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OCTOBER 2011

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Robert Chalifoux
Project manager
Leominster, Mass.

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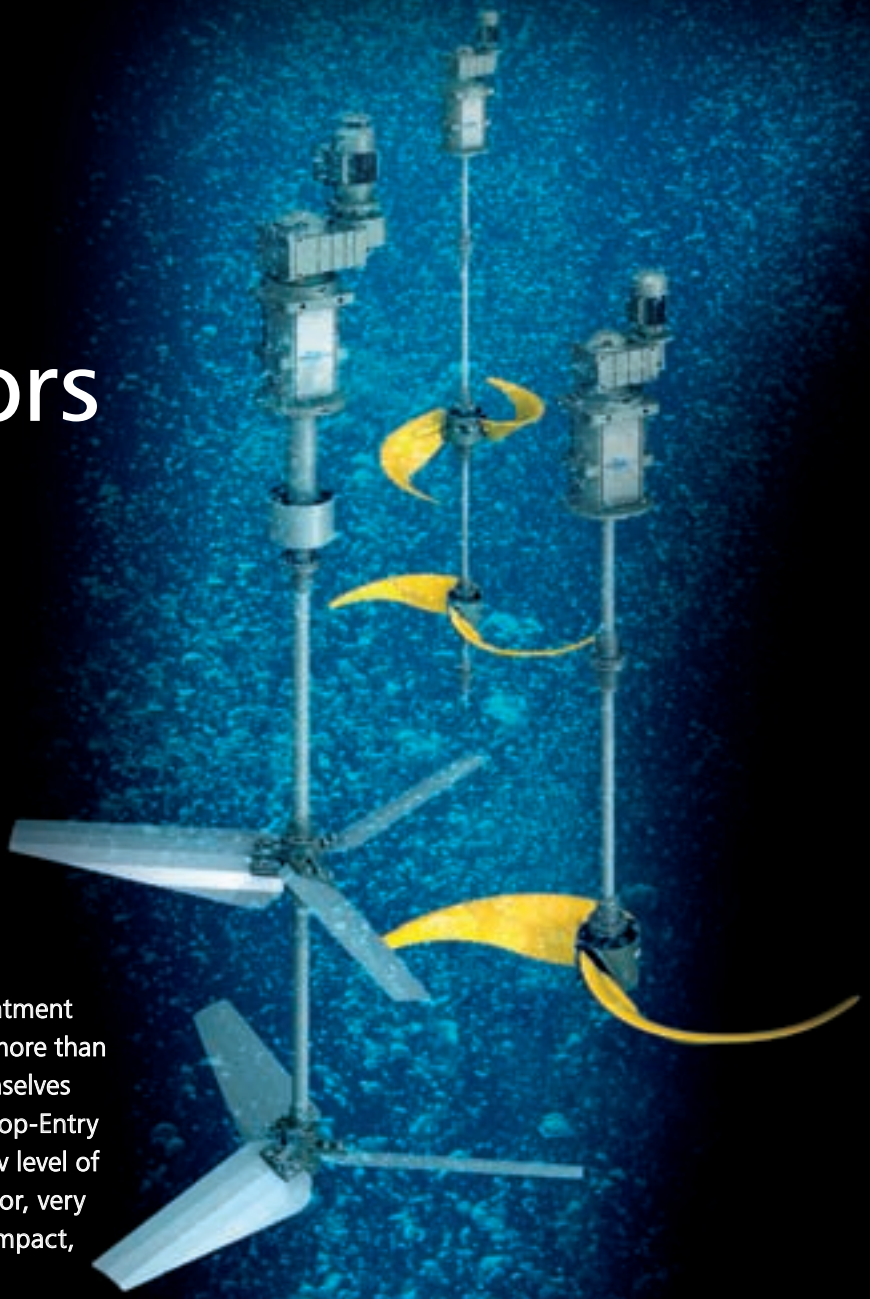

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- Top Performer – Plant: Town of Vernon (Conn.) Water Pollution Control Facility
- How We Do It: Mobile ammonia removal system in Gresham, Wis.
- Hearts and Minds: Internship program in Fort Worth, Texas
- In My Words: Apprenticeships boost professionalism in Wisconsin
- Greening the Plant: Turbo blowers at Charles River (Mass.) Pollution Control District

on the cover

The City of Leominster (Mass.) Water Pollution Control Facility has gone 25 years without a lost-time accident. In 2010, the plant won the Water Environment Federation's George W. Burke Jr. Award for safety. Veolia Water North America project manager Bob Chalifoux helps instill a sense of personal responsibility in his team. (Photography by Ed Collier)

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Flavor of the Month?

RESIST THE TEMPTATION TO WRITE OFF TOOLS LIKE LEAN AND SIX SIGMA AS FADS. THEY ARE VALUABLE METHODOLOGIES WITH POTENTIAL TO HELP THE WASTEWATER PROFESSION.

By Ted J. Rulseh, Editor

The "In My Words" column in this month's *TPO* is about applying Lean methods to wastewater treatment. Sometimes the temptation when these things come around is to write them off as just the latest fad.

Anyone who has been in an organization for a while has seen slogans and initiatives with clever names come and go. They last until management loses interest, or until a manager or supervisor moves on and a new one comes in. So the temptation for a grizzled veteran is just to go along and ride it out.

Methods like Lean are different. They aren't passing fancies. They're tried and true processes that have done wonders for organizations of many kinds. In fact, they bear closer resemblance to proven surgical procedures than to management fads.

If you doubt that Lean works, just remember one word: Toyota. Recent problems with accelerator pedals aside, Toyota has been recognized for years as the paragon of manufacturing quality and efficiency. And Toyota is where Lean began.

USING DATA

The headline to this column also mentions Six Sigma, another approach to quality improvement that is perhaps more reliant on statistical analysis than Lean. Companies like GE and Motorola have used Six Sigma to great effect to reduce product defects and make processes more efficient.

Enough said about that. Let's focus on Lean. The key thing these methodologies share is that they rely on data — not hunches, gut feel or educated guesses — to solve problems. Instead of nibbling around the edges of problems, Lean goes to the root cause.

