing, the flow enters six flocculation/sedimentation basins. These are followed by 12 gravity filters containing 54 inches of anthracite and 10 inches of silica sand media, and licensed for a loading rate up to 8 1/2 gallons per square foot per minute.

The filtered water is disinfected with sodium hypochlorite to achieve an overall 4-log pathogen removal/inactivation, then adjusted to pH 8 with soda ash before distribution to minimize potential leaching of copper and lead from customer piping.

FINE TUNING

A variety of measures helps ensure that water leaving the filters stays below 0.08 NTU. “We have turbidimeters (Hach) a few miles upriver so we can watch a plume of dirty water come down toward us,” Knecht says. “In

ABOVE: Scott Knecht checks bar screens where raw water is delivered.
RIGHT: Knecht discusses the rapid mixer and jet diffuser with Dillon Hansen, apprentice operator.

the raw water canal, we have cameras and turbidimeters. Then we have turbidimeters throughout the plant, all the way through the process. We adjust our feed rates based on turbidity and flow, the temperature of the water, and the type of dirt that's in it, whether it's large or small, easy to treat or not."

Coagulant addition is flow-paced; jar tests also support dose determination. "We continuously change the dose, anywhere from 14 to 30 mg/L," says Knecht. "It's automated based on how much water is coming into the plant, as read by the flowmeters. Each metering pump is checked at least twice a day for accuracy to make sure those pumps are giving us exactly what we want."

Two streaming current detectors (Milton Roy) help operators regulate the coagulant feed rate and optimize flocculation and sedimentation. But pure operator observation helps, too. "Through experience, you can tell by the color how big or small the particles are and how easily they're going to settle," says Knecht. "We look at the floc continuously. When we have good treatment, it looks much like storm clouds and it goes right to the bottom of the sedimentation basin."

A Zeta potential analyzer (Brookhaven Instruments, a Nova Instruments Company) can be used to measure the electrical potential of particles in the water to help assess how well the primary coagulant is working.

To deal with extremely cold water, operators can add anionic and non-ionic polymers to aid coagulation and flocculation, or reduce the filter loading rate. A final line of defense is a fail-safe mechanism on the filters. If a turbidimeter on a filter detects turbidity rising toward the limit of 0.08 NTU, the effluent valve closes, a waste valve automatically opens, and the water is returned to the primary settling ponds while the issue is diagnosed and resolved.

A SCADA system with Wonderware software (Schneider Electric - Invensys) with some 7,500 inputs oversees the distribution system and more than 90 storage tanks. Each day, the SCADA system distills flow data into a production number and a consumption number that, along with the weather forecast, helps the staff set the next day's production.

"We're on a fine tightrope," Knecht says. "We're using our drought resources stored upstream, and we have to husband those resources carefully. So our production/consumption numbers are critical for our planning. We don't have any water to waste. We need to plan how much we're going to make the next day."

QUALITY FIRST

The TMWA's focus on quality made pursuit of the Presidents Award natural, according to Miller: "We decided it was just the best a utility could do to protect public health and the best water we could offer to our customers, so we embraced the goal.

"We talked to the members of our firm and said, 'Look, we're going to embrace this and go the whole way with it.' I'm glad we did. I'm not an award-

Operator Scott Knecht and the Chalk Bluff team take pride in producing quality water in a fiscally responsible manner.

seeking individual, but it was a good goal for the utility. It's a good goal for any utility to try to achieve. When we received the award, I believe only 18 other utilities had won it. You wouldn't achieve this without having a committed team of people. It took an operations team fully on board to achieve this high standard (0.08 NTU) 100 percent of the time. They made it happen through some really challenging conditions over the last several years."

Knecht observes, "For the 14 years I've been with this company, every operator or apprentice has been really inculcated with the fact that water quality is job one. Yes, we try to do it in a fiscally responsible manner, but we simply don't cut corners when it comes to water quality. I'm sure everybody who works at TMWA feels the same. But as operators, we're on the front lines. It's ingrained in us that water quality will not be sacrificed for anything." **tpo**

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A NEW STUDY DEMONSTRATES POTENTIAL FOR $40B IN ANNUAL ENERGY SAVINGS THROUGH EFFICIENCY IMPROVEMENTS AT WASTEWATER TREATMENT PLANTS IN THE US, EUROPE AND CHINA

By Ted J. Rulseh

Energy efficiency is big on the agenda of clean-water plant teams. Pursuing the ideal of resource recovery, they're making changes that save electricity and fuel, and in some cases striving for energy self-sufficiency.

But in the grand scheme, exactly how big is the energy savings opportunity? A 2015 study conducted by Xylem lends perspective. The company's *Powering the Wastewater Renaissance* report estimates that plants in the United States, Europe and China could save $40 billion per year through the adoption of high-efficiency technologies. This would eliminate nearly half of those plants' electricity-related emissions, preventing an amount of greenhouse gas emissions equivalent to those released from the burning of 9.7 billion gallons of gasoline.

The report says 95 percent of the savings could be achieved through measures that have zero or negative cost, meaning they pay for themselves over time through savings on fuel or electricity. The technologies in question are not futuristic — they exist and can be readily deployed today. Al Cho, vice president for strategy and business development with Xylem, talked about the study in an interview with *Treatment Plant Operator*.

tpo: Why did Xylem undertake this study and report?

Cho: At the global and local levels, we hear a lot about the relationship between water, energy and climate. We saw an opportunity to address those issues together. There is a lot of inefficiency in today's water infrastructure. We took a data-driven approach to understand the size of the opportunity to reduce energy consumption and emissions in the wastewater sector.

> "A key finding of the report is that when you look at the energy savings available even in the United States and Europe, the cash flow from increased energy efficiency is big enough to make even the retrofit of many technologies highly attractive."
> **AL CHO**

tpo: What methodology was used in conducting the study?

Cho: We worked with a consulting firm as well as our own engineering experts. We also drew on published data and had the study peer-reviewed by external experts. We used a framework called the marginal abatement cost curve to compare the costs of different options for reducing greenhouse gas emissions. If you're trying to cut greenhouse gases by a huge amount, there are ways to do it that are very expensive and don't make economic sense unless you include a price for carbon. There are other opportunities that make economic sense on their own. A lot of those involve energy efficiency.

tpo: Can you give examples of measures that are overly expensive?

Cho: One example in the energy industry is carbon capture and storage, an emerging technology where utility companies would capture carbon dioxide from electric power generation and store and seal it deep underground. It's an expensive technology that would only be economical if the cost of carbon were high enough so that by capturing it companies would earn money for carbon emission reductions. On the other hand, there are negative-cost interventions like energy efficiency, where you save money by implementing them.

tpo: What are some of those negative-cost opportunities in the wastewater sector?

Cho: We looked at 18 specific interventions, from wastewater collection and transport through primary, secondary and tertiary treatment. We examined the current baseline in terms of the energy consumption and energy efficiency of existing infrastructure, relative to the best-in-class energy-efficient technologies that are readily available today.

We looked at it from two perspectives. First, in terms of a price on carbon: What is the cost associated with each ton of greenhouse gas abatement? That's what is relevant for global policymakers thinking about climate change. Then we looked at it in terms of the internal rate of return on investment. We found that by upgrading efficiency in areas such as pumping, aeration and process control, energy consumption can be reduced significantly, and mostly at a negative cost of abatement, at rates of return in excess of what most investors would normally require.

tpo: More specifically, what do these efficiency improvements include?

Cho: They include variable-speed pumping, high-efficiency pumping hydraulics, variable-speed blowers, optimized aeration systems and aeration control, improvements in biogas production, enhanced filtration control, and improved filter air scour efficiency. Another area that our analysis shows to be highly profitable is the use of sensors and data analytics to optimize energy-intensive processes.

tpo: What measures are involved in optimizing biogas production?

Cho: We evaluated technologies for optimizing the mixing of biosolids and other materials in digesters. Some digester processes aren't as efficient as they could be, because the mixing is too energy intensive or is not effective. In many cases, mixers don't operate at optimal speed, or they draw excessive energy in order to mix the biosolids and expose materials to the decomposition processes.

tpo: Where does biogas-fueled combined heat and power fit into this equation?

Cho: That is certainly an opportunity, but we did not include CHP in the scope of our study. It is certainly something we could evaluate in the future.

(continued)

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tpo: How would you rate the energy-saving opportunities at existing plants versus new facilities being built?

Cho: There are efficiencies to be gained both in retrofitting facilities and in making different choices when building new plants. Consider China, which is committed to building many wastewater treatment plants to address environmental problems. If you make the investment to build out the new plants with higher-efficiency technology, you get an even better return because there is no extra cost for retrofitting and you lock in the full lifetime of the more efficient technology. Some of the most attractive economics are in emerging markets that are still building their infrastructure.

> "What this study really does is put numbers to something many people intuitively already know — there are opportunities to make our wastewater systems more productive and efficient while improving quality and reliability."
> **AL CHO**

But a key finding of the report is that when you look at the energy savings available even in the United States and Europe, the cash flow from increased energy efficiency is big enough to make even the retrofit of many technologies highly attractive.

tpo: Efficiency retrofits require an up-front investment, and limited capital is often a barrier. How can that barrier be overcome?

Cho: When we see a big negative-cost opportunity like this persist for a long time, it's a signal that there is some type of market imperfection. In the United States, we have a nexus of market barriers that include limited capital and a strong focus on maintaining existing systems that work from an effluent-quality perspective. There is also most likely insufficient awareness of the full economic potential of upgrades.

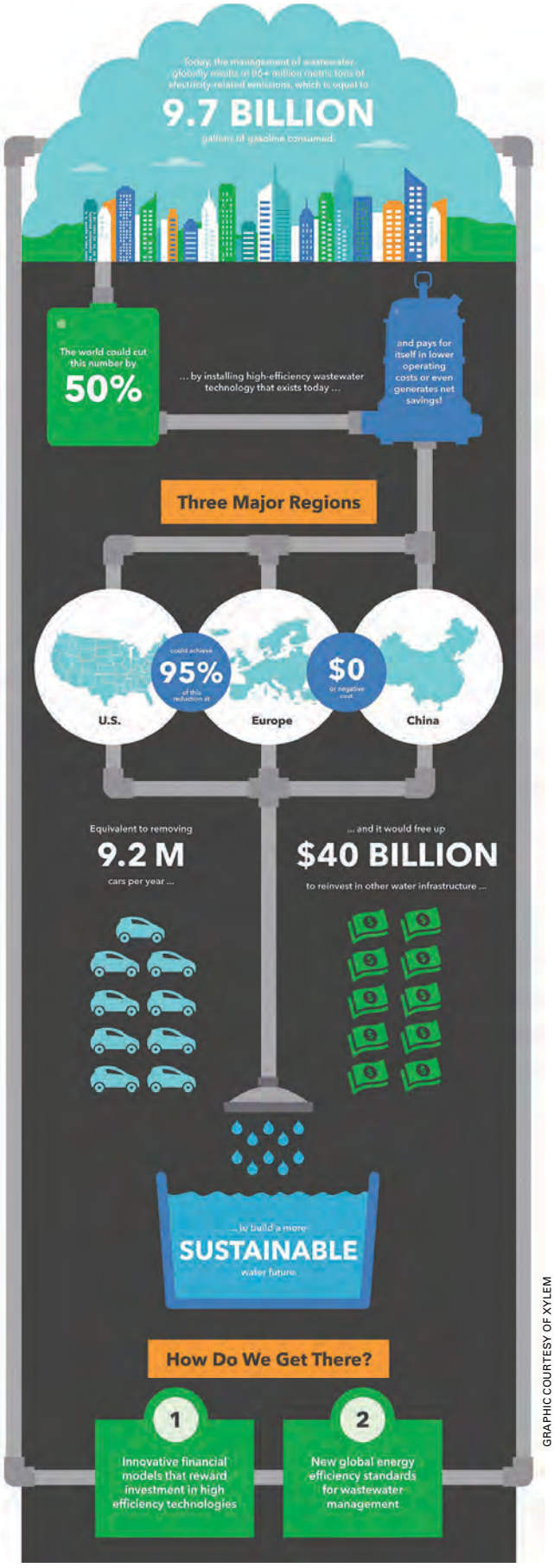
I believe the future model will involve some mix of enhanced financial service offerings that help municipalities make up-front capital investments by leveraging the cash flow from energy efficiency. We see some examples of this in building retrofits for schools and municipal buildings through energy savings performance contracting. I see that same model as potentially viable in the wastewater world.

tpo: How important are government and utility incentives as part of the answer?

Cho: They can and should be part of the picture. Almost every city in the country is looking at how to reduce energy consumption and greenhouse gas emissions. One of the first places they should look at is the wastewater infrastructure. Savings can be encouraged by a number of means, including government programs such as the green project set-asides in state revolving loan funds and state and local energy efficiency funding programs. Realizing the savings will require a lot of flexibility and creativity on the part of operators and municipal officials. The good news is that if people collaborate to make the financing and the technology come together, there are real benefits for ratepayers and for communities.

tpo: All things considered, how would you say this study adds value to the wastewater treatment sector?

Cho: What this study really does is put numbers to something many people intuitively already know — there are opportunities to make our wastewater systems more productive and efficient while improving quality and reliability. As more and more municipalities focus attention on their energy consumption and environmental performance, we will also see innovation in the market in the form of financing and business models that enable more treatment plants to take advantage of energy-efficient technologies. tpo



GRAPHIC COURTESY OF XYLEM

This graphic shows how the wastewater industry could cut its electricity-related emissions by half. (For more information on this report, visit Powering Wastewater.xyleminc.com or email powering.wastewater@xyleminc.com.)

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THE BEST MEDICINE

THOUGH SHE STOPPED SHORT OF ATTENDING MEDICAL SCHOOL, WEF FELLOW REBECCA WEST HAS DEDICATED HER CAREER IN WATER TO HEALTHY PEOPLE AND COMMUNITIES

STORY: **Steve Frank**
PHOTOGRAPHY: **Ken Osburn**

"MY CAREER HAS BEEN LIKE MOVING FROM ONE STEPPING STONE TO another, then jumping on a bulldozer, then back on the stepping stones."

That's how Rebecca West, chief operating officer of Spartanburg Water System and new Water Environment Federation (WEF) Fellow, describes her professional journey. The fellow designation recognizes career achievements, stature and contributions to the water profession. West also served as WEF president from 2008-09.

West's utility serves what's called "the upstate" of South Carolina. It's actually two entities — water and wastewater — that operate under one name. Spartanburg Water System is a political subdivision of the City of Spartanburg, while Spartanburg Sanitary Sewer District is a South Carolina special purpose district.

West oversees engineering, technical services, the capital improvement plan, contracts, regulatory permits, operations and maintenance, human resources, the utility's involvement in economic development for the area, and other community involvement efforts. Along the way, she has worked in a lab and managed a biosolids department, three drinking-water facilities, more than 10 clean-water plants, collections systems and distribution systems, as well as safety and security programs.

Rebecca F. West, chief operating officer of Spartanburg (South Carolina) Water System.

Lately she has worked with the Spartanburg Economic Futures Group to help Spartanburg land a large company, Toray Industries, that would supply carbon fiber parts to Boeing. Landing the company would mean an economic shot in the arm for the community. Her role is to help the company's manufacturing processes work with Spartanburg Water's needs. It's pretreatment done right, ensuring that the processes are water-friendly from the start.

THE MOVE TO WATER

West has moved steadily up the ladder since she began her career in water. She started with a 1986 bachelor's degree in biology from Wofford College in South Carolina. She enrolled at Wofford intending to go into medicine (the biology degree was to be her pre-med education). But Wofford required courses beyond biology, and West took and enjoyed some environmental courses.

She worked at a hospital for a year, but something about improving the environment kept tugging at her. A lab job opened up at Western Carolina Regional Sewer Authority in Greenville, South Carolina (now Renewable Water Resources), and West said to herself, "I have a biology degree. I can work in a lab."

She got the job and she credits her boss there, Andrea Fagin, with being a great mentor.

The authority was upgrading its wastewater treatment plant and phosphorus removal process, and that introduced West to operations: "I fell in love with it."

When Western Carolina ventured into biosolids land application, West was chosen to manage the new department. Fagin told her, "You want to learn about biosolids? Here's the Part 503 methods. Have at it. Figure it out." And turned her loose. Fagin supported West and sent her to training. West developed the lab methods and worked closely with operations. "That's what got me into operations," she says.

West has traveled a long road to become chief operating officer of Spartanburg Water and a Water Environment Federation Fellow.

"Will [technology] create more work? Will it make us less efficient? Sometimes it's OK to just roll the window down manually instead of using a button."

REBECCA WEST

Rebecca F. West, Spartanburg Water System, South Carolina

POSITION:	**Chief operating officer**
EXPERIENCE:	**28 years (at Spartanburg Water since 2002)**
CERTIFICATIONS:	**Biological Wastewater Operator, Biosolids Operator**
EDUCATION:	**Bachelor of Science in biology, Wofford College**
GOALS:	**Making the water/wastewater system resilient to natural disasters**
GPS COORDINATES:	**Latitude: 34°57'6.43"N; Longitude: 81°55'45.35"W**

Spartanburg Water includes a water system and sanitary sewer district with 250 employees, a $62 million budget and 180,000 customers.

> "You have to build a facility that matches the capabilities of your staff, or you have to get staff that has broader capabilities."
> **REBECCA WEST**

READY FOR THE WORST

Aggressive preparation for natural disasters helped Spartanburg Water "dodge a bullet" after the intense storms that inundated parts of South Carolina in October 2015.

Unprecedented rains fell in numerous areas of the state. Two Columbia locations got more than 15 inches in 24 hours on Oct. 3-4, and 16 inches fell in another area. A personal weather station in Columbia got 18.7 inches.

Rebecca West, chief operating officer, says the Spartanburg area got about 6 inches of rain over two days, but the utility was prepared through its long involvement in climate change discussions and planning for intense weather.

For example, the utility is working to have minimal water and sewer lines crossing creeks, "unless they're on a bridge or under a creek," West says. "We've intentionally designed the distribution system with alternate routing scenarios and redundancies built in." Service outages of more than 12 hours have been rare.

"We've also built temporary systems for the short term when we lost a feed waterline," West says. "It takes planning, but that's a decision made in the beginning that has allowed us to be where we are today."

'BAD NEWS BEARS'

Solids management then consisted mostly of moving material from Point A to Point B and to landfill. The people in her department were known as "the Bad News Bears" of the organization. "I was a very young manager, and green," West says. "I knew enough about operations to be dangerous, and they put me in charge of heavy-equipment operators and truck drivers. It was a world I didn't know anything about."

She worked through what her team was doing to produce biosolids so she could tell her operators and her customers. "We were going to start this department and we were going to produce biosolids," she says. "We were going to make a viable product."

So West began training. Her operators soon became certified Class D biological wastewater operators and biosolids operators. West then developed the biosolids operator certification program. She spearheaded the Biosolids Operator Training School and the Biosolids Operator Certification Program for South Carolina.

"What I learned in managing biosolids was that it was important for marketing and acceptance that you have a product people can trust," West says. "Our team learned to communicate with the farmers and encourage and teach them that this was a safe product and what they could do to help us. By the time I left that department, it was the department to be in."

TEACHING EXPERIENCE

West's experience at Western Carolina taught her a lot. "The neat part was learning how we have to get the public to embrace what we do from start to finish," she says. "It's just like a business. We have a product. We have to understand all the inputs and our manufacturing processes and how they combine to make our final product.

"We have to know the process is right so we can market and sell our product. Having the operators understand what we were doing — that we were not just dumping stuff in a landfill so we could check off a box and be done for the day — made it a great program for the industry."

From biosolids, West became manager of operations. "I got to where I could start to see the bigger picture," she says. "That was my big 'aha' moment." She came to understand that she wasn't just building facilities; she needed to build facilities that matched the skill sets of the people working there.

"You can't just give a toddler a car and say, 'Have at it,'" she says. "You have to build a facility that matches the capabilities of your staff, or you have to get staff that has broader capabilities."

THE NEXT LEVEL

From Western Carolina, West moved on to become director of technical services with Spartanburg Water (2002-09) and deputy general manager of engineering and technical services with that entity (2009-13) before taking her present position, where her duties still include overseeing facility development.

She observes that when a new plant is being built, the first question usually is, "What is the assimilative capability of the receiving stream?"

She finds that it's similar with people: "Is their existing skill set the

right one to operate this facility? What are their capabilities? What's their assimilative capacity? How far can I go? Then we have to ask ourselves, 'What are they able to do?' And we determine what is needed to bring them to the next level."

Some people, she observes, have already found their level. Then it's necessary to find other people to complement them, "so we can run the facilities the way they were designed to be run." All of this thinking brings the question: Why do I need this technology?

"Will it help us operate the facility and meet our service level commitments, our customers' needs and our regulatory requirements?" she asks. "What will it take to train operators to operate it as designed and intended? Will it create more work? Will it make us less efficient? Sometimes it's OK to just roll the window down manually instead of using a button."

Thinking about all this was her grand awakening as an operations manager. As she moved further into operations, she developed asset management skills that "have really shaped how I think about maintenance and how you make decisions about replacing parts in your system."

She credits asset management with helping her truly know the system's condition and capabilities of the system: "Once I realized that's what asset management helps you do, I understood better how to decide, for example, whether to drive a piece of equipment to failure or just to partial failure. I also learned how such decisions connect to customer service and to regulatory compliance."

GIVING BACK

Along the way, West has given abundantly to the industry. Among her many contributions, she served six years on the South Carolina Environmental Certification Board, including two years as vice chair. She chaired the AWWA Reuse Committee in 2014-15 and for the past three years has chaired the South Carolina AWWA Water Utility Council. She also serves on the board of the South Carolina Water Quality Association and for four years served on the board of the Water Environment Research Foundation.

> "What I learned in managing biosolids was that it was important for marketing and acceptance that you have a product people can trust."
> **REBECCA WEST**

In 2015, she received the prestigious W.T. Linton Award for service and leadership from the Water Environment Association of South Carolina.

West's life is not all work. She is active in her church and that has led her on two water-related mission trips overseas. One was to Harghita, Romania, where she oversaw the installation of an onsite wastewater treatment system that helped expand a church camp.

On another mission trip, she oversaw the development and installation of a water well in Kidete, Tanzania. The well serves a village of about 700 people who needed a reliable source of water. The well also provides water for a small farm that supports the children in a nearby children's home.

Previously, the village had relied mostly on ditches for water supply. Her group worked with the local authorities and got the well drilled. It worked so well a neighboring village did the same thing.

She must have done well on these projects, because her pastor is lining up another one for her.

"I blame my mother for all this," West says with a chuckle. "I grew up in Charleston on the coast. As a child, I was always wanting to go to the beach, but my mother always said, 'No, it's polluted and contaminated.'"

West remembers telling her mother: "One day I'm going to fix this." Although she didn't go into medicine, she's been working in public health ever since. **tpo**

Fourth-graders from Wilkes Elementary School celebrate as "faces of the future" during the Earth Day event.

PHOTOS COURTESY OF THE CITY OF GRESHAM

Making a Splash

AN EARTH DAY CELEBRATION HELPS AN OREGON PLANT CELEBRATE THE ACHIEVEMENT OF NET ZERO ENERGY THROUGH BIOGAS-FUELED HEAT AND POWER PRODUCTION AND SOLAR PANELS

By Craig Mandli

The Gresham (Oregon) Wastewater Treatment Plant produces enough sustainable energy to cut what used to be a $500,000 annual electricity bill to zero.

That and other accomplishments deserve recognition from the community. "That was our biggest challenge," says Elizabeth Coffey, the city's communications manager. "We put in all this work and got a terrific result, but we weren't done. It was up to us to explain to our community why this was so important, and why and how wastewater treatment plays a key role in everyone's lives."

In line with that, the city held an Earth Day event last April and has continued to keep the plant's accomplishments front and center.

CREATING ENERGY

The Gresham plant turns biogas from digestion of biosolids and fats, oils and grease (FOG) into electricity and heat. Add a solar energy array and it's enough to power the entire plant, which serves 114,000 residents and is operated and maintained in cooperation with Veolia in a public-private partnership. Gresham is among a handful of plants in the United States that have reached net zero status.

In early 2015, project leaders decided that Earth Day made the most sense for a public announcement. The April 22 celebration included elected officials, employees, community leaders, project supporters including the Energy Trust of Oregon, and 80 fourth-grade students from Wilkes Elementary School.

> "The kids are the ones who will carry sustainable practices forward. That's why it was so important that this celebration be shared with students."
> **ELIZABETH COFFEY**

"The kids are the ones who will carry sustainable practices forward," says Coffey. "That's why it was so important that this celebration be shared with students. Our focus on Earth Day and our outreach since then has urged kids to be 'net zero heroes.'"

As part of the celebration, Mayor Shane Bemis declared, "We've turned our biggest energy user into our biggest energy producer. We protect our environment and our taxpayers. Now that's green."

After his proclamation, Bemis counted down as the Wilkes students formed a giant zero on the lawn of the plant. The event created a great photo opportunity for the news media and allowed plant personnel a chance to spotlight their achievements. "We got a lot of media coverage around the event, which was a great way for us to spread our message," says Coffey.

FURTHER OUTREACH

At the celebration, Bemis announced a community partnership that will keep the spirit of collaboration and innovation behind net zero alive long past Earth Day.

An interactive booklet for kids about the plant's energy-producing processes also celebrates the vision and drive of Alan Johnston, city engineer and the energy project's mastermind.

Earth Day was special for 80 fourth-graders from Wilkes Elementary School. They formed a zero on the wastewater treatment plant lawn to celebrate the plant's net zero energy status.

With the Reynolds School District, Pamplin Media Group and MetroEast Community Media, the city has produced classroom materials that elementary school students can use to understand the energy-producing processes at work at the plant, which is a favorite field trip destination for all ages.

Reynolds teachers provided educational guidance, Pamplin printed an interactive booklet, and MetroEast produced a video posted on the city's website and available on YouTube. Besides outlining the energy process, the booklet celebrates the vision and drive of the project's mastermind, engineer Alan Johnston.

"Our outreach materials are presented in a way that is very understandable to young students," says Coffey. "They all focus on the process of turning wastewater and FOG into renewable energy. It's information that is specific to our process, but the idea can be carried to any community looking into becoming more sustainable."

Coffey points out that the program wouldn't be possible without the city's community partners coming to the table. She suggests identifying viable partners as the first step toward any successful wastewater treatment outreach program.

"You have to find partners who are passionate about the environment and getting the word out to kids, and who offer resources that you may not have at your disposal," she says. "Kids have that wonder and excitement. It's so important to tap into that."

SUSTAINABLE HISTORY

The city installed its first biogas-fueled generator in 2005 and added a solar array five years later. In January 2015, the city installed a second generator that created enough power to bring the plant to net zero status. The 10-year development cost $9.1 million, of which the city paid $5.6 million. The rest came from government sustainability and infrastructure grants and tax incentives.

Organic matter from wastewater now produces 92 percent of the plant's power. Heat from the engines is used for plant processes, and surplus electricity is sent to the Portland General Electric grid. The remaining 8 percent of the plant's power production comes from a 1,902-panel ground-mounted solar array.

In 2012, the city started feeding FOG from restaurants into the digesters. Now the city charges restaurants for taking the material. "We collect about $250,000 annually in FOG fees," says Coffey. "It helps us put a positive value on sustainability." **tpo**

PHOTO COURTESY OF *FLORIDA TODAY*

PHOTO COURTESY OF THE CITY OF COCOA

Workers begin taking down tarps after nearly a year of stripping, sandblasting, priming and painting. INSET: The finished tower.

Patriotic Pride

TNEMEC TANK OF THE YEAR AWARD WINNER IN CITY OF COCOA CONTINUES ITS VITAL ROLE IN MAINTAINING UTILITY'S WATER SUPPLY

By Ed Wodalski

The City of Cocoa's award-winning water tower stands near the intersection of U.S. Highway 1 and State Road 520, about 15 miles south of the John F. Kennedy Space Center in Florida.

Named Tank of the Year last October in a national online competition sponsored by the Tnemec industrial coating company, the landmark structure with three 25-foot-tall American flags pulled 20,703 votes, outpacing more than 200 other nominees.

Standing nearly 165 feet tall, the tank is featured on the cover of Tnemec's 2016 calendar, which also features entries from Plant City, Florida; Amboy, Illinois; Carrollton, Texas; Cedarville, Ohio; Chesterfield, Virginia; Lebanon, Missouri; Mont Belvieu, Texas; Nobleton, Ontario; North Newton, Kansas; Oak Grove, Missouri; and Zebulon, North Carolina.

BIG TERRITORY

Cocoa's 1.5-million-gallon water tower was built in 1957 by the Chicago Bridge & Iron Company to support NASA's growing space program. "That was the year we expanded to provide water to the Kennedy Space Center, which was literally being built out of the ground," says John "Jack" Walsh, utilities director.

PHOTO COURTESY OF THE CITY OF COCOA

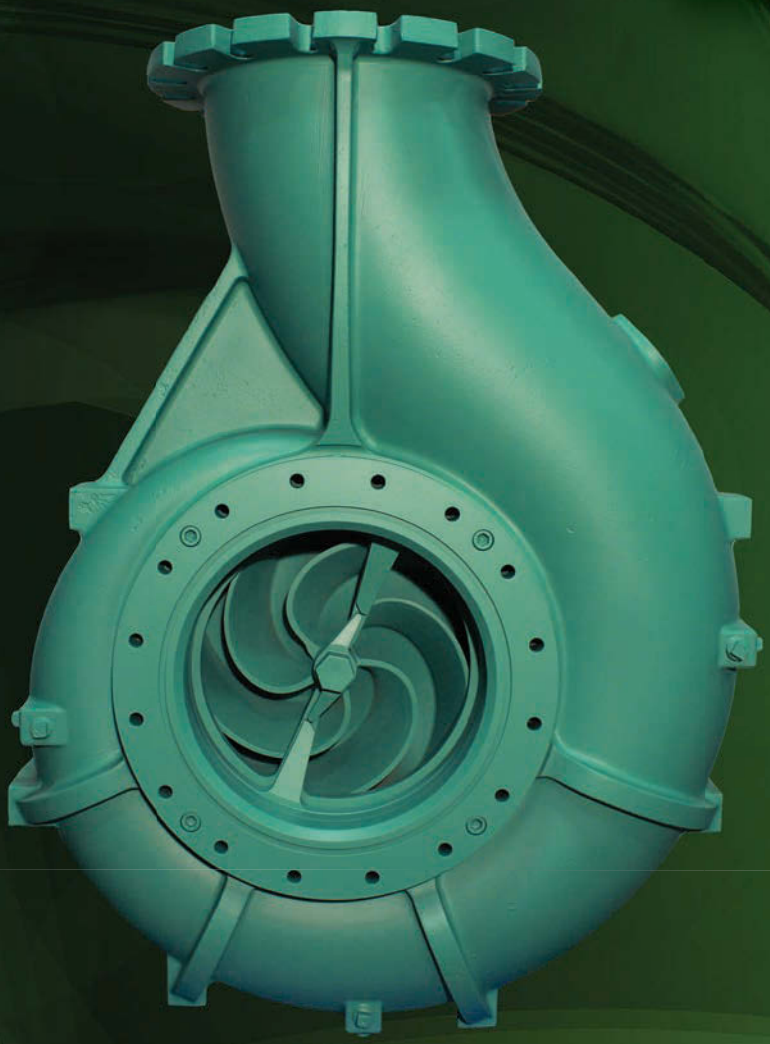
Scaffolding was placed around the tank during the renovation.

"NASA decided to bring the space center to the area, and Cocoa negotiated a contract to extend them water. In doing that they built a tank and pipeline. That waterline still serves us today." The tank's trademark flag was added in 1976 by Demetrios Dourakos, a Greek immigrant and owner of Royal Painting Company, to celebrate the nation's bicentennial.

"The story goes that he did it out of his own pocket," Walsh says. "He just came and asked permission. It's part of the pride of the tank that somebody took it upon himself to show patriotism and love of country."

(continued)

BIGGER IS BETTER



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The classic 12-legged tank remains a main component of the utility's distribution system, which supplies about 22 mgd of water to 250,000 customers. The service area, with about 80,000 connections, includes the municipalities of Cocoa, Cocoa Beach, Cape Canaveral, Rockledge, a large section of unincorporated Brevard County, the Kennedy Space Center, Port Canaveral, and Patrick Air Force Base.

MORE THAN JUST PRETTY

The city also has four inground storage tanks and a smaller elevated tower to the north for reclaimed water. The award-winning tank serves a number of purposes, but one of the key benefits is helping to buffer pressure changes.

"When you push that water 150 feet in the air and the demands around Cocoa, Cocoa Beach and even Merritt Island quickly change, the water drops and changes in height automatically as opposed to having to react with a variable-speed-drive pump," says Walsh. "We can adjust pressures in the system by simply filling the tank, which is a much simpler process than monitoring pressures throughout the area and then adjusting the pump and flow rate."

Cocoa's salty coastal air proves a constant challenge to maintaining the tank, which was renovated in 1991 and 2003, and again in 2014 at a cost of $810,000. That was likely the first time the tank was stripped down to bare metal; the project took almost a year. "There was some corrosion that was being buried under the paint," Walsh says.

Walsh calls the tower a beacon along Florida's east coast; winning the Tank of the Year contest adds to the community's sense of patriotic pride. "We were really thrilled to be recognized," he says. "And I think it's a good time for our country. It's a great reflection on the City of Cocoa and the people we serve." **tpo**

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LEVEL & PRESSURE INSTRUMENTS

By KELLER

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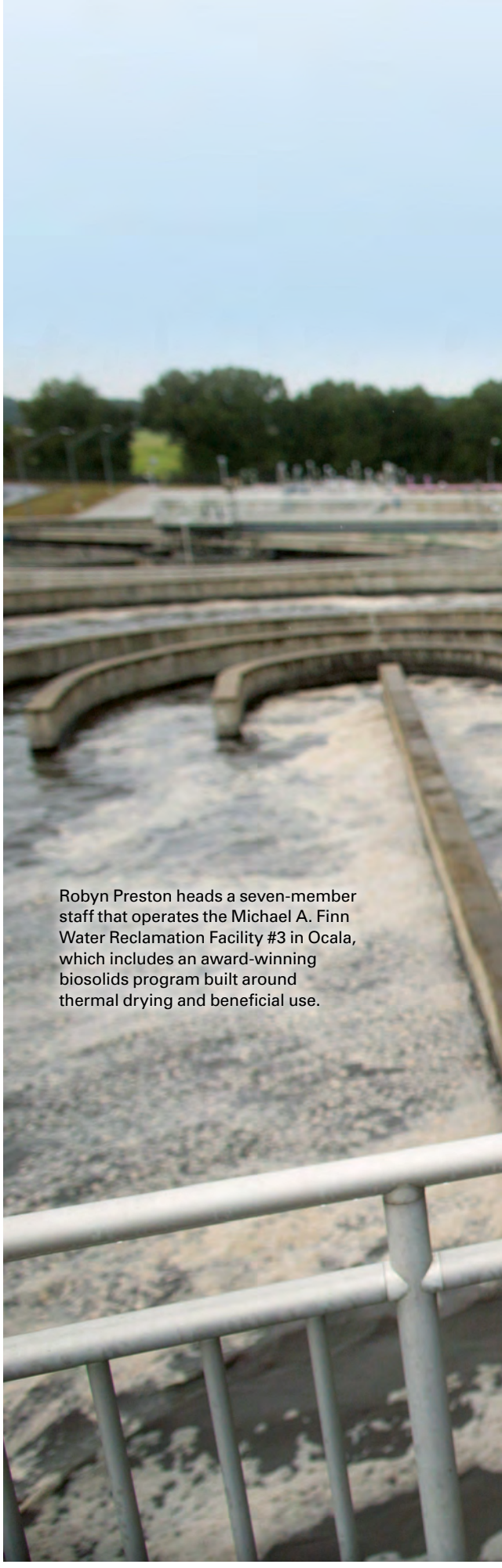
Lessons *Well Learned*

OPERATORS IN OCALA MASTER AN INDIRECT BIOSOLIDS DRYING PROCESS AND HELP THEIR FACILITY EARN RECOGNITION FOR EXCELLENT PERFORMANCE

STORY: **Jim Force**
PHOTOGRAPHY: **Andrew Stanfill**



Robyn Preston heads a seven-member staff that operates the Michael A. Finn Water Reclamation Facility #3 in Ocala, which includes an award-winning biosolids program built around thermal drying and beneficial use.