I am not a Lean practitioner by training, but I have worked around the industry for long enough to see what it can do. I have read and written accounts of how it has done everything from streamlining operating room procedures in a hospital, to speeding up the payment process in a government office, to improving productivity in a graphic design business. The possibilities are truly without limit.

NEW IN 2012:
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Some three years after launching *Treatment Plant Operator (TPO)* magazine, we continue to hear from readers that they like it, read it regularly and — what's most important — get useful information from it.

Now, COLE Publishing plans to offer a similar magazine for the drinking water side. *Water System Operator (WSO)* makes its debut in January. We will publish it every other month at first, and its approach will be similar to *TPO*'s: Focus on the people who run the water systems and help them share best practices, learn about new technologies and methods, receive recognition, and celebrate successes.

WSO seems like a logical extension, especially since many operators today have dual water and wastewater certifications. We hope the new magazine will prove as helpful to the profession as *TPO* seems to be. **You can get a free subscription by completing the postage-paid postcard on page 23 in this issue or by visiting the website at www.wsomag.com.**

And while we're on that subject, **it's time to renew your subscription to *TPO.*** Subscriptions are free to qualified industry professionals. Visit www.tpomag.com or complete the postage-paid subscription card included in this issue.

With *TPO* and *WSO,* we hope to "cover the waterfront" with information and insights for both wastewater and drinking water professionals.

There is no reason why Lean methods can't improve various facets of water and wastewater operations, so long as the people involved are receptive to it.

IN ESSENCE

In the simplest possible terms, Lean is a way of finding and removing wasteful steps and actions within a process. A key Lean tool is value stream mapping, in which a group of people involved in a process pull that process apart into its components.

It's amazing sometimes what mapping can reveal — ways of doing things that exist as artifacts of some older process, or steps that are taken for no other reason than that "this is the way we've always done it." Once those wasteful steps are removed, the process goes on with greater efficiency and accuracy than ever before. And generally the people involved end up happier, with more time to devote to productive work.

There is great satisfaction in taking a persistent problem and solving it once and for all. Lean enables teams to do that. If I had been a young person coming up through the ranks of an organization, and if I had been given the opportunity to get training in Lean and become a problem solver, I would have taken it.

You may not have heard the term "Lean" around your organization. I would simply suggest that if you do, you should not reject or ridicule it as just another "flavor of the month." You should embrace the idea and work with it. Or if no one around you has mentioned Lean, be the one to bring it up. **tpo**

Silver Lining

A MIXER REPLACEMENT PROJECT SAVES ON ENERGY AND CHEMICALS AT A WATER RECLAMATION PLANT IN NEVADA

By Scottie Dayton

An upgrade and expansion at the Kurt R. Segler Water Reclamation Facility in Henderson, Nev., included 23 submersible mixers installed in a modified Johannesburg biological nutrient removal system. Sixteen cells in two trains of the West Complex and eight in the East Complex provided phosphorus removal and nitrogen reduction.

The mixers began shorting out within the first year. "We spent almost three years working with the manufacturer to find the cause," says Adrian Edwards, wastewater operations manager. Repairing a mixer cost $3,000 to $4,000.

"The problem seemed to be water breaching the mixer seals, wicking down the electrical connection, and into the motor windings," says Howard Analla, treatment process manager. Seeking a solution, the two contacted the Clark County Water Reclamation Facility in Las Vegas, since it used a similar process and equipment.

The plant had experienced the same problem and had solved it by switching to Amamix submersible mixers (KSB USA). Clark County operators also reported that they used lower mixing energy for the process. The new mixers installed at the Kurt R. Segler plant stopped the short outs and used half the horsepower of the original units, saving the plant some $180,000 per year in energy and chemical costs.

GREAT BEGINNINGS

The expansion increased the facility's design capacity from 24 to 32 mgd and created a West Complex with two plug-flow activated sludge trains and an East Complex with one complete-mix activated sludge train.

"With just seven mixers installed, energy dropped from $166,450 per year to $136,880. When we replace all 23, costs will decrease to $84,630 per year and we'll save tens of thousands in repair bills."

HOWARD ANALLA

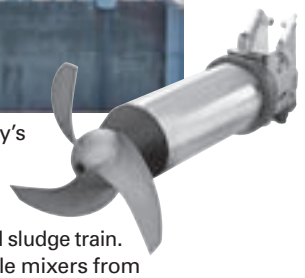
Chemical coagulation and precipitation, either in solids contact clarifiers or lamella plate settlers, provide supplemental secondary phosphorus removal. Sand filtration occurs through monomedia or continuous backwash filters. A UV process provides additional disinfection.

When the 12 hp, 480-volt submersible mixers went online, they increased the plant's electric bill by $11,000 per month. Analla and Edwards found it difficult to believe that mixers operating on half the horsepower could be as effective as larger units, so they contacted Quadna, the KSB representative in Las Vegas. A company technician evaluated the plant's dimensions and TSS estimates, then suggested the 6 hp C4138/48 UDC mixer.

The 16-inch, self-cleaning propeller on the horizontal submersible mixer moves 6,100 gpm at 850 rpm. The unit has triple seals — two mechanical seals and a lip seal — to keep water from breaching the mechanical seals or wicking through the whip-like cable where the blade nicks it. In addition, a watertight, resin-embedded cable entry system works with a plug-like connection. The mixer requires an oil change every two years.

PHOTOS COURTESY OF KSB

The West Complex houses two plug-flow activated sludge trains.



ABOVE: The expansion increased the facility's design capacity from 24 to 32 mgd and created a West Complex with two plug-flow activated sludge trains and an East Complex with one complete-mix activated sludge train. RIGHT: Twenty-three Amamix submersible mixers from KSB USA were added to the treatment plant.

PROOF POSITIVE

The team bought one mixer as a trial. It mixed the cell with half the horsepower and never failed. Confident in its reliability, the team purchased 13 more mixers, then replaced seven of the nine in the anaerobic zones.

"With just seven mixers installed, energy dropped from $166,450 per year to $136,880," says Analla. "After we replace all 23, costs will decrease to $84,630 per year and we'll save tens of thousands in repair bills."