WASTEWATER OPERATOR TRAINING IS AVAILABLE AT SCHOOLS, online and through various manuals and books. Then there's the training operators get at the biosolids processing facility at the Michael A. Finn Water Reclamation Facility #3 in Ocala, Florida. They learn chemistry, mechanics, biology, administration, instrumentation and more.

That's because WRF#3 operates a biosolids drying facility that processes up to 60 wet tons of biosolids cake per day and produces a Class AA product that helps Florida orange growers fertilize their groves. "We provide on-the-job training," says Robyn Preston, the facility's lead operator. "It can be a complicated process, but we make it easy. It takes about three months to get the hang of it. You learn a lot here."

The facility received the Florida Water Environment Association Biosolids Management Award for Small Operations in 2013.

TERTIARY PROCESS

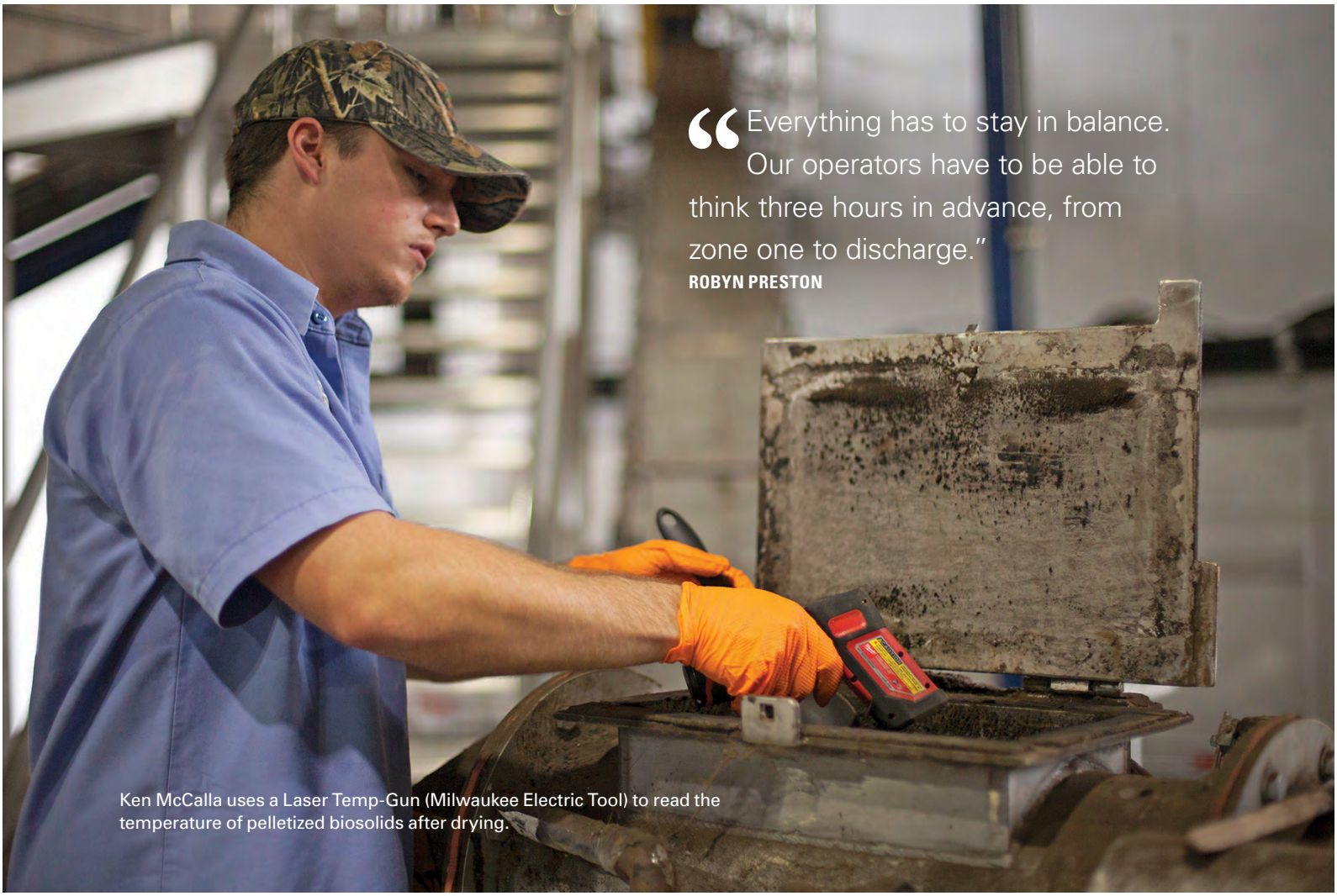
The biosolids dryers follow a wastewater treatment process train that includes biological nitrification-denitrification and tertiary filters. The headworks includes an Infilco Degremont Type II climber screen (SUEZ), a PISTA Grit chamber (Smith & Loveless), and a Wemco Hydrogritter grit removal system (Weir Specialty Pumps). A biotrickler tower (BIOREM Technologies) removes hydrogen sulfide.

Each of the two 1.7 mgd oxidation ditches (Ovivo USA) contains an aeration zone for nitrification and an anoxic zone for denitrification. Each basin has two 100 hp dual-impeller surface aerators in the aeration zone. The lower impeller increases flow velocity to prevent sedimentation. Two 15 hp mixers operate in the anoxic zone.

The clarifiers are center-feed Tow-Bro Unitube units (Evoqua Water Technologies). A cloth disc filter (Aqua-Aerobic Systems) provides tertiary treatment ahead of sodium hypochlorite disinfection. Final effluent flows to a 14-million-gallon public reuse pond used to water a palm tree farm and for subsurface irrigation at the community airport.

“We provide on-the-job training. It can be a complicated process, but we make it easy. It takes about three months to get the hang of it. You learn a lot here.”

ROBYN PRESTON



Ken McCalla uses a Laser Temp-Gun (Milwaukee Electric Tool) to read the temperature of pelletized biosolids after drying.

Pelletized biosolids are used as fertilizer by Florida orange growers.

Michael A. Finn Water Reclamation Facility #3, Ocala, Florida

COMMISSIONED: | **2003**

POPULATION SERVED: | **25,000**

FLOWS: | **3.4 mgd design, 2.5 mgd average**

BIOSOLIDS PROCESS: | **Dewatering, indirect drying, pelletizing**

BIOSOLIDS VOLUME: | **18 dry tons/week**

BIOSOLIDS USE: | **Orange grove fertilization**

AWARDS: | **Florida WEA Biosolids Management Award for Small Operations, 2013**

WEBSITE: | **www.ocalafl.org**

GPS COORDINATES: | **Latitude: 29°11′58.09″N; longitude: 82°8′27.75″W**

MIXING SOLIDS

The biosolids process system begins with a holding tank for waste activated sludge from the clarifiers. There is no digestion at the plant. The material is mixed with 4 dry tons per week of anaerobically digested liquid sludge imported from Ocala Water Reclamation Facility #1. The mixture is then treated with polymer (Fort Bend Services) and pumped by progressive cavity pumps (Moyno products by NOV) to two Winklepress belt presses (Alfa Laval Ashbrook Simon-Hartley).

The dewatered cake (18 percent solids) is mixed with 15 dry tons per week of cake from Ocala Water Reclamation Facility #2, which arrives by truck at 16 to 18 percent solids. The entire batch is then fed into two natural-gas-fired indirect dryers rated for 40 and 60 wet tons per day.

The retention time in the dryers ranges from 2 1/2 to three hours. “Each dryer contains three burners,” Preston says. “We maintain a temperature of 480 degrees Fahrenheit on burner one, then 470 degrees on burner two, and finally

350 degrees on burner three, which acts as a polishing zone." Thermocouples monitor the temperatures.

The granular end product at 96 to 98 percent solids is classified as U.S. EPA Class EQ (exceptional quality) biosolids, also referred to as Class AA (one A for reduced vector attraction and one A for enhanced pathogen reduction).

"It has a fertilizer value of 5-3-0 (NPK)," says Preston. It's distributed and marketed as Nutrisource throughout Florida, most often as a supplemental fertilizer on orange groves.

A thermal oxidizer (Pollution Systems) burns the volatile organic contaminants in the dryer exhaust at 1,450 degrees Fahrenheit, eliminating particulate and odors. Sprays carry condensate water out of the system through drainpipes.

This palm tree farm is completely irrigated with treated water from the facility.

ATTENTIVE OPERATORS

It's a simple sounding process, but operating it calls for attention to a number of variables. That makes it perfect for training new operators. "We operate the dryers five days a week, from Sunday night at 11 until Friday noon," Preston says. The units are staffed by three operators on eight-hour shifts, then shut down for the weekend.

Each new startup requires a detailed routine that is a training course in itself. "When we start up each week, we do a complete check," Preston says. "The first thing is which dryer we're going to. Then we check the waste feed pumps, make sure the manifolds are set up correctly, and check the polymer feed."

Dust control is also important. "We use Dustrol (ArrMaz Corp.)," says Preston. "It's a petroleum-based dust control agent that we add at the discharge end of the process to keep dust from blowing onto the neighbor's property."

The odor exhaust pipe valving is checked, and the discharge conveyor chute is positioned correctly above the trailer bin. Finally, the crew inspects the nitrogen tanks above the thermal oil heater. The tanks need to be full because the nitrogen prevents air from coming in contact with the transfer fluid. "Otherwise the air would oxidize the hot fluid," he explains.

At that point, the staff has completed a successful plant check and is ready to start the drying process. Again, there's a precise protocol, beginning with a standby status that brings the thermal oil heater to temperature (200 F on the 40-ton unit, 218 F on the 60-ton). "We also make sure we have

Robyn Preston, left, lead operator, and Ken McCalla, treatment plant operator I.

A GREEN WAY

To the team in Ocala, indirect drying is among the most environmentally sound ways to deal with biosolids.

The community lies atop a shallow aquifer in karst limestone geology. The honeycomb formation gives rise to several crystal-clear springs and rivers. In fact, the Ocala area is one of the world's leading areas for first-magnitude natural springs that gush out of crevices at tens of millions of gallons a day, or bubble up through sand boils. One of the most popular is Rainbow Springs, which includes a 250-foot-wide pool of clear water and is on the National Natural Landmarks list.

"Landfilling of biosolids or land spreading would not be acceptable here," says Robyn Preston, lead operator at Ocala's Water Reclamation Facility #3. "We need to keep nitrates out of the groundwater."

The drying process includes a natural-gas-fired thermal oxidizer that eliminates objectionable odors. The dryers also pass metals tests. "We monitor monthly for arsenic, lead, cadmium and copper, and we've never even come close to exceeding our metals limits," says Preston. "The dryer is a green way of treating biosolids."

cake in the feed hopper so when we hit the start button, we're not running on empty," says Preston.

BANISHING ODORS

The operators start the thermal oxidizer, bringing its temperature to 1,450 F to ensure odor destruction. "Although they're not very close, we have some neighbors," says Preston. "We don't want any odor complaints."

The dryer software sequence then kicks in, starting the bin agitator and the feed screw that delivers cake to the wet-end housing of the dryers. The condenser and blower fans are started; the thermal oil pump is set at 380 gpm. After burner No. 1 is started, the other two follow in a timed sequence.

Once underway, the process is closely monitored for temperatures, trends and feed rate. "The operators monitor the control panel regularly," says Preston. "They need to watch for consistent temperatures. If the cake is too wet, it requires more detention time and has a larger heat demand, so we slow down the feed rate, decrease the auger speed and raise the burner temperatures." On the other hand, if the feed cake is very dry, the crew can speed up the auger, resulting in less detention time, and lower the burner temperatures.

> "Only through teaching and talking about it will we bring new people to the profession. We should emphasize that the job pays well and it's steady work."
> **ROBYN PRESTON**

The decibel level is monitored, too. "The eight-hour OSHA limit is 90 dBA, but the process isn't that loud and the biosolids building is open on both sides," Preston says. "Everything has to stay in balance. Our operators have to be able to think three hours in advance, from zone one to discharge."

It takes about three months for a new operator to get comfortable with the system. "Training involves working on the job with other operators and reading the O&M manuals," Preston says. "We give a new person two straight weeks with an experienced operator on the dryers. Then they operate alone, but with somebody always nearby to answer questions and provide assistance."

QUALITY TEAM

The Ocala team consists of seven operators, four dual-certified in drinking water and wastewater. Preston has a dual Class A license and is a three-time top performer on the State of Florida exams. Bill Davis has a Class B wastewater license, and five others — Pete Jackson, Don Cook, Robert Boggess, Ken McCalla and Rodney Perea — have Class C wastewater licenses. Cook, Boggess and Perea are also licensed on the water side. The average length of service of an operator at Ocala is 10 years.

"Ken McCalla is just 22 years old," says Preston. "I like to see young people getting into this industry." To help that trend, Preston works hard at public education. He conducts tours, gives slide shows and provides samples of the pelletized end product for folks to examine.

"Only through teaching and talking about it will we bring new people to the profession," he believes. "We should emphasize that the job pays well and it's steady work. A young person just out of high school with a good atti-

Preston works the control panel for a belt filter press (Alfa Laval Ashbrook Simon-Hartley).

tude can earn up to $40,000. And you're not out in a drying bed shoveling — you're pushing buttons and out comes fertilizer," a valuable product that helps Florida's agricultural economy.

"It's not for everybody. Lots can go wrong, but it's a challenge. You could be a mechanic, a biologist, a chemist, anything you want in this business. You could work in the office, at the plant or in the field. It's not just earning a salary." tpo

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www.degremont-technologies.com

Weir Specialty Pumps (WEMCO)
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www.weirpowerindustrial.com

PHOTOS COURTESY OF EMORY UNIVERSITY

The WaterHub greenhouse (center left) and outdoor treatment facilities (center right) on the Emory University campus reduce potable water use by about 35 percent.

Natural Treatment

A WATERHUB PROCESS AT AN ATLANTA UNIVERSITY IS DRAMATICALLY REDUCING CITY WATER USE ON CAMPUS AND SERVING AS A RESEARCH CENTER FOR STUDENTS AND STAFF

By Doug Day

Researching water treatment and supply is nothing new in the classrooms at Emory University. While some research is involved in the university's latest endeavor, its main goal is to reduce the use of potable water on campus by reclaiming wastewater through ecological treatment processes, mainly hydroponics.

It's called the WaterHub, a compact facility that uses bacteria on plant roots to clean wastewater. It reduces potable water demand by about 35 percent on campus and could help build understanding about water reclamation. The program is having a big impact on the water footprint at the university in Atlanta, Georgia.

"It's not just a drop in the proverbial bucket," says Brent Zern, Emory environmental engineer. "This is making a huge holistic impact across our campus." Potable water use could be cut by as much as 110 million gallons a year.

One of four hydroponic reactors is located in a 2,100-square-foot greenhouse.

INNOVATIVE AGREEMENT

Zern and a colleague first proposed the WaterHub in 2011 after being approached by Sustainable Water of Glen Allen, Virginia, which developed the technology and owns and operates the system on campus. It went online in May 2015.

"We have an innovative water purchase agreement with the vendor team and purchase as much of the reclaimed water as they're able to produce," says Zern. The school also receives sewer credits because so much of its water is diverted from the municipal sewer system.

While the terms and costs are confidential, Zern says the several-million-dollar facility will save the school millions of dollars over the next 20 years by replacing potable water with reclaimed water. The region has supply issues: Georgia instituted statewide conservation mandates during a drought in 2007-08, and Atlanta has the highest water rates in the nation for most customer groups.

Emory's water demand is about 1.1 mgd, 34 percent of that consumed by six major utility plants and five satellite plants that heat and cool the campus. That demand for potable water has been cut by 90 percent — the main steam plant and three chiller plants can now use 100 percent recycled water. A new residence hall has a dual plumbing system and will use excess WaterHub effluent for toilet flushing.

MULTI-STEP PROCESS

With a capacity of 400,000 gpd, the WaterHub takes sewage from a county line that runs across the north part of the campus. Most of the flow is from college buildings, but some comes from a Centers for Disease Control complex next door.

A 6 mm primary screen removes inorganics before the wastewater flows through three moving-bed bioreactors (MBBR) containing BioPortz biofilm (Entex Technologies) with coarse-bubble diffusers and mixers. An anoxic MBBR provides denitrification and removes BOD. Two aerobic MBBRs remove carbonaceous material and odorous gases, which are put through activated carbon filters.

Plants in the hydroponic reactor sit on racks with their roots extending into the wastewater, forming a substrate for organisms that consume waste. The reactors also contain a synthetic root system to increase the bacteria population.

Then it's on to a greenhouse where vegetation takes over the treatment process in a hydroponic reactor. There are three more outdoor hydroponic reactors nearby. All told, the treatment systems take up just under 4,000 square feet. "We have beautiful plants that were specially selected because of the type of roots they produce," says Zern. "That's where the good bacteria live that eat the organics out of the wastewater."

WETLANDS INCLUDED

Fine-bubble diffusers provide oxygen and keep contents mixed properly. Plants are held in racks with their roots directly in the water, where microbes reduce remaining BOD to secondary levels and complete the nitrification process. The roots are augmented by a BioWeb synthetic root system (Entex) to provide more surface area for bacteria. The vegetation also supports beneficial insects and organisms that eat the microbial biomass, reducing sludge volume.

A layer of lightweight shale on the racks creates a habitat for bacteria that serves as a natural biofilter to remove residual odor. The greenhouse also has activated carbon scrubbers to prevent odors.

> "It's not just a drop in the proverbial bucket. This is making a huge holistic impact across our campus."
> **BRENT ZERN**

While most of the flow goes through the hydroponic reactors, up to 2,000 gpd is diverted to a wetland system near the outdoor hydroponic cells. "We thought it was important to include it so we could understand the differences in natural treatment techniques and students can do research," says Zern.

The four wetland cells also contain natural organisms that consume wastewater compounds and residual organic carbon and reduce nitrates. The wetlands require frequent filling and draining of the cells. That process is computer controlled and uses high-efficiency pumps and automated valves.

It takes 16 to 20 hours for water to go through the hydroponic system and well over 24 hours for wetland treatment. The effluent from both goes to a traditional clarifier. A disc filter removes remaining suspended solids. That is followed by UV disinfection and addition of chlorine to provide a residual in the distribution piping. Online instrumentation and periodic testing verify system performance.