Within two weeks of the seven mixers going online, operators saw secondary effluent phosphorous levels decrease from 0.25 mg/l to 0.10 mg/l, enabling them to use less alum. Alum savings averaged $270 per day, or $98,000 per year.

"The reductions in energy and chemicals are saving us around $180,000 per year," says Analla. "We estimate an equal return on investment within the first year." **tpo**

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Picky, Picky!

LESSONS FROM HIS FATHER HELPED TONY FOSTER SHAPE UP A SMALL LAGOON TREATMENT PLANT IN A CENTRAL ILLINOIS COMMUNITY

By Jim Force

IF HIS DAD HADN'T BEEN A WASTEWATER PLANT superintendent, Tony Foster might not have taken the job at the Heyworth (Ill.) Sanitary Treatment Plant back in 2000.

Verdant trees were sprouting from the sand filters; the fence surrounding the property did little to keep trespassers out; gophers were eating their way through the underground electrical systems; septic sludge islands floated up from the depths of the raw zone lagoon, resulting in offensive springtime odors; and the filing system consisted of stuffing paperwork into any drawer that might still have room.

"My dad taught me to take pride in my work and always do my best," Foster recalls. "He was the superintendent at Ladd, Ill., and he was very picky — an admirable trait that he passed on to me." Within months of signing on at Heyworth in 2000, Foster was named superintendent of wastewater, water and streets.

With encouragement and advice from EPA inspector Joe Koronkosky of the Champaign office, he began improving the treatment plant, and last year it was named small plant of the year by the Illinois Rural Water Association.

"Joe helped me tremendously with deficiencies that had been going on for some time before my appointment," Foster remembers. "He went out of his way to answer my questions and give me guidance on how to correct those issues."

(continued)

The Heyworth Sanitary Treatment Plant team includes, from left, maintenance worker Robbie Curtis, superintendent Tony Foster, lead worker Jimmy Ellis, and maintenance workers Vince Albert and Francis Greene. Not shown: Dave Hall. (Photography by Laurent Gasquet)


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COMMUNITY SERVICE

Heyworth is a bedroom community of about 2,800 people in the heart of Illinois. The municipal collection system delivers about 300,000 gpd through two lift stations equipped with Fairbanks Morse pumps and USEMCO control panels. Both lift stations have Cummins/Onan emergency backup generators.

At the plant, the flow is treated in a simple gravity-flow three-cell rectangular lagoon system. In the first cell, or "raw zone," eight floating aerators supplied by AEROMIX, with control panels from Aquascape, add oxygen and mix the contents. The aerators operate for various periods depending on dissolved oxygen levels in the lagoon.

Biological treatment continues in the second cell, and the third cell polishes the effluent before it is discharged to a dosing tank where chlorine used to be added (the plant now has a chlorine exemption from the Illinois EPA). The water cascades between cells two and three, and cell three and the dosing tank, adding oxygen as it moves through the system.

Finally, Hydromatic (Pentair) submersible pumps move the flow to a pair of 6- to 8-foot-deep sand filter beds, which operate on an alternating basis to remove remaining suspended solids. Effluent, averaging less than 4 mg/l TSS and BOD, is discharged through a subsurface outfall into Kickapoo Creek.

The Heyworth staff cleans the sand filters about twice each year. Sludge accumulates in the raw zone, dropping to the bottom during the spring and fall turnover when the water temperature changes. The material requires periodic dredging and removal, although Foster and his operational team have not had to do that yet.

While Foster's wastewater, water, and street department employs eight people, the treatment plant requires a minimum of attention. Foster or another staff member check on the operation three times a day — morning, lunchtime and afternoon.

QUICK IMPROVEMENTS

Before joining Heyworth, Foster had worked in a water treatment plant and a cement plant. Just six months after his arrival, improvements to the Heyworth plant began in earnest.

"We started by uprooting and removing the trees and weeds from the sand filters," he recalls. "Then we removed the top layer of sand from the filters, using shovels and elbow grease. We applied for and obtained a land application permit before spreading the waste sand and bringing in new filter sand."

Additional housekeeping improved the plant's performance and appearance, and Foster incorporated all those stray pieces of paper into a filing system so that the information required for reports could be more easily located. But he and his staff didn't stop there.

They repaired the fence around the property line and replaced the

Tony Foster, superintendent of the Heyworth Sanitary Treatment Plant.

"I've found it is better to be proactive and find possible future problems before they are serious problems of raw sewage backing up in homes of residents."

TONY FOSTER

profile

Heyworth (Ill.) Sanitary Treatment Plant

BUILT:	1979
POPULATION SERVED:	2,800
SERVICE AREA:	1.5 square miles
FLOW:	300,000 gpd (average)
RECEIVING WATER:	Kickapoo Creek
TREATMENT LEVEL:	Secondary
TREATMENT PROCESS:	Aerated lagoons, sand filtration
BIOSOLIDS:	Land-applied
ANNUAL BUDGET:	$80,000 (operations)
WEBSITE:	www.heyworth-il.gov
GPS COORDINATES:	Latitude: 40°22'49.84"N; Longitude: 88°57'30.63"W

(continued)

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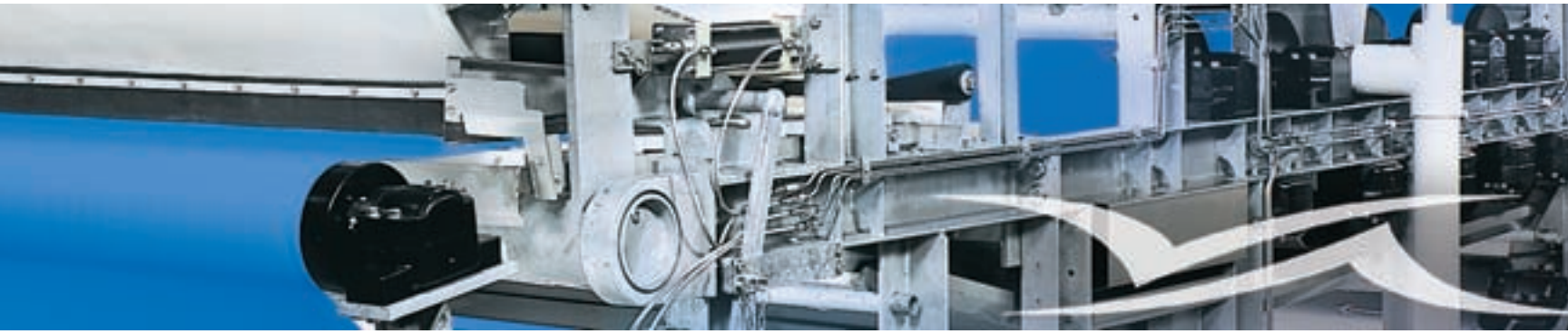