COMMERCIAL POTENTIAL

The Rollins School of Public Health at Emory includes the Center for Global Safe Water, which researches technologies to provide clean water in developing countries. "They not only need a way to treat their wastewater, but also need a clean drinking water source," notes Zern. "A facility like this could possibly accomplish that."

It could also help build a case for reclaimed water here at home. "In the United States, our regulations are sophisticated enough that they say we can't use the water for potable purposes," says Zern. "They also tell us the water needs to be cleaned to a level of purity that is basically drinking water quality. If it is indeed clean enough to drink and we can verify that through simple chemical analysis, then why not?"

The WaterHub is available for research to all Emory students and staff. "We hope to engage environmental studies students, maybe some law students to understand the regulatory hurdles, business students to look at the economics. So there's lots of learning potential," says Zern.

One thing he's learned by working on the WaterHub is that the various treatment technologies are not all that different from one another: "It's basically using Mother Nature's tried and true concepts and tweaking them with engineering, logic controls, pumps and pipes, just to make it more efficient and faster. That, to me, is the ultimate in sustainability." **tpo**

WaterHub treatment data

	Design influent	Design effluent
BOD	266 mg/L	< 5 mg/L
TSS	350 mg/L	< 5 mg/L
TKN as N	65 mg/L	< 5 mg/L
Turbidity	N/A	< 3 NTU

A Twist on Radiant Heating

A VENTILATED BUILDING WITH A HEATED SLAB HELPS A CALIFORNIA REGIONAL AGENCY IMPROVE BIOSOLIDS DRYING AND REDUCE TRANSPORTATION COSTS

By Ted J. Rulseh

When thinking of radiant heat or hydronic snowmelt, most people envision warm floors, heated sidewalks and ice-free driveways. The Big Bear Area (California) Regional Wastewater Agency (BBARWA) had something altogether different in mind.

The agency had been looking to reduce the water content and weight of its biosolids, making the material less expensive to haul to an offsite facility. After trying several drying methods with marginal success, BBARWA (pronounced BAR-wa) decided to devise a new system that would be more effective and more efficient, and reduce odor complaints.

The agency worked with Viega Radiant Design Services to construct a ventilated drying building with a heated concrete slab floor. Viega Radiant Design Services completed the facility, which BBARWA personnel say has performed above expectations. In the first year alone, it saved some $200,000 in transportation and fuel costs.

Workers lay the tubing that will carry hot water for radiant heating of the slab in the building in which biosolids are dried.

DIFFERENT TWIST

Viega had designed and quoted thousands of traditional radiant or hydronic heating projects, but none quite like what Big Bear planned. Fred Uhler, BBARWA plant manager, approached Viega's radiant sales manager and district manager to discuss the concept's viability. "I met the Viega representative; he thought outside the box and was able to get what I needed in an easy and economical way," says Uhler. "Viega answered our call for this unique project."

Since the wastewater treatment facility produces its own electricity using three natural-gas-fueled generators, the water flowing through the slab is warmed by the generators' exhaust by way of a heat exchanger. Viega worked on the specifics of the slab heating system, focusing on how to generate enough heat from the slab to meet the biosolids drying objectives.

Engineers used finite element analysis to determine the optimum tubing size, spacing and install depth in the slab, based on the water temperature supplied from the generator exhaust. The shape and size of the slab — 315 by 60 feet — made the project well suited for the Viega Climate Mat system, designed for applications larger than 10,000 square feet.

The size of the slab made the project well suited for the Viega Climate Mat system for slabs 10,000 square feet and larger.

SIMPLE INSTALL

Arriving on the job site in a preassembled roll, the mat came complete with temporary supply-and-return headers and tubing. Installation involved

simply unrolling and securing. There was no concern about proper laying or spacing of individual lines. The mat system was pre-pressurized and numbered for accurate placement. The drying building also includes three fans (Big Ass Fans) to move moisture out of the building.

The 18,900-square-foot mat and distribution manifold installation was completed in less than one day with the labor of three workers. Uhler estimates that he saved three weeks of labor as opposed to installing conventional radiant heat tubing. "The representative was right there on the job site, working hand in hand with my guys," says Uhler. "That's how we like to work — we do things ourselves."

> "This system is self-operational and I've had zero maintenance issues with the Viega product. It couldn't be any better."
> **FRED UHLER**

With the mat and manifolds installed, the system was pressurized and the slab was poured; construction of the metal building began the next week. The system went into operation June 2014.

UNIQUE SOLUTION

While many clean-water agencies use covered drying beds, BBARWA's use of a heated slab is unique. Within a few months, it became clear that its application of radiant heating was successful. In 2015, Uhler reported that the system was performing beyond expectations and even better in the low-humidity winter months.

"This system is self-operational and I've had zero maintenance issues with the Viega product," Uhler says. "It couldn't be any better." He reports that a number of other agencies are interested in the project, which received a California Water Association Desert Mountain Award for Innovation.

Uhler appreciated the support Viega provided: "Anything they said they could do, they did it. They were top-notch guys, from the sales staff to the design support. They were excited about the project. It's great to work with people like that." **tpo**

After the hydronic heat tubing system was laid, the system was pressurized, the slab was poured, and construction of the metal building began.

Share Your Ideas

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

Send your ideas to editor@tpomag.com or call 877/953-3301

2016 TREATMENT PLANT OPERATOR Pumps COMPANY DIRECTORY

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Boerger, LLC 2860 Water Tower Pl., Chanhassen, MN 55317 612-435-7300 Fax: 612-435-7301 america@boerger.com www.boerger.com			YES		YES			
DSI Dynamatic 7900 Durand Ave., Bldg. 3, Sturtevant, WI 53177 800-548-2169 262-554-7977 Fax: 262-554-7041 sales@dynamatic.com www.dynamatic.com								
EBARA Fluid Handling 1651 Cedar Line Dr., Rock Hill, SC 29730 803-327-5005 Fax: 803-327-5097 sales@pumpsebara.com www.pumpsebara.com		YES		YES	YES		YES	YES
EPIC INTERNATIONAL, Inc. 10993 Richardson Rd., Ashland, VA 23005 804-798-3939 Fax: 804-798-9175 try@epicintl.com www.epicintl.com	YES							
Fluid Metering, Inc. 5 Aerial Way., Ste. 500, Syosset, NY 11791 800-223-3388 516-922-6050 Fax: 516-624-8261 pumps@fmipump.com www.fmipump.com See ad page 37			YES					
Flygt - a Xylem Brand 14125 S. Bridge Cr., Charlotte, NC 28273 704-409-9700 Fax: 704-295-9080 www.flygtus.com See ad page 79		YES		YES	YES			YES
Force Flow 2430 Stanwell Dr., Concord, CA 94520 800-893-6723 925-686-6700 Fax: 925-686-6713 info@forceflow.com www.forceflow.com								
FPZ, Inc. 150 N. Progress Dr., Saukville, WI 53080 262-268-0180 Fax: 262-268-0415 usa@fpz.com www.fpz.com See ad page 73		YES						
Gardner Denver 1800 Gardner Expressway, Quincy, IL 62305 217-222-5400 Fax: 217-228-8243 pd.blowers@gardnerdenver.com www.gardnerdenverproducts.com See ad page 45		YES			YES			
Gorman-Rupp Company 600 S. Airport Rd., Mansfield, OH 44903 419-755-1011 Fax: 419-755-1251 grsales@gormanrupp.com www.GRpumps.com See ad page 31		YES			YES		YES	
Hawkins, Inc. 2381 Rosegate, Roseville, MN 55113 800-328-5460 612-331-6910 Fax: 612-331-5304 customer.service@hawkinsinc.com www.hawkinsinc.com			YES			YES		
Hayward Flow Control One Hayward Industrial Dr., Clemmons, NC 27012 888-429-4635 Fax: 888-778-8410 hflow@hayward.com www.haywardflowcontrol.com See ad page 27		YES	YES					

	High Pressure	Metering	Peristaltic	Piston/Plunger	Progressive Cavity	Pump Alignment/ Vibration	Pump Controls	Pump Parts/ Components	Pump Repair/ Service	Rotary Lobe	Solids/Sludge	Submersible	Vertical/ Lift Station	Other
		YES	YES											
										YES	YES	YES		
							YES							Drives - Variable Frequency (VFD)
	YES						YES	YES	YES		YES	YES	YES	
		YES	YES	YES			YES							Chlorination
					YES		YES	YES			YES	YES	YES	
							YES							Chlorine/ Chemical Tank Scales
										YES				
			YES	YES			YES	YES	YES					
	YES						YES	YES			YES	YES		
		YES	YES											
		YES												Immersible Vertical

(continued)

2016 TREATMENT PLANT OPERATOR Pumps COMPANY DIRECTORY

	Archimedes/ Screw	Centrifugal	Chemical Feed	Chopper	Dewatering/ Bypass	Diaphragm	Effluent	Grinder/Sump	
Hidrostal Pumps 2225 White Oak Cr., Ste. 101, Aurora, IL 60502 630-948-3355 Fax: 930-948-3353 info@hidrostalpumps.com www.hidrostalpumps.com	YES	YES							
Iwaki America Inc. 5 Boynton Rd., Holliston, MA 01746 888-522-1110 508-429-1440 info@iwakiamerica.com www.iwakiamerica.com		YES	YES			YES			
Komline-Sanderson 12 Holland Ave., Peapack, NJ 07977 800-225-5457 908-234-1000 Fax: 800-329-7457 info@komline.com www.komline.com See ad page 77					YES				
Lakeside Equipment Corporation 1022 E. Devon Ave., Bartlett, IL 60103 630-837-5640 Fax: 630-837-5647 sales@lakeside-equipment.com www.lakeside-equipment.com See ad page 3	YES								
LMI Pumps 201 Ivyland Rd., Ivyland PA 18974 215-293-0401 lmi@precisionflowsystemsleads.com www.lmipumps.com			YES			YES			
Lutz-JESCO America Corp. 55 Bermar Park, Rochester, NY 14624 800-554-2762 585-426-0990 Fax: 585-426-4025 mail@jescoamerica.com www.lutzjescoamerica.com		YES	YES			YES			
Met-Pro Global Pump Solutions 700 Emlen Way, Telford, PA 18969 800-392-7621 215-712-8155 Fax: 215-723-2197 info@mp-gps.com www.mp-gps.com		YES	YES				YES		
Milton Roy 201 Ivyland Rd., Ivyland, PA 18974 877-786-7298 215-441-0800 miltonroy@precisionflowsystemsleads.com www.miltonroy.com			YES			YES			
Penn Valley Pump Co., Inc. 998 Easton Rd., Warrington, PA 18976 800-311-3311 215-343-8750 Fax: 215-343-8753 info@pennvalleypump.com www.pennvalleypump.com See ad page 35			YES			YES			
Philadelphia Gear - A Timken Brand 901 E 8th Ave. Ste. 100, King of Prussia, PA 19406 800-766-5120 610-265-3000 Fax: 610-337-5637 info@philagear.com www.philagear.com									
PRIMEX PO Box 1708, Detroit Lakes, MN 56501 844-477-4639 218-847-1317 info@primexcontrols.com www.primexcontrols.com									
Proco Products, Inc. 2431 N. Wigwam Dr., Stockton, CA 95205 800-344-3246 209-943-6088 Fax: 209-943-0242 sales@procoproducts.com www.procoproducts.com See ad page 8									
ProMinent Fluid Controls, Inc. 136 Industry Dr., Pittsburgh, PA 15275 412-787-2484 Fax: 412-787-0704 sales@prominent.us www.prominent.us			YES			YES			

	High Pressure	Metering	Peristaltic	Piston/Plunger	Progressive Cavity	Pump Alignment/ Vibration	Pump Controls	Pump Parts/ Components	Pump Repair/ Service	Rotary Lobe	Solids/Sludge	Submersible	Vertical/ Lift Station	Other
								YES	YES		YES	YES	YES	
		YES						YES	YES					
	YES			YES			YES	YES	YES		YES			
		YES					YES	YES						
	YES	YES	YES		YES		YES	YES	YES					
							YES	YES				YES	YES	Dry Pit
	YES	YES		YES	YES		YES	YES						
				YES							YES			
						YES	YES	YES	YES					
							YES							
						YES		YES						
	YES	YES	YES	YES										

(continued)

2016 TREATMENT PLANT OPERATOR Pumps COMPANY DIRECTORY

	Archimedes/ Screw	Centrifugal	Chemical Feed	Chopper	Dewatering/ Bypass	Diaphragm	Effluent	Grinder/Sump
Pulsafeeder, Inc. 27101 Airport Rd., Punta Gorda, FL 33982 800-333-6677 941-575-3800 Fax: 941-575-4085 ppgsposales@idexcorp.com www.pulsatron.com			YES			YES		
Red Valve Company/Tideflex Technologies 600 N. Bell Ave., Carnegie, PA 15106 412-279-0044 Fax: 412-279-7878 valves@redvalve.com www.redvalve.com See ad page 15		YES		YES		YES	YES	YES
Robuschi USA 1813 Associates Ln. Ste. E, Charlotte, NC 28217 877-424-1020 704-424-1018 Fax: 704-424-1019 sales@robuschiusa.com www.robuschiusa.com See ad page 7								
Schreiber LLC 100 Schreiber Dr., Trussville, AL 35173 205-655-7466 Fax: 205-655-7669 info@schreiberwater.com www.schreiberwater.com See ad page 51	YES							
SEEPEX Inc. 511 Speedway Dr., Enon, OH 45323 937-864-7150 Fax: 937-864-7157 sales@seepex.net www.seepex.com See ad page 73			YES				YES	
Sensaphone 901 Tryens Rd., Aston, PA 19014 877-373-2700 610-558-2700 Fax: 610-558-0222 sales@sensaphone.com www.sensaphone.com								
Smith & Loveless, Inc. 14040 Santa Fe Trail Dr., Lenexa, KS 66215 800-898-9122 913-888-5201 Fax: 913-888-2173 answers@smithandloveless.com www.smithandloveless.com See ad page 17		YES					YES	
Sulzer Pumps Solutions, Inc. 140 Pond View Dr., Meriden, CT 06450 800-525-7790 203-238-2700 Fax: 203-238-0738 info.abs.usa@sulzer.com www.sulzer.com		YES		YES	YES		YES	YES
USABlueBook PO Box 9006, Gurnee, IL 60031 800-548-1234 847-689-3000 Fax: 847-689-3030 customerservice@usabluebook.com www.usabluebook.com See ad page 80		YES			YES		YES	YES
Vaughan Company, Inc. 364 Monte -Elma Rd., Montesano, WA 98563 888-249-2467 360-249-4042 Fax: 360-249-6155 info@chopperpumps.com www.chopperpumps.com See ad page 39		YES		YES				
Wastecorp Pumps PO Box 70, Grand Island, NY 14072 888-829-2783 201-445-2882 Fax: 888-883-3320 info@wastecorp.com www.wastecorp.com See ad page 49		YES		YES	YES	YES	YES	
Watson-Marlow Fluid Technology Group 37 Upton Technology Park Rd., Wilmington, MA 01887 800-282-8823 978-658-6168 Fax: 978-658-0041 support@wmpg.us www.watson-marlow.com See ad page 25			YES					
Weir Specialty Pumps (WEMCO) 440 West 800 S., Salt Lake City, UT 84101 800-716-5050 801-359-8731 wsprfq@weirgroup.com www.weirpowerindustrial.com		YES		YES	YES		YES	

	High Pressure	Metering	Peristaltic	Piston/Plunger	Progressive Cavity	Pump Alignment/ Vibration	Pump Controls	Pump Parts/ Components	Pump Repair/ Service	Rotary Lobe	Solids/Sludge	Submersible	Vertical/ Lift Station	Other
	YES	YES	YES				YES	YES	YES					
	YES				YES					YES	YES		YES	
										YES				Rotary Screw Blower Packages
		YES			YES		YES				YES		YES	
														Remote Monitoring Systems
							YES	YES	YES		YES		YES	Grit
	YES						YES	YES	YES		YES	YES	YES	Deep Well
			YES									YES		
											YES	YES	YES	
				YES	YES	YES	YES	YES	YES	YES	YES		YES	
		YES	YES								YES			
								YES	YES		YES	YES	YES	Self-Priming

The plantings along the south side of the plant occupy the area in between the facility and a residential neighborhood.

Neighborly Project

AN EXTENSIVE TREE-PLANTING AND LANDSCAPING PROJECT HELPS PROVIDE VISUAL SCREENING AND ODOR CONTROL FOR A TERTIARY TREATMENT PLANT

By Jeff Smith

Beautifying the Kellogg Creek Water Resource Recovery Facility is a community affair in the City of Milwaukie, a northwest Oregon city 11 miles south of Portland.

With an intergovernmental agreement and significant citizen input, more than 1,000 shrubs and 250 trees were planted near the activated sludge wastewater treatment plant that is across the street from downtown and next to a residential neighborhood.

"It was truly a cooperative effort of Clackamus County, the City of Milwaukie and the Kellogg Good Neighbor Committee," says Doug Rumpel, operations supervisor of the 10 mgd design/8.02 average flow tertiary treatment facility owned by the county.

DIVERSE SPECIES

Hundreds of 2-foot-tall shrubs, such as Yankee point blue blossom, James Roof silk tassel bush, Pacific wax myrtle, cascara and Oregon grape, were planted during early 2015. Twelve species of trees including cedar, chestnut, American beech, Oregon ash, oak and dogwood were also strategically placed to shield the facility from view and help control odor. Most were at least 10 feet tall. A tall giant sequoia and 23 redwoods were included.

> "As good neighbors, we have worked to help camouflage the plant and are continuing to work on controlling odors."
>
> **DOUG RUMPEL**

Trees were selected for their ability to screen views and direct airflow, and for their beauty. "We chose to install larger plants so that it wouldn't take as long for them to grow in and screen the view," says Gail Shaloum, county environmental policy specialist who served as project leader. Almost all the trees and shrubs are native to Oregon.

Many of the plants and trees were requested by the Kellogg Good Neighbor Committee, a 10-member volunteer citizen group organized in 2014 to make suggestions for mitigating the treatment plant's impact on the environment.

PREPARING THE SITE

To make way for the plantings, many shrubs and nearly 60 trees that were in poor health had to be removed. Before that could begin, bird-watchers discovered an unusual visitor on the site — a black-and-white warbler off track from its usual migration route.