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Heyworth (Ill.) Sanitary Treatment Plant PERMIT AND PERFORMANCE			
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BOD	115 mg/l	4 mg/l	20 mg/l
TSS	91 mg/l	4 mg/l	24 mg/l

MAKE WAY FOR GEESE

One issue Tony Foster and his team haven't been able to solve at Heyworth is the flocks of geese that use the plant as a rest stop during their spring and fall migrations up and down the central Illinois flyway.

"We get 1,000 to 2,000 birds every year, and they love to land in our lagoons for a quick swim and feast on our grassy slopes," Foster says. "During those periods we experience some minor changes in our effluent quality. I used to think it was a problem with our sand filter, until I realized that when the geese left, things quickly returned to normal."

The plant simply puts up with the visitors. "I don't like to kill an animal if I don't have to," says Foster. His staff actually rescued a couple of injured birds a few years ago. "We took them to a rehabilitation person in Springfield and she was able to get them going again."

Maintenance workers Vince Albert and Robbie Curtis, shown installing a fence post, are part of a plant team that tackles a wide variety of tasks.

gopher-ravaged copper-wire electrical system with all new lines, this time protected inside a plastic conduit. They upgraded the main control panel and added fuse disconnects. "We put in new effluent monitoring equipment, too," Foster says. "It was really antiquated when I started here."

Foster and his staff have become experts of sorts in the use of enzymes to improve treatment. Working with the biotech company AQUAFIX, they have installed an enzyme addition system that reduces odors and keeps sludge from going septic. "When I came here, we had maybe six to eight inches of raw sludge bubbling up on the surface of the raw zone," Foster says.

"I am very highly motivated about doing my job. We try to make this place a nice little town to live in."
TONY FOSTER

Using a "polar" enzyme during cold weather, and a standard enzyme at other times, Heyworth has solved that problem, and as a bonus, sludge settles better. "We add about a half a pound a day," Foster explains.

Heyworth also uses enzymes from AQUAFIX to attack grease in its sewer system. "It helps when we put grease-eating enzymes in problem areas," Foster says. "We do it every spring. We used to use acid but found that it could damage the sewers, and at times it had an adverse effect on our biological system at the plant."

Heyworth also works with Rewesewer Drain Cleaning of Bloomington-Normal to jet the collection system every year. "I've found it is better to be proactive and find possible future problems before they are serious problems of raw sewage backing up in homes of residents," Foster says.

COLOR IT CLEAN

The plant team uses a simple approach to monitor the quality of the water being treated. "We do that by just being very observant of the color," Foster says. "We pay attention to the color of the water as it flows from lagoon to lagoon. If it looks iffy, we retest in a week or two."

Although it has a laboratory on site, Heyworth sends its samples to a certified laboratory in Peoria. "We determined a number of years ago that there would be considerable cost savings by having an outside certified laboratory run monthly samples," Foster says. "We use our plant lab only for operational sampling."

Heyworth uses AQUAFIX products in an enzyme addition system that helps keep sludge from going septic and so reduces odors.

The maintenance program involves common sense. Foster and his team keep all rotating equipment clean and well-greased. "We run our aerators long enough to reach our treatment goals, but not too much so that we have overkill on energy consumption," Foster says. "In today's economy it's all about saving every dime possible."

Foster holds an Illinois Class 3 wastewater license and encourages his staff members to attend training sessions and continuing education classes and work toward certification. "We're spread thin here, and we try to get the most out of our guys," he says. "I'd like to upgrade

Lead worker Jimmy Ellis does maintenance on the AEROMIX aerators. In the first cell, or "raw zone," eight floating aerators add oxygen and mix the contents.

my license further, but it takes time to learn a new process. That's one of the tough things about being in a small town."

But Foster wouldn't trade places with anyone. "I am very highly motivated about doing my job," he says. "We try to make this place a nice little town to live in. When I started here some of the village residents had a negative view of our crew. We've helped change that, and I think the workers appreciate it.

"I now see that my father had a reason for teaching me the way he did, and I have come to appreciate that more and more as I and my career age." tpo

AMONG THE BEST

Frank Dunmire

For many years, Heyworth has been a member of the Illinois Rural Water Association, a nonprofit association of rural water and wastewater systems.

"They do a great job with technical advice and other on-site technical assistance," says Tony Foster, superintendent of wastewater, water and streets. "They are the go-to people when you need help with a problem or continuing education training."

The association thinks Foster and the Heyworth plant do a great job, as well — enough so that Heyworth won the IRWA 2010 Best Small Treatment Plant Award for communities with less than 10,000 population.

Frank Dunmire, IRWA executive director, was impressed by the quality of the water after it is treated at Heyworth, and "how neat and clean everything was, given the problem small towns have with limited finances and manpower. It was a very well-run operation." Foster credited the eight employees who work for his department.

"When the association called me, they asked who was coming to accept the award," he recalls. "I asked if another worker could accept with me." He took along plant operator Jimmy Ellis because: "I wanted to show the guys I appreciate the work they do."

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NEW-STYLE TURBO BLOWERS ALLOW A NEW YORK TREATMENT PLANT TO SAVE MONEY FOR RATEPAYERS AND FUND COLLECTION SYSTEM IMPROVEMENTS

By Doug Day

Federal stimulus funds paid the bill and the people of Ogdensburg, N.Y., will reap the rewards from a $1.1 million upgrade to its wastewater treatment plant. "It's not often you get the opportunity to have this kind of efficiency increase," says Kit Smith, public works director. "Small gains usually mean a lot. These are big, big gains."

A new style of high-efficiency turbo blower is at the heart of the project, which also includes fine-bubble diffusers and a biogas-to-energy system for heating the digesters. The turbo blowers and fine-bubble diffusers will result in a 25 percent savings on the plant's annual energy budget. Biogas recovery could double that.

The 1950s-era 19 mgd sludge activated plant has gone through incremental improvements over the years, the last in 1978. Located just downstream from Lake Ontario and across the St. Lawrence River from Canada, the plant has always discharged good effluent to the St. Lawrence Seaway, according to Smith.

AERATION UPGRADE

With money from the American Recovery and Reinvestment Act of 2009, the plant's coarse-bubble diffuser system was replaced with fine-bubble diffusers as part of the aeration upgrade that went online in October 2010. The project was designed by Tisdel Associates Consulting Engineers and is expected to free up money for needed improvements to the city's combined sanitary and storm sewer system.

APG-Neuros makes the turbo blower selected for the project. "They are state-of-the-art technology," says Smith. "We feel they are going to be a very popular blower. To my knowledge, ours are the first in New York." The manufacturer says there are 368 units operating in the U.S. and more than 1,100 installed around the world.

> "Small gains usually mean a lot. These are big, big gains."
>
> **KIT SMITH**

APG-Neuros says its turbo blowers operate at a savings of up to 40 percent compared to conventional blowers. "We did a lot of research on the blowers," notes Smith. "The APG-Neuros blowers have been used in Canada for the last five or six years."

One of the Canadian plants using the blowers is just 40 miles away in Kingston, Ont., so Smith went there to learn more about them. Kingston reported energy savings of 46 to 66 percent, and Smith has seen similar results at his plant.

"We used to run three centrifugal blowers 24 hours a day and a fourth about 11 hours a day with the coarse-bubble diffusers," he says. "With the fine-bubble, we're running only one of our four high-efficiency blowers around the clock, and sometimes we use two."

The biogas treatment system from Applied Filter Technology installed in April 2011 at the Ogdensburg plant.

PHOTOS COURTESY OF KIT SMITH

LEFT: The new turbo blowers made by APG-Neuros. With the new fine-bubble diffusers, Ogdensburg needs to run only one blower around the clock. RIGHT: The biogas will be burned in a new Burnham Commercial boiler that can also use natural gas.

BIG REDUCTION

Smith is seeing a 52 percent reduction in electricity use so far, though that could change if a nearby cheese plant goes back into operation. It shut down shortly after the fine-bubble system went into operation. Even if it does go back into operation, Smith expects a worst-case 40 percent electricity savings.

"We're looking at saving $90,000 to $100,000 a year. It's been great so far," he says. The cost of aeration has been nearly cut in half, and that equates to a savings of 25 percent of the plant's total budget for heat,

What's Your Story?

***TPO* welcomes news about environmental improvements at your facility for future articles in the Greening the Plant column. Send your ideas to editor@tpomag.com or call 877/953-3301.**

power and lighting. The changes have also made life easier on the operators because they no longer have to travel around the plant adjusting blowers.

The new blowers have high-speed motors that run on air bearings. "There's no need for a gearbox or a lubrication system," Smith says. "They turn at a very high rpm, very similar to a jet engine, and have very few parts to wear out. The efficiency is by far better than anything we could come close to, and we looked at a lot of different blowers."

They are also clean and quiet. "Anyone who has walked into a room with centrifugal blowers knows that you have to wear hearing protection and be able to read lips," Smith says. "Even with two of the new blowers running, you can carry on a normal conversation."

Treatment results have also been good; a combination of the turbo blowers, new dissolved oxygen probes from Hach Co., and an automated dissolved oxygen control system provided through Koester Associates. "We put in variable-speed drives that adjust the blowers automatically according to the amount of air we need to achieve the proper dissolved oxygen," Smith says.

The blowers, diffusers, and DO system cost just over $800,000 in stimulus funds. The remaining $300,000 went for the biogas system that heats the plant's three digesters and miscellaneous energy efficiency improvements.

ENERGY RECOVERY

Keeping digesters at 90 degrees year-round requires a lot of gas, especially during winter. The new biogas system will provide digester heating while also heating part of the treatment plant. "We're expecting at least a 50 percent reduction in our natural gas costs, about $130,000 in annual savings," Smith says. The system will also provide environmental benefits by ending the flaring of biogas.

The biogas project started two years ago when plant staff and the city's Highway Division took on the difficult job of cleaning and repairing the digesters on their own rather than hiring a contractor. "That was a big project; they hadn't been cleaned since the 1960s," Smith says. "We also removed the old metal roofs, which were rusted and leaking."

New fiberglass roofs were installed by the plant staff to support capture and storage of the biogas. A gas conditioner from Applied Filter Technology installed in April 2011 will clean the biogas, which will be burned in a new Burnham Commercial boiler that can also use natural gas.

"Gas conditioning wasn't included in the original system," Smith notes, "but after reading about it, doing some research and talking to people at other plants, we added it to cut down on the maintenance needed for the boiler."

EXCITING TIME

Ratepayers aren't the only ones who will benefit. Smith says there are unmet needs for the combined sewer and stormwater system, and the savings will help fund that work. "Our collection system is about 100 years old; we're a small city and our funding is limited," Smith says. "We're planning to take some of the savings and build a capital fund and develop a long-term plan for making upgrades."

While some separation of the sanitary and stormwater systems has been accomplished, there are still two to four times a year when stormwater overtaxes the sanitary system, causing discharges to the St. Lawrence River.

"We're under order from the EPA to correct that the best we can, so we're hoping to take some of the savings and do upgrades without having to finance the whole cost," Smith says. "We can save a lot of money, increase our efficiencies, make our effluent even better, and limit the number of overflows. It's been a godsend to us." **tpo**

> "We can save a lot of money, increase our efficiencies, make our effluent even better, and limit the number of overflows. It's been a godsend to us."
> **KIT SMITH**

Mixing It Up

A PORTABLE AERATION SYSTEM PROVIDES IMMEDIATE AND LONG-TERM ENERGY SAVINGS FOR AN ALABAMA CITY'S TREATMENT POND

By Scottie Dayton

Discharge from a textile plant in Monroeville, Ala., paid 90 percent of operating costs for the Hudson Branch Wastewater Treatment Plant. The 2 mgd (design) activated sludge extended aeration facility ran two 125 hp propeller-type aerators in its 11-foot-deep wastewater pond. Power usage averaged $12,500 per month.