Tree removal was delayed to allow time for birders to view the warbler. Once begun, tree removal proceeded and was organized to give the bird a chance to move on. "It delayed our project for only about two weeks," says Shaloum.

Workers took an innovative approach to the removal of weeds from a steep embankment near a city park between the plant and the Willamette

Share Your Ideas

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

Goats were brought in to graze the weeds along the steep and rocky Willamette River bank. The company that manages the goats is called Goat Power.

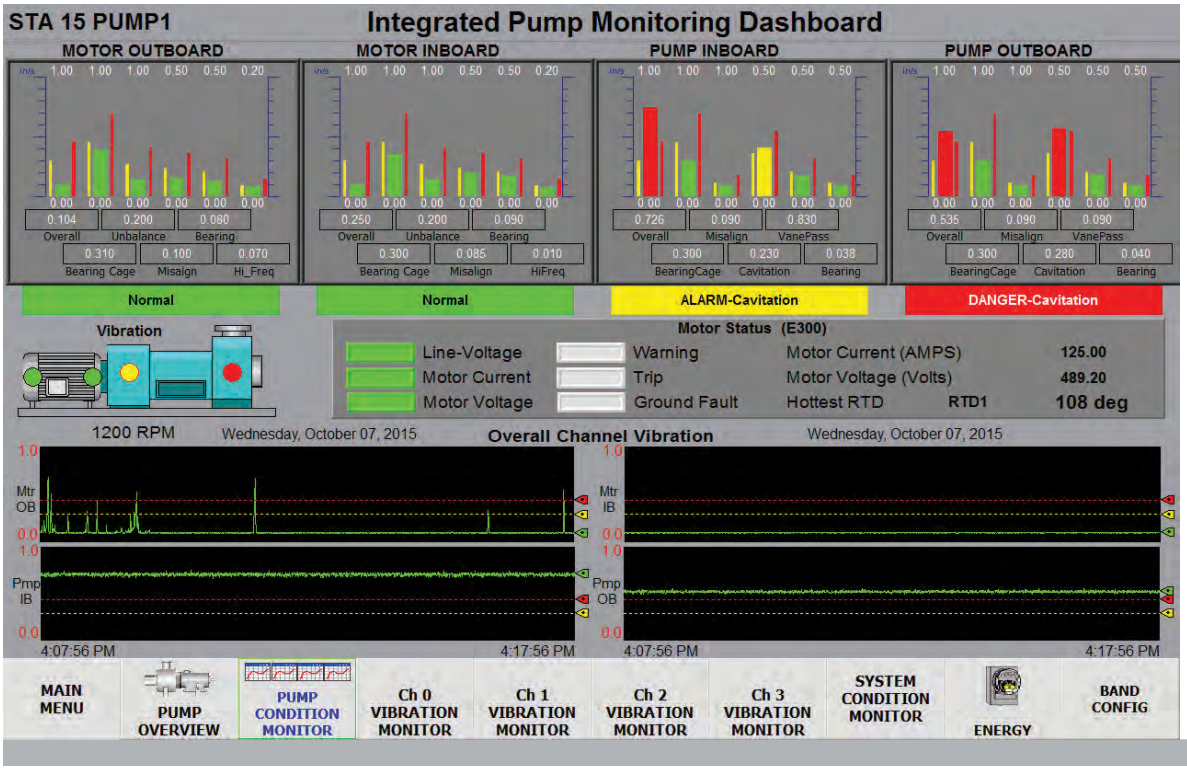
A sign along the Trolley Trail before and during construction notified trail users of the upcoming changes.

River. They deployed a herd of 40 goats to clean up the area instead of using equipment and putting operators at risk.

Money for the landscape project came from a fund established through an agreement between the county and the city. The county contributed $1 million as seed money for the fund and provides $1 per month for each of the city's 11,000 sewer connections to sustain the fund.

Shaloum says that until the new shrubs and trees have time to grow toward maturity, a fabric lining along the perimeter fence will help to screen views of the plant. The Trolley Trail, a heavily used 8-foot-wide paved path enjoyed by hikers and bikers, passes in front of the facility. A city park with picnic tables lies between the plant and the Willamette River.

Says Rumpel, "As good neighbors, we have worked to help camouflage the plant and are continuing to work on controlling odors." **tpo**



The Integrated Pump Monitoring Dashboard displays pump and motor conditions in an easy-to-understand green-yellow-red scheme.

Beyond the 'Idiot Light'

TECHNOLOGY FROM ROCKWELL AUTOMATION ENABLES IN-DEPTH MONITORING OF PUMPS AND MOTORS AND SUPPORTS EFFECTIVE PREDICTIVE MAINTENANCE

By Ted J. Rulseh

Pump and motor failures are costly, and yet treatment facility operators often lack the equipment condition and trending data they need to detect impending trouble and create optimal predictive maintenance programs.

A variety of factors can help indicate pump and motor trouble, among them temperature, current, voltage and vibration. But historically, monitoring has tended to focus on one or two parameters and has not provided data in simple forms that help operators determine what is wrong and precisely what to do about it.

Now Rockwell Automation offers Integrated Pump Monitoring (IPM), which uses multiple sensors to enable detailed monitoring of a wide range of parameters. Information from those sensors is translated into equipment health and diagnostic information displayed on a screen in forms easy for operators to understand.

The system also records time-stamped information about events such as alerts and faults to support operation and maintenance staff members' investigations. Rockwell representatives Steve Liebrecht, water/wastewater industry team leader, and Wayne Leideker, integrated architecture technical consultant, talked about the technology in an interview with *Treatment Plant Operator.*

tpo: What was the objective in developing this technology?

Liebrecht: In industry, we have a lot of equipment but a limited number of people who understand its proper operation and maintenance. Motor and pump protection has been somewhat rudimentary. For example, motors have been protected with a eutectic overload device that monitors the motor current; pumps have been monitored mechanically with a trip point switch so that if vibration reaches a high level, it triggers an alarm. Essentially, what has been available is an "idiot light." Then someone has to go figure out what happened. We set out to make equipment smarter, allowing it to continuously articulate its condition and help the user diagnose exactly what the problem is.

tpo: In basic terms, how have you accomplished that?

Liebrecht: We install two input/output (I/O) modules, one electrically protecting the motor and the other mechanically protecting the pump and motor as a system, and we integrate them within a control strategy. By combining those technologies, we provide the maintenance and operation staff with a much broader and more detailed view of overall pump and motor health.

tpo: How is this information conveyed to operators?

Liebrecht: A 10-inch PanelView display articulates motor and pump health and diagnostics in forms easily understood by operators — in plain English and using the power of graphics such as bar charts and green/yellow/red condition indicators.

> "Rather than waiting for an alarm to go off, operators can see trends in operating conditions. If they see a trend continuing toward an alert threshold, they can direct maintenance to be performed sooner. It's predictive maintenance."
> **STEVE LIEBRECHT**

Leideker: All of the technical information is displayed on the operator panel in legible, descriptive text or indicators that specifically identify the problem area and give detailed, accurate information as to what the trouble is, what is causing it, and what to do about it.

tpo: Can you give an example of what an operator might see in case of an adverse event?

Leideker: For a water pump operating normally, all indicators would be green. If the pump were to begin to cavitate, the vibration amplitude of that specific frequency would go up and eventually the green vibration indicator dedicated to cavitation would turn to yellow. We also have an alert message pop up on the screen and use an interface with a PLC to turn on an indicator or an alarm annunciation somewhere in the facility. That information could be conveyed all the way up to the facility's control station to indicate the presence of an alert condition, specifically identifying that it's a cavitation alert and what action to take.

tpo: Where would the operator display for this system typically be located in a facility?

Liebrecht: It would be on the control panel for the pump and motor being monitored. In a pump station there could be just one central interface terminal where operators could look at all the pumps simultaneously. The information can also be shared remotely via SCADA so that the same screen can be seen from the operator control room or in some other remote location.

tpo: What are the parameters this technology can monitor?

Leideker: One of our Dynamix 1444 modules can monitor four individual channels of vibration, typically the outboard and inboard of the motor, and the inboard and outboard of the pump. These four channels can then each identify eight individual frequency bands or ranges buried within that overall vibration signature, targeting the specific frequencies pertaining to looseness, misalignment, bearings, pump cavitation, vane pass and others.

> "All of the technical information is displayed ... in legible, descriptive text or indicators that specifically identify the problem area and give detailed, accurate information as to what the trouble is, what is causing it, and what to do about it."
> **WAYNE LEIDEKER**

Our E300 module can monitor line voltage, motor current, thermal capacity, estimated time to trip, motor voltage, and all the power and energy monitoring parameters such as power factor, line-to-line voltage, current, kW, kVAR and kVA. We also have RTD temperature modules interfaced into the E300. It's a compact system that can supply operators with a vast amount of diagnostic and operational information.

tpo: How does the system record historical information?

Leideker: All alerts and trips are recorded with a date and time stamp. In addition, when an event occurs, the system takes a snapshot of what the event monitored values were at that time so that information is available to the operator or maintenance person who arrives later to perform service.

tpo: What would you say is the net benefit of this technology?

Liebrecht: It helps eliminate catastrophic damage. Rather than waiting for an alarm to go off, operators can see trends in operating conditions. If they see a trend continuing toward an alert threshold, they can direct maintenance to be performed sooner. It's predictive maintenance — predicting problems before they become catastrophic. We're not just looking at voltage, current, temperature or vibration. We're looking at all those simultaneously. That is the real power of this technology.

tpo: How would you assess the return on investment in this technology?

Liebrecht: We did a presentation for a consulting firm designing a pump station for a water pipeline containing four pumps, each worth $200,000. If you weigh the modest cost addition for our equipment to protect a $200,000 pump — if just one bearing problem could be detected before it became catastrophic — you can get an idea of the impact. **tpo**

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Send a note to editor@tpomag.com

Pumps

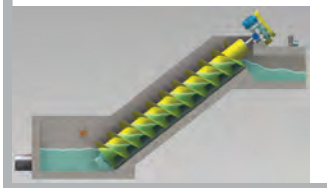
By Craig Mandli

Archimedes/Screw Pumps

BLACKMER S SERIES SCREW PUMP

S Series screw pumps from Blackmer

S Series screw pumps from Blackmer are available with or without external timing gears and bearings. The self-priming double-ended positive displacement pumps provide complete axial balancing of the rotating screws, and their timing technologies eliminate metal-to-metal contact with the pump. They are ATEX certified for use in explosive or dangerous environments and have been specifically designed to address the difficult pumping challenges found in the oil and gas, process, and marine industries. **616/241-1611; www.blackmer.com.**



Screw pumps from Lakeside Equipment Corporation

LAKESIDE EQUIPMENT CORPORATION SCREW PUMP

Screw pumps from Lakeside Equipment Corporation have built-in variable capacity that automatically adjusts the pumping rate and power consumption while operating at a constant speed to match the incoming flow. They have a high rate of acceptance for their ability to lift water efficiently at any stage of the treatment process. They can be used in a variety of applications, including wastewater plant lift stations, return activated sludge, stormwater pumping, land drainage and industrial applications. They efficiently lift large quantities of water at low heads. Patterned after the Archimedean screw, the pump's assembly consists of a simply designed screw, upper bearing, lower bearing and drive arrangement. **630/837-5640; www.lakeside-equipment.com.**

SCHREIBER TUBE-MOUNTED SCREW PUMP

Tube-mounted screw pump from Schreiber

The tube-mounted screw pump from Schreiber incorporates the Archimedean screw pump concept in a self-contained unit for ease of installation and construction. It transports liquid inside a stationary tube, simplifying design and eliminating grouting. Units are factory assembled and can be set at a fixed angle, or the lower end can be supported by a hoist to vary the pump angle and for maintenance access. The pump provides variable capacity at constant speed. It uses a single-row spherical roller and self-aligning combination radial/thrust lower support bearing. A flanged bearing provides radial support at the upper shaft. **205/655-7466; www.schreiberwater.com.**

Centrifugal Pumps

AMERICAN-MARSH PUMPS 340 HD SPLIT CASE

340 HD centrifugal pumps from American-Marsh Pumps

American-Marsh Pumps 340 HD double-suction centrifugal pumps have a removable rotating assembly that can be serviced without disturbing the driver or piping. Models are available in a packed or mechanically sealed orientation for use in demanding applications. Available in discharge sizes from 3 to 14 inches, they can handle flows up to 8,000 gpm and up to 175 psi, and temperatures as high as 300 F. They have heavy-duty, high-tensile cast iron castings with Thru-Bore line boring technology for ease in maintenance, swapping of rotation, and conversion from packed to mechanically sealed. They have high-efficiency double-suction enclosed impellers made of bronze or other specified material, machined and polished and dynamically and hydraulically balanced. The oversized shaft, constructed of 420 stainless steel, is ground and polished to a smooth surface. **901/860-2300; www.american-marsh.com.**

CURFLO ANSI SERIES

ANSI Series of pumps from CURFLO

The CURFLO ANSI Series of pumps comply with the standards established by the American National Standards Institute for the ASME B73.1 overhung impeller design. The series uses SKF bearings and INPRO oil isolators. Multiple sealing solutions are also available, including various stuffing box designs. API flush plans are available per the customer's specifications. Skid- and baseplate-mounted packages are available. **281/479-5000; www.curflo.com.**

GORMAN-RUPP COMPANY 6500 SERIES

6500 Series line of centrifugal pumps from Gorman-Rupp Company

The 6500 Series line of solids- and clean-liquid-handling end suction centrifugal pumps from Gorman-Rupp Company is available in sizes from 3 to 16 inches, flows to 15,000 gpm, total dynamic head to 530 feet, and solids-handling capabilities up to 4 inches, providing a high level of performance and efficiency for applications in wastewater treatment plants, industrial facilities, construction, mining and agricultural uses. They come standard with oversized bearings, an atmospheric vent, side access inspection port (on solids-handling models), and an indexable Smart Scroll discharge locator. **419/755-1011; www.grpumps.com.**

GRISWOLD PUMP COMPANY 811 SERIES

811 Series ANSI centrifugal pump from Griswold Pump Company

The 811 Series ANSI centrifugal pump from Griswold Pump Company has an open-impeller design that minimizes concentrated wear by balancing the hydraulic thrust load and reducing stuffing-box pressure, maximizing performance while simplifying maintenance, extending pump life and reducing repair costs. The casing can be constructed of ductile iron, CDM4Cu, Alloy 20 or stainless steel, while a no-bake casing process ensures smooth, precise, superior finishes. The pumps are available in a full range of sizes, with flow rates up to 4,000 gpm and the ability to operate in temperatures up to 500 F. They include self-tightening impellers, the ability to externally adjust the pump's clearance so that peak efficiency is maintained, and strong power frames. **909/512-1262; www.griswoldpump.com.**

HIDROSTAL PUMPS SCREW-CENTRIFUGAL PUMP

The Screw-Centrifugal Pump from Hidrostal Pumps has durable construction suitable for the handling of solids in suspension and vis-

Screw-Centrifugal Pump from Hidrostal Pumps

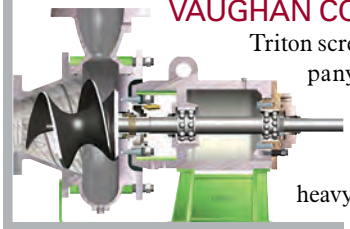
cous liquids, as well as for applications with larger negative suction heads. They are available in a bearing frame configuration. This type of installation in a dry area permits direct access for maintenance and monitoring. This execution offers flexibility in the choice of drive and makes possible the installation of larger motors. For operation in areas that are wet or are susceptible to flooding, an immersible model can be used. A self-cooling system that is independent of the medium being handled ensures universal use. Various monitoring elements can be built into all motor sizes. **www.hidrostalpumps.com.**

SUBARU INDUSTRIAL POWER PRODUCTS PKX

PKX centrifugal pumps from Subaru Industrial Power Products

PKX centrifugal pumps from Subaru Industrial Power Products are available in 2-, 3- and 4-inch models. They are powered by a Subaru EX Series overhead cam engine. The 2-inch PKX220 is powered by the EX16, a 4.3 hp engine, and offers a delivery volume of 172 gpm. Powered by the 5.7 hp EX17 engine, the 3-inch PKX320 provides a delivery volume of 291 gpm. The 4-inch PKX401 offers a delivery volume of 356 gpm and is powered by the 9 hp EX27 engine. **847/540-7300; www.subarupower.com.**

VAUGHAN COMPANY TRITON

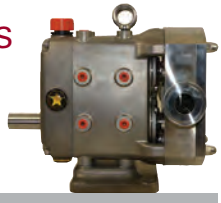


Triton screw centrifugal pumps from Vaughan Company

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

Chemical Feed Pumps

KAMAN INDUSTRIAL TECHNOLOGIES DIXON/JEC RZL 100 SERIES



Dixon/JEC RZL 100 Series rotary lobe pumps distributed by Kaman Industrial Technologies

Dixon/JEC RZL 100 Series rotary lobe pumps in 316 stainless steel construction and multi-lobe rotors, distributed by Kaman Industrial Technologies, provide minimal pulsation and high-accuracy dosing for fluids with low and high viscosities. Flow rates range from 0.53 to 5.54 gallons per 100 revolutions with connection sizes ranging from 1 to 2 inches using standard clamp connections, allowing for pressures of up to 300 psi. The front-loading tungsten carbide single mechanical seal is suited for a variety of chemical applications and is easily maintained without having to remove the pump from the process line. The line can be automated with a variable-frequency drive for applications that require dosing at different rates within the same process with the same accuracy. **800/526-2626; www.kamandirect.com.**

PULSAFEEDER PULSATRON

PULSAtron pumps from Pulsafeeder

PULSAtron pumps from Pulsafeeder have a guided check valve system with a seat-and-ball design that ensures reliable and accurate metering year after year. Their fin-cooled solenoid enclosure dissipates heat, ensuring that the pressure-handling capability of the pump can be maintained. The thermally protected solenoid protects the pump from seizing up in extreme heat conditions with an automatic reset feature, allowing the pump to resume operation upon cooldown. They offer flows up to 600 gpd and pressures up to 300 psi, with a wide range of flows and pressures. **800/333-6677; www.pulsatron.com.**