When the textile plant closed in 2009, Hudson Branch installed a baffle curtain in the pond, cutting its capacity in half. With flows averaging 250,000 gpd, operators cycled the active aerator on and off. Although running it 10 hours per day lowered utilities to $4,000 per month, it was too expensive to run for the influent coming into the headworks.

"In 2008, an aerator broke down and Randy McGuffin of DO2E Waste Water Treatment leased a floating mixer and aerator to us for 60 days," says superintendent Darlene Johnson. McGuffin later installed two single-flow high-volume 5 hp floating aerators, and two 2 hp high-volume floating mixers in the active half of the lagoon. They lowered the utility bill to $1,300 after one month.

"Based on what we're saving, we should see a return on our investment in 18 months, and save tens of thousands of dollars over the lifetime of the equipment."

DARLENE JOHNSON

PHOTOS COURTESY OF HUDSON BRANCH WASTEWATER TREATMENT PLANT

The control box (left) for the aerators cycles them on and off. The two light-green canisters each contain two air filters on suction pipes.

Each mixer moves up to 1.3 mgd and transfers 2.75 lb O_2/hp/hr. Each mixer is driven by a 3 hp regenerative air blower producing 1.5 psi and 125 cfm of air flow, drawing eight to 12 run amps while reducing sludge buildup by up to 60 percent. The single-flow high-volume aerators move 12.6 mgd, diffuse 245 cfm at 50 inches Hg and transfer 3.70 lb O_2/hp/hr.

GREEN AND WHITE TEAM

The prewired and pre-plumbed DO2E aerators (dissolved oxygen enhancers) installed in four hours. "They float on the water and are held in place by guide wires," says Johnson. "Randy plugged them in, hooked up the air hoses, and we were good to go."

The staff electrician stepped down the three-phase power to single-phase for the mixers and mounted a control box for the aerators. The original aerators remained in the pond as backups.

The mixers each have two green sponsons. Suspended between them eight to 10 inches below the water is an air manifold and stationary diffuser head. Each mixer moves up to 1.3 mgd and transfers 2.75 lb O_2/hp-hr. Each mixer is driven by a 3 hp regenerative air blower producing 1.5 psi and 125 cfm of air flow, drawing eight to 12 run amps while reducing sludge buildup by up to 60 percent.

The single-flow high-volume aerators move 12.6 mgd, diffuse 245 cfm at 50 inches Hg and transfer 3.70 lb O_2/hp-hr. The blower injects air through a multichambered manifold at the bottom of the units to draw up the solids.

Released at a specific depth within a confined space, coarse bubbles provide velocity while fine bubbles maximize oxygen transfer. The resulting turbulence creates a surface current of 8 knots for 100 feet while reducing sludge buildup by 75 percent.

SUBSTANTIAL SAVINGS

The marine-grade mixers and aerators have no moving parts, reducing maintenance costs by up to 90 percent. "Timers cycle the units on for three hours and off for five," says Johnson. "When they run, the aerators push the solids to the outfall and into the clarifiers.

"I budgeted $58,900 for utilities this year with an average of $4,900 per month for electric," says Johnson. "Based on what we're saving, we should see a return on our investment in 18 months, and save tens of thousands of dollars over the lifetime of the equipment." **tpo**

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The Manchester Wastewater Treatment Plant team includes, from left, Wes Cotant, operator I; Ken Young, operator II; Don Johnson, lead operator; Brian Fletcher, operator II; and Mick Durham, operator II. (Photography by Jim Bryant)

One of three final clarifiers at the Manchester plant.

THE MANCHESTER (WASH.) TREATMENT PLANT HAS WON THE STATE DEPARTMENT OF ECOLOGY OUTSTANDING PERFORMANCE AWARD FOR A RECORD 15 STRAIGHT YEARS

Super Achiever

By Trude Witham

IT'S SOMETHING TO BE PROUD OF WHEN A PLANT wins an award. But when it wins that award year after year, that's special.

That distinction belongs to the Manchester (Wash.) Wastewater Treatment Plant, a 0.46 mgd facility that is one of four owned by Kitsap County. It has won the state Department of Ecology's outstanding performance award for 15 years in a row and is the only plant in the state to earn a perfect score since the department began honoring top performers in 1995.

To receive a perfect score, a plant must consistently meet every condition of its permit, take every water sample, and pass every on-site inspection. Located in a community of 2,400 residents, the plant serves light industry, Manchester State Park, a U.S. EPA laboratory, the Northwest Fisheries Science Center (a National Oceanic and Atmospheric Administration research facility) and the Manchester Naval Fuel Depot.

WINNING TEAM

Lead operator Don Johnson, one operator and a rotating operator staff the Manchester activated sludge plant. Johnson also oversees the county's Kingston (oxidation ditch) and Suquamish (sequencing batch reactor) wastewater treatment plants.

The Kingston plant has won a Department of Ecology Outstanding Wastewater Treatment Plant Award every year since it was rebuilt in 2005. The Suquamish plant has a perfect operating record since its upgrade in 1998.

Besides Johnson, the operations staff for the three plants includes:

- Mick Durham, operator II, 18 years of wastewater experience, all with Kitsap County
- Brian Fletcher, operator II, 15 years, 12 with the county
- Ken Young, operator II, 13 years, 10 with the county
- Wes Cotant, operator I, six years, all with the county. He assists one day at each of the three plants during the week and covers all three plants on weekends.

With a Group IV certification and 24 years of experience, all with Kitsap County, Johnson is up to the task of running the facilities, although he credits the county and his staff for the plant's success. "We have a lot of support from the county, which has 60 full-time employees in the wastewater division," says Johnson. "There is a main plant that serves central Kitsap, and then three outside plants, which I serve."

The successful operations at the plants are supported by many skilled colleagues at the central plant: facilities maintenance staff, mechanics, electricians, instrument technicians and lab staff. These 22 full-time employees are responsible for the treatment plants as well as 60 lift stations. The central plant also has six operators.

"We have a lot of support from the county, which has 60 full-time employees in the wastewater division. There is a main plant that serves central Kitsap, and then three outside plants, which I serve."

DON JOHNSON

SOUND MAINTENANCE

One factor that has kept the Manchester team intact for so long is the excellent condition of the plants, which are up to date and well maintained. "Our staffing levels have remained stable in a time when private sector and government employment has been less sound," Johnson says.

Operators work 7 a.m. to 3:30 p.m. Monday through Friday. During off-hours, a dial-up alarm system notifies on-call operators of any problems. A small on-site lab performs daily tests such as pH and dissolved oxygen. The main Kitsap County lab conducts all other tests.

Don Johnson, lead operator at the Manchester Wastewater Treatment Plant.

profile

Manchester (Wash.) Wastewater Treatment Plant

BUILT:	1969; upgrades 1991, 1998
POPULATION SERVED:	2,400
EMPLOYEES:	3
FLOWS:	0.46 mgd design, 0.21 mgd average, 0.99 mgd peak
TREATMENT LEVEL:	Secondary
TREATMENT PROCESS:	Activated sludge
RECEIVING WATER:	Puget Sound
BIOSOLIDS:	Trucked off site and land-applied or composted
WEBSITE:	www.co.kitsap.wa.us/ww/manchester.htm
GPS COORDINATES:	Latitude: 47°33'31.73"N; Longitude: 122°32'43.36"W

The Manchester plant, built in 1969 with primary treatment, was operated by a local utility district until 1976 when Kitsap County took it over. In 1991, the plant was upgraded to an SBR secondary treatment facility, and in 1998 to a conventional activated sludge process to increase capacity.

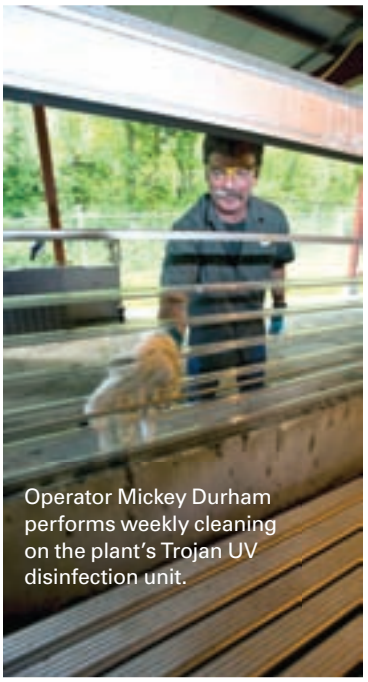
ROTATION PROGRAM

Don Johnson, lead operator at the Manchester Wastewater Treatment Plant, believes in rotating his staff among the three Kitsap County plants for which he is responsible. He initiated the concept 11 years ago.

"When I started the rotation of operators, the main reason was to periodically consider plant operations with a fresh perspective and encourage new ideas," Johnson says. "The three plants I supervise are smaller operations, all less than 0.5 mgd, and I wanted to keep the duties from becoming routine."

Operators have readily accepted the program. One operator may prefer one plant or another, but Johnson doesn't see that as a disadvantage. Instead, it fosters an amiable rivalry, encouraging operators to advance in skills and knowledge. "The operators are in constant contact with each other, promoting teamwork," Johnson says. "They know I am not likely to challenge well-considered decisions, so they are not frozen in place."

With the rotation program, all the operators share in the success. "Everyone is proud of the awards the plants have won because they have all contributed to earning them every year," Johnson says.



Operator Mickey Durham performs weekly cleaning on the plant's Trojan UV disinfection unit.

The 1998 upgrade provided a return activated sludge (RAS) pump station in which the pump drew from the two secondary clarifiers at the same time. The withdrawal rates were not easily equalized, and that led to unbalanced solids inventories in the clarifiers. To correct that, county personnel divided the RAS pump station into two pump wells in fall 2010. An RAS pump with variable-speed control is now dedicated to each clarifier.

Wastewater flows to the influent pump station and is delivered via three 10 hp Myers submersible pumps to the headworks, consisting of a rotary bar screen with integral dewatering (Lakeside Equipment). From there, the wastewater is sent to a Smith & Loveless vortex grit chamber and a Weir Specialty Pumps/WEMCO Pump grit classifier with cyclone. It then flows by gravity to two parallel Jet-Tech aeration systems (Siemens) powered by three Dresser Roots 15 hp positive displacement blowers.

The 0.126 mgd aeration basins are the retrofitted SBRs. The mixed liquor flows from the basins and is split between two 35-foot-diameter Ovivo final clarifiers. It then flows to a low-pressure, low-intensity TrojanUV disinfection system. The final effluent is discharged 880 feet from the shore of Puget Sound, 60 feet below the low-tide point.

The plant dewaters the biosolids to 4 percent solids with an Ashbrook gravity belt thickener. Solids are trucked to the Central Kitsap Wastewater Treatment Plant for anaerobic digestion and dewatering. The biosolids are transported to a contractor for land application or composting.

"We focus on controlling the quality of the activated sludge, and each day we have a protocol to assess solids inventory. We want to know how much we have, where it is, how long it has been there and how it is behaving."

DON JOHNSON

FORMULA FOR SUCCESS

"There is no secret formula, no precise mixed liquor suspended solids sweet spot, no ideal RAS/Q (return activated sludge flow to sewage flow) ratio," says Johnson. "We do what I imagine successful treatment plant operators around the world do. We have well-designed facilities and infrastructure, which we keep clean, well maintained mechanically, and safe.

"We focus on controlling the quality of the activated sludge, and each day we have a protocol to assess solids inventory. We want to know how much we have, where it is, how long it has been there and how it is behaving. But beyond facilities and protocols, it is the staff that makes a treatment plant successful."