Dewatering/Bypass Pumps

RUHRPUMPEN RDP SERIES

RDP Series reciprocating plunger pumps from Ruhrpumpen

RDP Series reciprocating plunger pumps from Ruhrpumpen are used for high-pressure duties across industries where low leakage, high reliability and reduced running noise are paramount. They meet API 674 third edition and ISO13710. Available in triplex and quintuplex formats, they can handle pressures up to 14,500 psi at temperatures between minus 104 and 392 F. Leakage is reduced by using a high-quality seal arrangement with condition monitoring. Its stiffness reduces running noise and vibration, often eliminating the need for acoustic enclosures. It delivers a service life of 20 years while easily accessible service points reduce scheduled maintenance time. **918/627-8400; www.ruhrpumpen.com.**

Effluent Pumps

EDSON PUMPS 25000 SERIES

Model 25000 Series diaphragm pump from Edson Pumps

The Model 25000 Series electric double diaphragm pump from Edson Pumps combines pumping features that include dry-start suction lift, the ability to pump liquids with suspended solids, a low-emulsion pumping action, and the ability to run dry indefinitely with the chemical resistance of polypropylene. The electric motor provides installation versatility and cost efficiency. It can also create vacuum lift and discharge pressures comparable to small peristaltic systems. Components can be cleaned and replaced in just a few minutes with virtually no tools. **508/995-9711; www.edsonpumps.com.**

SPX FLOW NOVAPLEX VECTOR

NOVAPLEX Vector process pump from SPX FLOW

The NOVAPLEX Vector process pump from SPX FLOW offers a reduced footprint size, reduced weight, increased efficiency and improved reliability. This triple diaphragm process pump reduces the required footprint for installation by arranging the pump heads in three dimensions. It simplifies assembly and reduces the number of crankshaft bearings from six to two, increasing reliability and making maintenance easy. The unit only requires dis-

assembly of the drive to gain access to the gears. It is ideal for use with hazardous fluids and offers weight and size reduction for offshore use. The potential for increased productivity can be further ensured with the use of the NOVALINK-CSM 2 continuous pump-parameter monitoring system. **800/252-5200; www.spx.com.**

VERTIFLO PUMP COMPANY SERIES 1300

Series 1300 horizontal pumps from Vertiflo Pump Company

Series 1300 horizontal pumps from Vertiflo Pump Company have back pullout construction, a semi-open impeller, and a packing or mechanical seal for quick maintenance. Applications for Models 1320, 1326 and 1334 include industrial process, pollution control, general pumping, spray systems, deionized water, wastewater, clear liquids, corrosive liquids and chemicals. The pumps offer capacities to 3,600 gpm, heads to 275 feet total dynamic head, and temperatures to 250 F. **513/530-0888; www.vertiflopump.com.**

Sludge Pro mobile double disc pump from Wastecorp Pumps

WASTECORP PUMPS SLUDGE PRO

The low-maintenance Sludge Pro mobile double disc pump from Wastecorp Pumps has fluid-handling capabilities ranging from 10 to 500 gpm. The customer selects the size and style of pump that best fits their fluid pumping application, with clack or ball valves available. Tier 4-compliant diesel pump engines are available up to 40 hp with either off-road or DOT-approved trailers with electric brakes. No regular scheduled maintenance is required, and pressure sensors are available to assist in detecting blockages or closed valves in the line. A hydraulic lift system allows for easy access to pump internals. **888/829-2783; www.wastecorp.com.**

Metering Pumps

BLUE-WHITE INDUSTRIES CHEM-PRO M SERIES

Chem-Pro M Series of diaphragm metering pumps from Blue-White Industries

The Chem-Pro M Series of diaphragm metering pumps from Blue-White Industries is designed for precision liquid injection in municipal water treatment applications. It includes NSF 61 listing, a 200-1 turndown ratio, an LCD screen, 4-20mA output and a stainless steel pump head cover. Communication options include industrial Ethernet, Modbus TCP, ProfiNet, Modbus and Profibus. **714/893-8529; www.blue-white.com.**

Valveless Piston Metering Pumps from Fluid Metering

FLUID METERING VALVELESS PISTON METERING PUMP

Valveless Piston Metering Pumps from Fluid Metering provide precision fluid control for environmental monitoring, sampling and treatment applications. The low-current DC motor is ideal for extended 12/24-volt battery operation in remote locations. Their CeramPump uses one moving part — a rotating and reciprocating ceramic piston — to accomplish both pumping and valving functions without valves. The piston and mated liner are made of dimensionally stable, sapphire-hard ceramics that ensure long-term, drift-free accuracy of 1 percent or better for millions of maintenance-free cycles. The inert fluid path of ceramic and fluorocarbon is ideal for injection of concentrated tracer dyes and water treatment chemicals. Models are available in all standard voltages as well as low-current DC voltage, making them fit for remote field operation. **800/223-3388; www.fmipump.com.**

LMI PUMPS ROYTRONIC EXCEL SERIES AD PUMP

ROYTRONIC EXCEL Series AD Pumps from LMI Pumps

ROYTRONIC EXCEL Series AD Pumps from LMI Pumps are positive displacement Liquifram chemical metering pumps with an NEMA 4X/IP-65 enclosure. They have flexible control options and electromagnetics to meet all flow/pressure ratings. FastPrime Liquid Ends are equipped with a valve that allows for opening the head to atmospheric pressure to assist in pump priming. Options include four function valves, AUTOPRIME Liquid Ends, high-viscosity liquid ends, a dual low-level float switch, Digi-Pulse flow monitor, repair and preventive maintenance kits, and calibration columns. They have an LCD user interface with backlit graphical display, an industrial-grade IP-68 external signal/equipment interface, and a theoretical flow rate display. It can be used from 0.001 up to 2 gph in applications up to 250 psi. They are UL, CUL, NSF 50, NSF 61, and CE listed. **800/564-1097; www.lmipumps.com.**

MEMDOS Smart Series metering pump from Lutz-JESCO America Corp.

LUTZ-JESCO AMERICA CORP. MEMDOS SMART SERIES

The MEMDOS Smart Series mechanically actuated metering pump from Lutz-JESCO America Corp. is built for precise liquid dosing and includes an additional size that delivers 12.7 gpd at pressures up to 300 psig in 316 stainless steel PVDF or polypropylene materials. Its compact design and sturdy tappet drive make handling acid, lye, coagulants and flocculants easy. It has remote start and stop control, level and diaphragm rupture monitoring, and batch dosing with interval and timer functionality. Double-ball check valves are standard, and it comes with an integrated dosing head venting device. **800/554-2762; www.lutzjescoamerica.com.**

NEPTUNE CHEMICAL PUMP COMPANY 5005-S

5005-S hydraulic diaphragm metering pump from Neptune Chemical Pump Company

The 5005-S hydraulic diaphragm metering pump from Neptune Chemical Pump Company can deliver repeatable flows down to quarts per day, making them ideal in oil and gas production, recovery, and in refineries. Typical applications include the injection of antifoam agents, corrosion inhibitors and other additives injected at very low volumes but high pressures. The pumps have EZE-CLEAN valves, which enable the valve cartridges to be removed for cleaning without disturbing the piping. Electronic stroke-length control is available, along with explosion-proof models that can be used in a variety of hazardous environments. It has discharge pressures of 3,000 psi. **215/699-8700; www.neptune1.com.**

PROMINENT FLUID CONTROLS GAMMA/ X

The gamma/ X solenoid diaphragm metering pump from ProMinent Fluid Controls is user-friendly and has a long service life. A solenoid

control measures the back pressure and protects the system from overload. This technology makes a pressure sensor superfluous, meaning that operating safety can be significantly increased since no additional parts come into contact with the feed chemical. It is suitable for continuous micrometering from 1 mL/h thanks to the regulated solenoid drive. It has integrated pressure measurement for greater safety during commissioning and during the process. It includes an integrated seven-day timer for timed metering tasks. It can be integrated into automated processes and used in all industries, and can work as a control unit with the process timer. **412/787-2484; www.prominent.us.**

gamma/ X solenoid diaphragm metering pump from ProMinent Fluid Controls

SEEPEX INTELLIGENT METERING PUMP

Intelligent Metering Pump from SEEPEX

The programmable, precise, low-pulsation Intelligent Metering Pump from SEEPEX operates from standard 1x120 VAC 20-amp circuits with a grounded plug. It has an electronic programming memory chip on which parameters can be preconfigured for simple plug-and-play installation. Duplication of drive settings is quick and accurate. Program an entire line of pumps within minutes without starting issues. Conveying capacities are 0.08 to 5 gpm with pressures up to 360 psi and speeds from 20 to 600 rpm. It can be installed vertically or horizontally. A 4-20mA process signal, external high pressure and low-flow or dry-run protection can be connected via a terminal strip inside the control box. **937/864-7150; www.seepex.com.**

WANNER ENGINEERING HYDRA-CELL METERING SOLUTIONS MODEL P200

Model P200 Hydra-Cell Metering Solutions pumps from Wanner Engineering

Model P200 Hydra-Cell Metering Solutions pumps from Wanner Engineering have gearbox reducers with ratios from 60-to-1 to 5-to-1. Combined with variable-frequency drive electronic flow adjustment, they provide precise, accurate flow throughout the turndown range at up to 81 gph at pressure ratings to 350 psi for nonmetallic pump heads and 1,000 psi for metallic pump heads. The separate gearboxes also allow for versatility in changing applications and to prevent cross-contamination of actuating hydraulic oil. The multiple-diaphragm design minimizes pulsations, producing smooth, linear flow without the need for pulsation dampeners. A replenishment valve in every piston assembly ensures optimum actuating oil on every stroke for continuous accuracy. **612/332-5681; www.hydra-cell.com.**

Peristaltic Pumps

AALBORG TPV DP

TPV DP peristaltic pumps from AALBORG

TPV DP adjustable-rpm dispensing peristaltic pumps from AALBORG have a timing device that permits dispensing via the user's settings or by optional remote input via a D-connector at the rear of the pump. Seven time periods ranging

FREE INFO ON THESE PRODUCTS — RETURN FOLLOWING FORM

from "0.1 to 1 second" to "10 to 100 hours" are possible. They are designed to pump low- to high-viscosity liquids from source to destination, including fuel with the appropriate tubing. Fluids never touch the pump head. Models accommodate user-selected speeds from 0 to 300 rpm. Flow rates range from 0 to 5,000 mL per minute through 1/2-inch I.D. tubing. The tubing holder subassembly's adjustable handle allows users to carry, hang or stand the pump. **845/770-3000; www.aalborg.com.**

ABAQUE HD65

HD65 peristaltic (hose) pump from Abaque

The HD65 peristaltic (hose) pump from Abaque has a seal-free design that eliminates leaks and product contamination. These self-priming pumps can run in forward or reverse and offer suction lift capabilities to 25 1/2 feet, as well as the ability to run dry without adversely affecting performance, pressure and accuracy. They are available in ductile iron and stainless steel construction, allowing higher discharge pressure up to 217 psi. Pumping action is achieved by compression of a circular loop of elastomeric hose with two diametrically opposed rotating shoes. This rotational motion forces the fluid in the hose to move ahead of each shoe. When each shoe reaches the end of the loop, the reinforced hose immediately returns to its original shape, ensuring suction and priming, creating a strong vacuum pulling more fluid inside. Models are available in 13 different sizes, with flow rates ranging from .07 to 339 gpm. **215/699-8700; www.psgdover.com.**

SVP Series metering pump from Stenner Pump Company

STENNER PUMP COMPANY SVP SERIES

The SVP Series from Stenner Pump Company is an adjustable, variable-speed peristaltic metering pump that can accept a 4-20mA signal to pace the pump, making it suitable for industrial applications and municipal water and wastewater treatment plants. It has a DC motor and an LED keypad to adjust the output by increasing or decreasing the motor speed. The turndown ratio is 20-to-1 with 1 percent increments. They offer a maximum of 40 gpd with pressures to 100 psi. The SVP1 is manually adjusted using the keypad. The SVP4 is designed to respond directly to a 4-20mA input signal from water treatment controls, including pH and ORP monitors to maintain proper water chemistry and treatment of effluent discharge water. The SVP4 includes an external port to accept the signal, or it can override the 4-20 mode and be adjusted manually with the arrows on the keypad. **800/683-2378; www.stenner.com.**

Progressive Cavity Pumps

M3068.175 progressive cavity pump from Flygt - a Xylem Brand

FLYGT - A XYLEM BRAND M3068.175

The M3068.175 progressive cavity pump from Flygt - a Xylem Brand is engineered to meet the rigors of wastewater systems with a unique impeller for optimum hydraulic efficiency and a heavy-duty cutting device that grinds solids into 1/4- by 5/8-inch particles for easy transport through small-diameter pipes, eliminating the risk of clogging. It has a Griploc seal system consisting of two mechanical seals that provide double security against water intrusion. Its air-filled motor has stators that are trickle impregnated with resin to eliminate air pockets and allow 30 starts per hour. Its tough radial grinding mechanism has been used in municipal pumps for over 20 years. **855/995-4261; www.flygtus.com.**

KEEN PUMP MODEL KPCG

Model KPCG submersible progressive cavity grinder pump from Keen Pump

The Model KPCG 1 hp submersible progressive cavity grinder pump from Keen Pump offers a high head for long run applications. It has a triple-sealed cord entry with epoxy potting, high-torque press-fit motors cooled with proprietary dielectric oil, three-bearing support, dual silicon-carbide mechanical seals, moisture probes, a scratch-resistant hardened tool-steel rotor, Viton blend full-lobe stator with wear liner, through-hardened stainless steel cutter assembly, and an internal or external start kit. It is available for rail mounting and base mounting, and configured for field replacement. **419/207-9400; www.keenpump.com.**

Rotary Lobe Pumps

BLUEline rotary lobe pump from Boerger

BOERGER BLUELINE

The Boerger BLUEline rotary lobe pump is a self-priming, valveless, positive displacement pump capable of running dry for a short time and delivering up to 7,500 gpm. It can be used for loading or unloading by reversing the flow direction. The screw rotor provides pulsation-free operation for the conveyance of highly viscous and abrasive materials. Applications include crude oil, produced water, polymer flood, drilling mud, cuttings, knockout condensate, fuel oil, refined products and waste oil. Constructed using a maintenance-in-place design, all wetted parts can be replaced easily through the quick-release front cover. **844/263-7437; www.boerger.com.**

Solids/Sludge Pumps

EM Series positive displacement pumps from ABEL Pumps

ABEL PUMPS EM SERIES

EM Series electric diaphragm, positive displacement pumps for municipal sludge transfer from ABEL Pumps offer low operating costs and durability. High-efficiency electric drive and slow stroke rates keep energy bills low and wear parts cost to a minimum. Mechanical simplicity makes seldom-needed maintenance easy. The construction includes integral metal core membranes and a smooth, mechanically controlled linear drive. Large ports and valve clearances make even the highest solids content sludge easy to pump. True process control is achieved via an optional variable-frequency drive. Optional discharge dampeners and suction stabilizers are available to minimize flow pulsations under variable or demanding system conditions. **412/741-3222; www.abelpumps.com.**

FPZ SCL K10-MS

SCL K10-MS blower from FPZ

The model SCL K10-MS blower from FPZ incorporates regenerative/side-channel technology, providing up to 556 scfm with continuous pressure up to 7.6 psig. It is available in 7.5, 10, 15, 20 or 25 hp versions, depending upon pressure require-

ments. Standard motors are suitable for use with variable-frequency drives so the blower can operate at slower speeds to minimize power consumption. It has an integral, direct-drive TEFC motor (no belts/transmissions) and is oil-less, requiring virtually no maintenance. Optional intake/exhaust ports maximize installation flexibility. The unit weighs less than 300 pounds and its noise level is under 82 dbA. **262/268-0180; www.fpz.com.**

MYERS SETH PUMP DD-6

DD-6 double diaphragm pump from Myers Seth Pump

The high-volume DD-6 double diaphragm pump from Myers Seth Pump can be used for multiple applications, including well-pointing, ponds, sludge, sewage, and handling solids up to 4 inches in diameter. It's self-priming with head pressure of 135 feet and a flow rate of 475 gpm. It can be run up to 10 days on 65 gallons of fuel. It can be used to replace many current 4-inch pumps in the market; its industrial engines run efficiently and can be repaired in the field easily. **904/389-6114; www.myersseth.com.**

PISTA TURBO Grit Pump from Smith & Loveless

SMITH & LOVELESS PISTA TURBO GRIT PUMP

The PISTA TURBO Grit Pump from Smith & Loveless is designed for pumping grit separated from sewage. Available in both top-mounted vacuum-primed and remote-mounted flooded-suction configurations, it has an oversized stainless steel shaft and oversized bearings. It is equipped with a heavy-duty mechanical seal and a Ni-Hard volute and Ni-Hard recessed impeller mounted completely out of the flow path of the abrasive fluid. This combination yields reliable grit pumping and the velocity required for effective grit washing and dewatering devices. Its space-efficient, vertical direct-coupled construction eliminates V-belt maintenance and grit slurry spills experienced in horizontal designs. It doesn't require wear plates and is available for applications with 4- and 6-inch piping arrangements. **913/888-5201; www.smithandloveless.com.**

Submersible Pumps

ATLAS COPCO WEDA

WEDA submersible pumps from Atlas Copco

WEDA electric submersible pumps from Atlas Copco give users a fast and effective dewatering solution for a variety of applications. The pumps are compact, weigh just 20 to 30 pounds, and are easy to maintain. They are available in 50 and 60 Hz versions. The range consists of the WEDA 04 and WEDA 08 drainage pumps, the WEDA 04B residual pump, and the WEDA 04S and 08S sludge/trash pumps. The pumps are 1 hp or less and have two voltage variants, 115 and 230 volts. They have small, lightweight and high-efficiency motors, and their triple shaft seal ensures reliability. Each has thermal protection to automatically stop the pump if overheating or overload/over-current occurs. To ensure quick servicing, unscrewing just three bolts removes the pump's outer jacket for access to the motor and impeller. **800/732-6762; www.atlascopco.us.**

(continued)

BJM PUMPS SKG SERIES

SKG Series submersible pumps from BJM Pumps

SKG Series submersible pumps from BJM Pumps shred flushable wipes and other difficult solids in wastewater applications. They come with RAD-AX dual shredding technology, a four-pole motor, and double mechanical seals for long life and trouble-free performance. They are constructed from 440C hardened stainless steel on all cutting elements. The impeller and suction cover are constructed of chrome iron for added durability. Winding protection and NEMA Class F motor insulation allow motor temperatures to rise to 239 F. They operate at up to 480 gpm, with heads to 49 feet. **877/256-7867; www.bjmpumps.com.**

GOULDS WATER TECHNOLOGY 33GS - 80GS

Goulds Water Technology 33GS - 80GS submersible pumps

Goulds Water Technology 33GS - 80GS 4-inch high-capacity submersible pumps are designed for residential, small municipal water supply, and light irrigation applications. Powered for continuous operation, they can run nonstop without damaging the motor. They are constructed with a strong and corrosion-resistant stainless steel casing. To protect against abrasion, they are made with a durable polymer-bearing material and a stainless steel and FDA-compliant BUNA rubber built-in check valve that also ensures quiet operation. Components include impellers, diffusers and bearing spiders that are nontoxic, and a six-sided hex shaft design that ensures a positive impeller drive. They can be easily serviced with common tools and readily available repair parts. **866/325-4210; www.goulds.com.**

HYDRA-TECH PUMPS S4SHR-LP

S4SHR-LP submersible shredder pump from Hydra-Tech Pumps

The S4SHR-LP 4-inch hydraulic submersible shredder pump from Hydra-Tech Pumps continuously rips and shears solids with a 360-degree shredding action. The carbide-tipped impeller and hardened macerator suction plate work together to produce a violent shredding action that keeps the discharge open. It is 21 1/2 inches, which allows it to fit through most manholes. Depending on the application, there is a version for portable or fixed installations. A guide rail assembly is available for stationary applications. Combined with HT15 to HT35 power units, it is capable of flows up to 810 gpm. The safe and variable-speed hydraulic drive can be used where electric power is hazardous or impractical. **570/645-3779; www.hydra-tech.com.**

Vertical/Lift Station Pumps

CENTURY Pump Stations from AppTech Solutions

APPTECH SOLUTIONS CENTURY PUMP STATION

CENTURY Pump Stations from AppTech Solutions are available in a full line of vertical and horizontal configurations and are fabricated using structurally reinforced thermoplastic (SRTP). The SRTP material permits the fabrication of lightweight yet robust pump station wet wells, combining the strength of spirally wound structural profiles with the durability and noncorrosive attributes of pressure rated high-density polyethylene, giving this line of pump stations a service life of approximately 100 years. The line is customizable to meet project-specific requirements and is designed to meet the needs of public and private sector entities that pump wastewater or clean water for purposes such as wastewater transfer, water conveyance and irrigation. They are available in up to 132-inch-diameter vessels, with up to 55-foot installation depths. They are delivered as fully packaged units, ready for immediate installation. **540/380-5600; www.apptech-solutions.com.**

CRANE PUMPS & SYSTEMS BARNES FIBERGLASS LIFT STATION

Barnes Fiberglass Lift Stations from Crane Pumps & Systems

Preassembled Barnes Fiberglass Lift Stations from Crane Pumps & Systems are available in pipe rail simplex/duplex and hard piped simplex systems, and are offered in a wide range of sizes. The stations can be purchased with or without a pump, and a selection of sewage ejectors, effluent, grinder or sump pumps are available. The online configurator tool and technical sales staff make the configuration process easy to select the right pump, control panel, basin and cover for each unique application. Stations are available in a variety of depths and diameters in both simplex and duplex configurations. **937/778-8947; www.cranepumps.com.**

TOPP INDUSTRIES STAINLESS STEEL GUIDERAIL LIFT STATION

Stainless Steel Guiderail Systems (SGR) from TOPP Industries

Noncorrosive Stainless Steel Guiderail Systems (SGR) from TOPP Industries can be installed in fiberglass basins at the company's facility or can be sold separately. It is constructed of 1 1/2-inch-outside-diameter 304 stainless steel rails with a removable cast iron ball check valve. It is suitable for most 1 1/4- or 2-inch vertical discharge pumps. Standard 8-foot rail systems consist of two 4-foot by 1 1/2-inch-outside-diameter stainless steel guide rails. There are 12-, 24- and 48-inch extensions available for applications larger than 8 feet. They can also be made as a seamless one-piece construction available in up to 20-foot lengths. **574/223-3681; www.toppindustries.com.**

Pump Controls

DSI DYNAMATIC EC-2000

EC-2000 digital controller from DSI Dynamatic

The EC-2000 digital controller from DSI Dynamatic is designed to be a compatible replacement, regardless of coil voltage or speed feedback format, for any known manufacturer of eddy current drives. It enables digital or analog integration of eddy current drives with digital process control systems, SCADA systems or PLCs. The flexible keypad enables simple and intuitive programming of control parameters and digital display of any two of several status parameters. It achieves responsive, accurate speed control, controlled acceleration and deceleration, selectable local/remote or manual/automatic speed control, external signal following, and programmable PID speed control. The compact printed circuit board design enables retrofit to existing enclosures, or it can be supplied in a variety of wall-mount or freestanding enclosures. **800/548-2169; www.dynamatic.com.**

EATON FLASHGARD

The FlashGard arc-preventive motor control center from Eaton is designed to prevent and protect personnel and equipment from the dan-

gers of arc flash. It enables units to be disconnected and reconnected to the vertical bus with the unit door closed, maintaining a dead-front barrier during maintenance operations that increases operator safety. The arc-preventive design emphasizes prevention, insulation and isolation to support safety during maintenance operations. It is designed for three-phase 230-volt applications up to 300 hp, or three-phase 480-volt applications up to 600 hp. **877/386-2273; www.eaton.com.**

FlashGard motor control center from Eaton

FORCE FLOW WIZARD 4000

The Wizard 4000 chemical inventory management system from Force Flow provides operators with critical information about the status of water treatment chemicals. It can indicate how much chemical remains in tanks or cylinders, the current feed rate, and how many days until empty. Up to four scales or ultrasonic sensors can be monitored by a single unit, allowing the operator to consolidate information into a central instrument. With separate 4-20mA outputs for each scale or sensor, it not only provides local information but also sends it to a SCADA system. By mounting it near the chemical vessels, tank changeout or filling can be closely monitored, making for a safer procedure. Operators can instantly verify the chemical status without the need to travel to the chemical room, well site or pump station. **800/893-6723; www.forceflow.com.**

Wizard 4000 chemical inventory management system from Force Flow

GREYLINE INSTRUMENTS PSL 5.0

The PSL 5.0 pump station level controller from Greyline Instruments has redundant level sensing. It includes a noncontacting ultrasonic sensor and can be connected to a loop-powered pressure sensor for redundant sensing in applications with foam or grease. It will continuously recalibrate the pressure sensor and automatically switch back and forth from ultrasonic to the pressure sensor as required. It is designed for sewage lift stations, wet wells and storage tanks. Calibration and relay setpoints are easy to enter through a user-friendly keypad and menu system. An automatic pump runtime logging and reporting system helps operators plan pump maintenance and identify lazy pumps before they fail. It includes an isolated 4-20mA output and six programmable control relays for pump control, pump alternation, and level alarms. An intrinsically safe sensor and built-in data logger are optional. **888/473-9546; www.greyline.com.**

PSL 5.0 pump station level controller from Greyline Instruments

HARWIL CORPORATION FLOW SWITCH PLUG-IN CONTROLLERS

Flow switch plug-in controllers from Harwil Corporation can help manage chemical feed pump activation. When there is water flow in the waterline, the controller switches the chemical feed pump on, then off again when the water flow stops. These controllers can be used on 3/4- to 6-inch pipe and provide 13 amps at 120-volt receptacles that are always on and also switched. Three different flow switch and plug configurations will fit any application, making installation quick and simple. These controllers can be used to ensure liquid flow for other applications where sufficient water flow is critical, such as chillers, heaters, and UV and ozone systems. **800/562-2447; www.harwil.com.**

Flow switch plug-in controllers from Harwil Corporation

SENSAPHONE 1800

The 1800 monitoring system from Sensaphone provides cost-effective 24/7 remote monitoring of environmental conditions at unattended water treatment operations. It detects problems such as temperature changes (from minus 109 to 168 degrees Fahrenheit), humidity fluctuations, water leaks, power failure, carbon monoxide and carbon dioxide levels, and smoke. When the system identifies a potential issue, it can immediately alert up to eight people with custom phone calls, allowing personnel to quickly address the situation. The internal rechargeable battery backup provides 24 hours of continuous monitoring and alerts in the event of a power outage. Operators can obtain the status of each monitored condition at the installation site or remotely by telephone. **877/373-2700; www.sensaphone.com.**

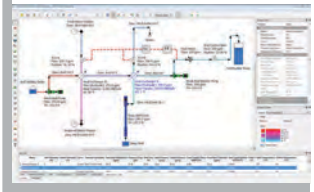
1800 monitoring system from Sensaphone

Pump Parts/Supplies/Service

BLACOH FLUID CONTROL SENTRY XP

SENTRY XP high-pressure pulsation dampeners from BLACOH Fluid Control are made of 316L stainless steel with pressure ranges to 15,000 psi and an optional pressure gauge for metering and dosing applications. Choose from Buna-N, EPDM and Viton bladders, or a PTFE Bellows design. With chemical and thermal resistance, PTFE Bellows offers flex life and compatibility with virtually all chemicals and solvents, and can withstand temperatures up to 220 F. They remove high-frequency pulses greater than 15 Hz as well as low-frequency pulses. The flow-through design allows it to effectively remove both hydraulic and acoustic pulses to achieve residual pulsations of less than 1 percent. ATEX-specific models are available to conform to EU directives and CRN models for Canadian provinces. **800/603-7867; www.blacoh.com.**

SENTRY XP pulsation dampeners from BLACOH Fluid Control



PIPE-FLO Professional from Engineered Software

ENGINEERED SOFTWARE PIPE-FLO PROFESSIONAL

The conditions needed to achieve steady-state operation can be determined by modeling a piping system in PIPE-FLO Professional from Engineered Software. The design engineer, process engineer or plant operator can easily see the steady-state conditions. If not operating at those conditions, it can do a "what if" analysis to troubleshoot the root cause of the problem. It can help enhance communication between work groups, eliminating costly mistakes caused by misunderstanding the system's steady-state operating requirements. When the plant is running smoothly, hazards are avoided, environmental emissions are under control and production is increased. **800/786-8545; www.eng-software.com.**

FEHR BROS. T-316 HIGH-STRENGTH STAINLESS STEEL CHAIN

T-316 High-Strength Stainless Steel Chain from Fehr Bros. has high

chemical resistance and lifting strength. It is marked T-316 to be properly identified by the user. If there are no markings on the chain it is assumed to be T-304. **800/431-3095; www.fehr.com/wastewater.**

T-316 High-Strength Stainless Steel Chain from Fehr Bros.

NIDEC MOTOR CORPORATION U.S. MOTORS 6812

The cast iron-frame U.S. MOTORS 6812 vertically enclosed, fan-cooled motor from Nidec Motor Corporation has a tubeless design that decreases service requirements. This large-frame TEFC is manufactured with a ball-type non-reverse ratchet, which require less service and downtime in critical applications. The all cast iron construction, including the frame and end brackets, reduces construction variations and delivers a reliable motor. Mechanical variability (including reed critical frequency) is also reduced. The one-piece frame ensures easy assembly and a shorter lead time. They are available up to 2,000 hp. **888/637-7333; www.usmotors.com.**

U.S. MOTORS 6812 motor from Nidec Motor Corporation

NUHN INDUSTRIES LAGOON CRAWLER

Lagoon Crawler from Nuhn Industries

The easily transportable Lagoon Crawler from Nuhn Industries helps agitate lagoons, creating a mix that can provide a higher concentration of nutrients in the manure and increase crop yield. It can pump 10,000 gpm and is remote controlled to a distance of 1,000 feet. It has a triple port header pump and a 6-inch front agitation canon that allow it to pump thick manure and crush through thick crusts. It blasts away sand and soil buildup, increasing storage, and it eliminates the expense of additional clean-out once the lagoon has been pumped. The four-wheel-drive system makes it flexible. If the unit gets caught up on solid buildup, it can drop its large aggressive tread tires to drive itself out. It can also drive out of the lagoon when the job is done. **877/837-7323; www.nuhn.ca.**

Pump oilers from Trico Corporation

TRICO CORPORATION OILER

Closed-system-type pump oilers from Trico Corporation offer protection from contamination, essentially keeping the lubricant cleaner for longer periods of time. Reducing the number of oil changes in pumps over time can lead to significant savings, as the cost of oil changes per pump can run up to $150, including labor and materials. **262/691-9336; www.tricocorp.com.** tpo

FREE INFO ON THESE PRODUCTS — RETURN FOLLOWING FORM

For FREE information on these products, check the box(es) below:

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- ❒ Lakeside Equipment Corporation screw pump
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- ❒ CURFLO ANSI Series of pumps
- ❒ Gorman-Rupp Company 6500 Series of centrifugal pumps
- ❒ Griswold Pump Company 811 Series of centrifugal pumps
- ❒ Hidrostal Pumps Screw-Centrifugal Pump
- ❒ Subaru Industrial Power Products PKX centrifugal pumps
- ❒ Vaughan Company Triton screw centrifugal pumps

Chemical Feed Pumps
- ❒ Kaman Industrial Technologies Dixon/JEC RZL 100 Series rotary lobe pumps

Dewatering/Bypass Pumps
- ❒ Ruhrpumpen RDP Series reciprocating plunger pumps

Effluent Pumps
- ❒ Edson Pumps Model 25000 Series electric double diaphragm pump
- ❒ SPX FLOW NOVAPLEX Vector process pump
- ❒ Vertiflo Pump Company Series 1300 horizontal pumps
- ❒ Wastecorp Pumps Sludge Pro double disc pump

Metering Pumps
- ❒ Blue-White Industries Chem-Pro M Series of diaphragm metering pumps
- ❒ Fluid Metering Valveless Piston Metering Pumps
- ❒ LMI Pumps ROYTRONIC EXCEL Series AD Pumps
- ❒ Lutz-JESCO America Corp. MEMDOS Smart Series metering pumps
- ❒ Neptune Chemical Pump Company 5005-S diaphragm metering pump
- ❒ ProMinent Fluid Controls gamma/ X diaphragm metering pump
- ❒ Pulsafeeder PULSAtron pumps
- ❒ SEEPEX Intelligent Metering Pump
- ❒ Wanner Engineering Model P200 Hydra-Cell Metering Solutions pumps

Peristaltic Pumps
- ❒ AALBORG TPV DP peristaltic pump
- ❒ Abaque HD65 peristaltic (hose) pump
- ❒ Stenner Pump Company SVP Series peristaltic metering pumps

Progressive Cavity Pumps
- ❒ Flygt - a Xylem Brand M3068.175 progressive cavity pump
- ❒ Keen Pump Model KPCG progressive cavity grinder pump

Rotary Lobe Pumps
- ❒ Boerger BLUEline rotary lobe pump

Solids/Sludge Pumps
- ❒ ABEL Pumps EM Series positive displacement pumps
- ❒ FPZ SCL K10-MS blower
- ❒ Myers Seth Pump DD-6 double diaphragm pump
- ❒ Smith & Loveless PISTA TURBO Grit Pump

Submersible Pumps
- ❒ Atlas Copco WEDA electric submersible pumps
- ❒ BJM Pumps SKG Series submersible pumps
- ❒ Goulds Water Technology 33GS - 80GS submersible pumps
- ❒ Hydra-Tech Pumps S4SHR-LP hydraulic submersible shredder pump

Vertical/Lift Station Pumps
- ❒ AppTech Solutions CENTURY Pump Station
- ❒ Crane Pumps & Systems Barnes Fiberglass Lift Station
- ❒ TOPP Industries Stainless Steel Guiderail System

Pump Controls
- ❒ DSI Dynamatic EC-2000 digital controller
- ❒ Eaton FlashGard motor control center
- ❒ Force Flow Wizard 4000 chemical inventory management system
- ❒ Greyline Instruments PSL 5.0 pump station level controller
- ❒ Harwil Corporation flow switch plug-in controllers
- ❒ Sensaphone 1800 monitoring system

Pump Parts/Supplies/Service
- ❒ BLACOH Fluid Control SENTRY XP pulsation dampeners
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By Craig Mandli

Grinder selected to regulate wastewater flow

Problem

The septage receiving area at the Las Vegas Street Water Resource Recovery facility in Colorado Springs, Colorado, was essentially an open pit with a bar screen. Trucks dumped waste into the pit, where it sometimes stagnated and caused odor. Waste also flowed through the facility at random intervals, occasionally overloading it and causing clogs and blockages.

Solution

The city worked with an engineering firm to construct a receiving building with three dual-shaft **Muffin Monster 30K inline grinders** from **JWC Environmental.** The grinders shred rags, clothing, wood and rocks into particles that pass through pipes and pumps without clogging or compromising flow. The units quickly adapted into existing pipelines, saving on installation time and eliminating a complete system retrofit.

RESULT

Since completion of the receiving building, the waste receiving process has been streamlined and worry-free. **800/331-2277; www.jwce.com.**

Chopper pumps employed at biodigester plant

Problem

The FCPC Renewable Generation Biodigester Plant in Milwaukee, Wisconsin, needed efficient chopper pumps to handle a variety of solid and liquid waste from numerous food and beverage manufacturers. The plant treats up to 120,000 gpd of high-strength waste, producing up to 2 MW of electricity, enough to power 1,500 homes.

Solution

Ten **Landia chopper pumps** were installed. Designed with an external knife system to prevent large solids from entering the casings, the pumps handle food waste 24/7.

RESULT

"Landia's chopper pumps are proving extremely reliable and blockage-free," says Christopher Winkowski, plant manager for Natural Systems Utilities, which operates and manages the FCPC plant. "The pumps can handle all types of food waste, which more often than not has aggressively low pH that will corrode pumps that aren't up to the job." **919/466-0603; www.landiainc.com.**

City upgrades piston pump with familiar model

Problem

The City of Greeley (Colorado) Wastewater Treatment Facility recently completed upgrades to its biosolids facility. The existing Schwing Bioset piston pump in the dewatering building had operated for 20 years and was a key component of this process.

Solution

The facility implemented a new pumping system with a **Schwing Bioset KSP piston pump.** To be as cost-effective as possible yet provide maximum redundancy, the city purchased a new KSP 25 and upgraded the existing pump to modern standards. The existing now matches the new unit with control modifications. Upgraded safety features offer easier remote operation and long wear part life. The existing unit was outfitted with a new hydraulic power unit, offering modern hydraulic feed pumps and unlimited control variability.

RESULT

The two pumps provide redundancy and additional capacity for growth. They are networked with the plant's SCADA system. The pumping system was turned over to the city in fall 2015. **715/247-3433; www.schwingbioset.com.**

Pump station helps keep sewage out of drainage ditch

Problem

The aging wastewater treatment plant for the Hermits Lake subdivision in Crown Point, Indiana, serving 206 homes, had a long history of state citations for discharging raw or poorly treated sewage during rain events into Foss Ditch, which drains south into the communities of Lake Dalecarlia and Lowell.

Solution

The U.S. Army Corps of Engineers, with DVG Engineers and Haas Associates, created plans to modify the plant lagoons into flow equalization basins and construct a new pump station. The city agreed to receive the flow into its wastewater treatment plant at up to 100 gpm. The fully automated **Precision Systems pump station** includes three 20 hp Vaughan submersible chopper pumps, each rated for 230 gpm. The pumps have variable-frequency drives, Auma actuated valves, dual flowmeters, SCADA monitoring and a backup generator with an automatic transfer switch. In an overflow event, the valves automatically send the 100 gpm flow to Crown Point, and any excess is sent directly to the equalization basins. Once incoming flows are less than the 100 gpm, the automated valves allow flow to drain from the equalization basins to Crown Point, alleviating the discharge into Foss Ditch.

RESULT

The fully automated station went online in November 2015. It has expanded the system capacity, alleviated flooding and eliminated environmental concerns. **708/891-4300; www.precision-systems.com.** tpo

1. SHERWIN-WILLIAMS CONCRETE RESURFACING COATING

The epoxy modified, water-based Dura-Plate 2300 concrete resurfacing coating from Sherwin-Williams Protective & Marine Coatings provides a hard, durable surface that minimizes the potential for pinholing and outgassing. The coating can be dry to the touch in three to four hours and cures for immersion in 12 hours at 75 degrees Fahrenheit. **800/524-5979; www.sherwin.com/protective.**

2. HAYWARD DIAPHRAGM METERING PUMPS

The Z Series of solenoid diaphragm metering pumps from Hayward Flow Control, designed for chemical dosing systems and corrosive environments, feature front-facing controls and tube connections for flexible installation. Available with analog or digital controls, the pumps are available in three sizes, flow rates from 1 to 14 gph and stroke rates from 120 to 300 per minute. Other features include one-piece, molded PVDF pump head; double check valves with dual ceramic balls; integral degassing valve; solids PTFE diaphragm; glass-reinforced polypropylene housing; FPM O-ring seals; automatic power supply (100-240 VAC); 4-20mA or pulse inputs and outputs; backlit LCD display, and NEMA 4X/IP 65 rated. **888/429-4635; www.haywardflowcontrol.com.**

3. LARSON MOBILE POWER DISTRIBUTION CENTER

The temporary power distribution system (MDC-240-100MB-1X240.30A-1X240.50A-6X120) from Larson Electronics enables operators in industrial settings to safely and reliably tap into power sources independently of the work area. The portable transformer is designed to operate with 240 volts 60 Hz, which steps down to 120 volts. The portable substation makes 120 volts AC available with six 20-amp, 120-volt GFCI protected 5-20 duplex receptacles with weatherproof covers. The system also makes 240 volts available through one 30-amp and one 50-amp receptacle. **800/369-6671; www.magnalight.com.**

4. FLOMATIC SILENT WAFER CHECK VALVES

Model 888 silent wafer check valves from Flomatic Valves are NSF/ANSI Standard 61 certified for drinking water systems and feature EPSM elastomers. **800/833-2040; www.flomatic.com.**

5. METALFAB VOLUMETRIC BELT FEEDER

The APB volumetric belt feeder from Metalfab is designed for highly accurate metering of all types of powders, pellets and agglomerates, as well as feeding abrasive or friable materials. Available in 12-, 24-, 36- and 48-inch belt widths and 36-, 72-, 108- and 144-inch lengths, the feeder features a sliding belt assembly and feed rates up to 5,800 cubic feet per hour. **973/764-2000; www.metalfabinc.com.**

6. AQUA-AEROBIC SURFACE MECHANICAL AERATOR

The Aqua-Jet SS-PW surface mechanical aerator from Aqua-Aerobic Systems is certified to NSF/ANSI 61 by Underwriters Laboratories for potable water applications. The aerator can be used for TTHM stripping or circulation in potable water treatment systems and reservoirs with a minimum volume of 100,000 gallons. Each aerator has an Endura Series high-efficiency, low-maintenance motor. **815/654-2501; www.aqua-aerobic.com.**

7. INDUSTRIAL VIDEO & CONTROL THERMAL CAMERA

The FV-3543-1 radiometric thermal camera from Industrial Video & Control senses temperatures for a range of applications, including process monitoring, product testing, quality control, equipment monitoring and worker safety. The thermal video sensor detects temperatures within up to eight user-defined zones. High, low, average and standard deviation thresholds can be set for each zone. Camera alarms can communicate to a plant's control system via OPC or Modbus/TCP. **781/255-7400; www.ivcco.com.**

8. SCREENCO SYSTEMS FOLDING TRIPOD LIFTER

The Folding Tripod Lifter from Screenco Systems helps eliminate painful and costly back injuries, easily lifting stubborn and heavy septic and pump chamber lids. The all-aluminum unit has a lifting capacity of 600 pounds, with an 800-pound winch and auto-brake. It includes 20 feet of 3/16-inch galvanized cable, or is available with a 1,200-pound winch that holds 50 feet of cable. A stainless steel cable is optional. The unit is available with 4-, 5- or 6-foot legs. The 4-foot model weighs 28 pounds and stores upright in service vans. The 5-foot model fits on the hose deck of most trucks, while the 6-foot model can be used to lift heavy pumps. All models have aluminum footpads with cleats for solid footing on soft soils. **208/790-8770; www.screencosystems.com.** tpo

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LaMotte chlorine colorimeter meets IP67 waterproof standard

By Ed Wodalski

DC1500 chlorine colorimeter from the LaMotte Co.

The **DC1500 waterproof chlorine colorimeter from the LaMotte Co.** meets IP67 waterproof criteria and includes six glass sample vials, DPD tablets for 100 tests of free and total chlorine or liquid DPD reagents for 140 tests.

"It's always nice to have a waterproof meter just because of the conditions you're in a lot of times out in the field doing these samples," says Ernie Rector, market manager for the LaMotte Co.

"There is wear and tear in any kind of treatment facility," he says. "They get knocked around quite a bit and get dropped. Water can get all over things. I know when I went into treatment plants to do sampling that sometimes there would be pipes burst and water spraying all over. It's not a bad idea to have it as rugged and durable as humanly possible so that it will last a long time."

The colorimeter has a rechargeable battery, USB cable and protective carrying case. A car charger is optional.

"The USB cable makes it much easier to take information and put it in a computer and into your spreadsheet so you don't have to do data entry," he says. "The recharger battery is nice because most waterproof meters with replaceable batteries, if you get them wet, the battery compartment can rust. The meter may say it's waterproof but the battery compartment is not. With this meter, it's completely sealed and completely waterproof so no matter what kind of water you get on it, it's still going to be ready to go."

The meter can be used both in the field and in the lab as a benchtop unit. It has a range of 0-4 ppm and sensitivity of 0.05.

"It's geared primarily toward public drinking water facilities," Rector says. "If you wanted to go higher you could do some dilutions. We offer other meters, but the market I most see for this is rural water, smaller water utilities that are doing grab testing of chlorine – hitting five or six places a day."

The meter has a backlit screen that can be turned on and off, which comes in handy when working in dimly lit areas.

"It has six buttons. It's very easy to use as far as the reagent systems and to get a reading," he says. "It's meant to be a very simple, straightforward meter so you can go out the day you get it and be collecting relative data." **800/344-3100; www.lamotte.com.**

FREE INFO ON THIS PRODUCT — RETURN FOLLOWING FORM

(continued)

wastewater:
product spotlight

Neptune Benson's closed-vessel system uses UV technology for wastewater reuse

By Ed Wodalski

The **Neptune Benson ETS-UVLW (ultraviolet, low-pressure wastewater) closed-vessel disinfection system** features a multi-lamp, high-output amalgam reactor with lamps positioned parallel to the flow and chamber access hatch. The system is also used to disinfect municipal drinking water and industrial process applications. Validated to NWRI (National Water Reuse Institute) UV Guidelines (2003 and 2012 revision), each reactor has been approved by the California State Water Resources Control Board, Division of Drinking Water, and is being incorporated in water reclamation facilities across the nation.

The chlorine-free system can handle a range of flow rates, from about 50 gpm to 100 mgd, and is not required to be taken offline for maintenance.

"Most wastewater is treated in an open channel," says Jon McClean, president and CTO, ETS-UV by Neptune Benson. "The enclosed vessel makes it safer. The operators are shielded from the UV light, which can be harmful. It's the safest way to disinfect the effluent."

Engineered for municipal water reuse, the system features automatic wipers to keep the optical path free from fouling. The chamber's flexible design can be installed in a vertical or horizontal orientation. Its compact design can easily be incorporated in new construction or as a retrofitted solution as the facility requires.

"Our robust systems are engineered to withstand varying conditions, including hard outdoor environments," McClean says. "Monitors give the operators feedback so they know precisely how the system is performing. Unlike a chemical system, there are no harmful byproducts formed."

Neptune Benson ETS-UVLW disinfection system

By utilizing 800-watt technology, the system requires fewer lamps, while offering an expected lamp life of over 12,000 hours.

Recently, the closed-vessel system was selected for an NWRI validated project in Southern California that will treat about 3 mgd at the Hollywood Casino.

"This is an irrigation project where they will take effluent from the casino and use the water to irrigate the grounds," McClean says. "The technology is growing rapidly. With water becoming more and more scarce, wastewater is seen as a valuable commodity. We currently have about 5,000 installations across the U.S. in a broad variety of applications." **800/832-8002; www.neptunebenson.com.**

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- ❒ **6.** Aqua-Aerobic Systems Aqua-Jet SS-PW surface mechanical aerator
- ❒ **7.** Industrial Video & Control FV-3543-1 radiometric thermal camera
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POSITIONS AVAILABLE

Gainesville Regional Utilities is seeking qualified applicants to fill two vacancies within the Water/Wastewater Department; a Water Distribution & Wastewater Collection System Director and for a Water/Wastewater Facilities Operations & Maintenance Manager. For further information and/or to apply, visit: www.cityofgainesville.jobs EOE/AA/DFWP/VP (o03)

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The Town of Brownsburg, IN is seeking qualified candidates for our Wastewater Treatment Plant. Please visit our website at www.brownsburg.org. (o03)

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industry news

BASF signs Water Solutions agreements

BASF signed an exclusive agreement with Pochteca, a Mexican-based raw materials supplier, for the distribution of its Water Solutions portfolio throughout Mexico and Central America. Product lines include BASF's Zetag, Magnaflox LT, Burst, Magnasol and Antiprex brands.

Endress+Hauser launches Open Integration partner program

Endress+Hauser launched the Open Integration partner program, which promotes cooperation between providers of industrial automation systems and Fieldbus communication. To date, eight companies have joined the program, including AUMA Riester, HIMA Paul Hildebrandt, Honeywell Process Solutions, Mitsubishi Electric, Pepperl+Fuchs, Rockwell Automation, R. STAHL and Schneider Electric.

Blue-White elects president

Blue-White Industries named Rob Gledhill company president. He has been with the company 25 years and was instrumental in the development and launch of the Pro-Series and Proseries-AM lines of metering pumps and flowmeters. Gledhill also helped develop new production methods in the machining and assembly phases of the manufacturing process, and more efficient packaging and shipping processes.

Dynamatic forms pump, fan and compressor group

Dynamatic, a member of Drive Source International, has formed a new pump, fan and compressor group to more closely align with industry standards and market trends. Formerly known as Municipal & Industrial Water, the new division will handle all applications that require a variable speed pump, fan or compressor. **tpo**

people/awards

Ken Hackett retired in November 2015 as wastewater treatment operations manager for the Town of Mansfield, Massachusetts. He worked for the town for 30 years.

Michigan Technological University researchers **Jennifer Becker** and **Eric Seagren** received a $37,000 award from the Water Environment Research Federation for their project "High-Tech Analysis of Low-Tech Methods for Sustainable Class A Biosolids Production." Becker, an associate professor of civil and environmental engineering, and Seagren, a professor of civil and environmental engineering, will lead a team to establish a pilot-scale field test at the Portage Lake Water and Sewer Authority in Houghton, Michigan.

The American Public Works Association Oregon Chapter named the **City of Gresham** as winner of the Public Works Project of the Year award in the environmental category. The Gresham Wastewater Treatment Plant was recognized for its cogeneration expansion project.

Josh Fritsch, who used to work in the wastewater department at Montpelier, Ohio, was named the village administrator for West Unity, Ohio.

The **Newberg Wastewater Treatment Plant** repair, renovation and expansion project was named the 2015 Project of the Year (budget between $25 million to $75 million) by the Oregon Chapter of the American Public Works Association. Public Works civil engineer Jason Wuertz served as the project manager for the $25 million project.

Rodney Taylor was named water utilities director for the City of Abilene, Texas. He oversees the city's public water supply and wastewater treatment operations. Taylor has several years' experience as a water treatment plant operator and manager and holds a Class A Water Operator license and a Class III Wastewater Collections Operator license.

The Northampton (Massachusetts) City Council named the city's wastewater treatment plant after former council president **James Dostal,** who passed away in October 2015. Among Dostal's accomplishments was helping develop support to build the wastewater treatment plant in the 1950s. He served the city for 55 years.

Missouri American Water named **Cheryl Norton** as its new president, replacing Frank Kartmann. Norton most recently worked as head of Kentucky American Water.

Spartanburg Water Director of Water Treatment **Ken Tuck** was appointed by Gov. Nikki Haley to a four-year term on the South Carolina Environmental Certification Board.

The National Association of Water Companies awarded second place in its Management Innovation Awards to **Illinois American Water** for the company's Mobile Education Center and Moving Water Forward through Education, an innovative approach to educating customers – especially the youngest — about the water industry.

Three Cape Fear Public Utility Authority staff members — **Robert Daughtry, Jim Tayson** and **Michael Richardson** — were honored by the North Carolina Section AWWA and Water Environment Association. Daughtry, collections system manager, received the 2015 Wastewater Collections Operator of the Year award. Tayson, water distribution and construction manager, was named 2015 Water Distribution Operator of the Year. Richardson, water resource manager, was the first individual recipient of the 2015 Disaster Preparedness Award.

The **Village of Bosque Farms** wastewater treatment plant received the New Mexico Rural Wastewater Association's Wastewater Treatment System of the Year award.

events

Feb. 29-March 2
Illinois Water Environment Association Annual Conference, iHotel and Conference Center, Champaign. Visit www.iweasite.org.

March 7-8
Virginia Water Environment Association Industrial Waste and Pretreatment Conference, Omni Charlottesville Hotel. Visit www.vwea.org.

March 7-10
AWWA 2016 Sustainable Water Management Conference, Providence (Rhode Island) Biltmore. Visit www.awwa.org.

March 13-24
Water and Wastewater 2016 Leadership Center, University of North Carolina, Chapel Hill. Presented by the Water Environment Federation, American Public Works Association, National Association of Clean Water Agencies, Association of Metropolitan Water Agencies and National Association of Water Companies. Call 202/833-1449 or visit wef.org.

March 15-16
AWWA Water Loss Seminar: Best Practice Water Audits and Loss Control Programs, Sands Casino Resort, Bethlehem, Pennsylvania. Visit www.awwa.org.

March 20-23
Missouri Water Environment Association / American Water Works Association Joint Annual Conference, Tan-Tar-A, Osage Beach. Visit www.mwea.org.

March 21-24
Central States Water Environment Association Odors and Air Pollutants 2016 Conference, Wisconsin Center/Hilton Hotel, Milwaukee. Call 703/684-2441 or visit www.cswea.org.

March 29-31
Kansas Rural Water Association Annual Conference and Exhibition, Century II Convention Center, Wichita. Visit www.krwa.net.

The **Town of Waynetown** received the Indiana Water Environment Association 2015 Collections System Award for Small Facility for its recently completed collections system improvement project.

The **City of Cordova** was named Water System of the Year (population over 1,000) by the Alaska Rural Water Association.

The **Roseburg (Oregon) Urban Sanitary Authority** received the Water Quality Improvement Award from the Water Environment Federation for its natural treatment system.

The **Verdigris Water Treatment Plant** in Broken Arrow, Oklahoma, was named Large Water Plant of the Year by the Oklahoma Water and Pollution Control Association.

The U.S. Centers for Disease Control and Prevention gave Water Fluoridation Quality Awards to the **Muskogee Water Treatment Plant** and the **Tahlequah Public Works Authority's** Illinois River and Lake Tenkiller water plants. All are in Oklahoma.

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The team at Antioch's Wastewater Treatment Facility is proud to show off their new high-efficiency system. In 2008, Antioch broke ground on their new wastewater treatment facility, which was officially completed in 2011. "The old plant had just run its course," explained Jason Treat, Lead Supervisor.

Thanks to the new facility, Antioch sees itself in a great place going forward. Their use of the Biological Nutrient Removal treatment process has proved highly effective in many ways, including increased control of phosphorus levels. Jason shared that "chemical usage has been greatly reduced from the old facility. This provides huge savings for the citizens of Antioch!"

USABlueBook is dedicated to helping Jason and his team, whether it's through our extensive product selection or our unbiased technical support. "We got a new temperature gauge from you guys, and it's been great. Now we're only out here measuring the temperature about once a month," said Jason.

USABlueBook is proud to support the entire crew out in Antioch. Their commitment to increased facility efficiency shows a great deal of dedication to the folks in their community.

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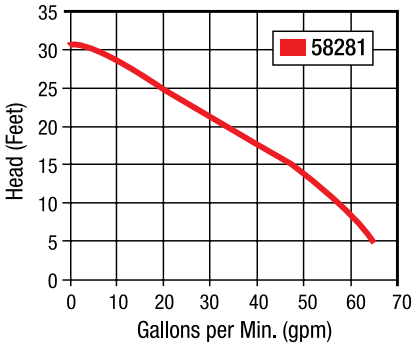

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