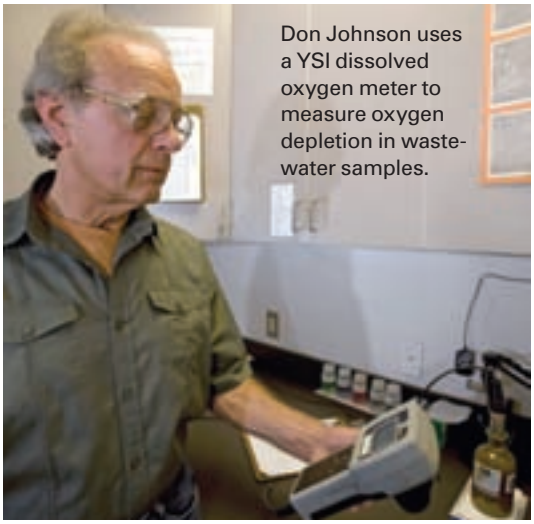
Johnson's philosophy as a leader is another reason for the plant's success. "We have an outstanding team of talented operators who are given the responsibility for recognizing and dealing with operational issues," he says. "My role is to provide whatever support they need to fulfill their responsibilities."

STEPPING UP

The Manchester plant's path to success has not been without challenges. "The evolution of the plant from primary treatment to sequential batch reactor to conventional activated sludge presented challenges, as the treatment processes are very different," says Johnson. Other challenges included keeping current with technology.

Training has helped. As part of each plant upgrade, manufacturers have been required by contract to provide comprehensive training to the staff on operating and maintaining all equipment. New operators work under experienced operators to gain specific skills and competency.

The Department of Ecology requires continuing education to maintain operator certification. Operators attend annual conferences, workshops and short schools sponsored by the Pacific Northwest Clean Water Association (PNCWA) and Washington Wastewater Operator Workshops. Monthly safety



Don Johnson uses a YSI dissolved oxygen meter to measure oxygen depletion in wastewater samples.

Manchester Wastewater Treatment Plant
PERMIT AND PERFORMANCE

	INFLUENT (monthly average)	PERMIT (monthly average)	EFFLUENT (monthly average)
BOD	210 mg/l	30 mg/l	4.0 mg/l
TSS	230 mg/l	30 mg/l	5.5 mg/l
Fecal	—	200/100 ml	3/100 ml
Ammonia	26 mg/l	N/A	3.5 mg/l

Operator Mickey Durham, left, and lead operator Don Johnson, wash down a pump at the influent pump station before pulling the pump for inspection.

"There are many changes in the industry, and it's important to pursue energy efficiency and create reusable resources."

DON JOHNSON

meetings also include training in related subjects.

Johnson is a member of the Water Environment Federation and PNCWA and attends annual conferences and workshops. "I have found value in their website technical forums and Web-based seminars," he says.

FUTURE CHALLENGES

A key future challenge is movement toward water reclamation. Located on the Kitsap Peninsula in the Puget Sound region, Manchester depends on groundwater for drinking. With a growing population, that source could become depleted. In 2009 the county adopted a policy that water is a resource that needs protection.

"The county is studying reuse as a way to enhance wetlands," says Johnson. "At present, there is no timetable for upgrading the Manchester plant for reclamation, but I have been involved with some studies of that nature for the Kingston plant."

The Manchester plant may need a capacity upgrade. "When we upgraded in 1991, it was supposed to be sufficient for 15 years, but by 1998 we were already exceeding growth expectations," says Johnson. "It has leveled off a bit now, but who knows what the future holds?"

Johnson believes operators should be ready for change. "My advice is for them to remain adaptable and up to date," he says. "There are many changes in the industry, and it's important to pursue energy efficiency and create reusable resources."

Whatever changes may come for the Manchester plant, one thing is certain: the operators will strive to maintain their success. Says Johnson: "Our goal is to continue to operate the plant safely and efficiently while protecting public health and the natural water resources." **tpo**

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Getting Going

TREATMENT CHALLENGES DURING MOUNT CARMEL WASTEWATER TREATMENT PLANT UPGRADES FROM CONTACT STABILIZATION TO TERTIARY ICEAS SBR TREATMENT

By Stephen N. Zeller, Tom Gallagher, and Archis Ambulkar

The Mount Carmel (Pa.) Municipal Authority Wastewater Treatment Plant serves Mount Carmel Borough, parts of Mount Carmel Township, and Cunningham Township in Columbia County. The plant was built in 1975 and consisted of a secondary contact stabilization designed for 1.5 mgd average daily flow and organic capacity of 2,500 pounds per day.

Based on state Department of Environmental Protection requirements, the authority prepared a Special Study Act 537 Plan MCMA in cooperation with Mount Carmel Borough and Mount Carmel Township to address the ongoing issues and future planning, including:

- Hydraulic overloads
- Correction of the poor conditions
- Compliance with U.S. EPA and DEP CSO policies
- NPDES permit requirements
- Compliance with the Chesapeake Bay Strategy for nutrient removal
- Future growth in the service areas and surrounding community

Overall, treatment operations during the transition from contact stabilization to ICEAS system were successfully maintained without violating any permit limits, overcoming the challenges during startup operations.

The Act 537 Plan proposed upgrades at the treatment plant with a new 2.25 mgd average flow (12.5 mgd peak) with an Intermittent Cycle Extended Aeration System (ICEAS) Sequencing Batch Reactor (SBR) tertiary treatment system, replacing the existing contact stabilization process.

Brinjac Engineering, retained municipal engineer for the MCMA, provided engineering and operational startup services for the upgrades.

OLD VERSUS NEW

The new system was proposed for a revised organic loading capacity of 4,691 pounds of BOD per day. The treatment technology was specifically chosen to account for high peak-flow to average-flow ratios that were expected because of the conveyance of stormwater from CSOs to the treatment plant. It was also chosen to ensure compliance with the new Chesapeake Bay Tributary Strategy Nutrient Reduction Plan.

PHOTOS COURTESY OF BRINJAC ENGINEERING

The new system was designed for a revised organic loading capacity of 4,691 pounds of BOD per day.

The Mount Carmel plant was upgraded with an Intermittent Cycle Extended Aeration System (ICEAS) Sequencing Batch Reactor (SBR) tertiary treatment system, replacing the existing contact stabilization process.

The secondary contact stabilization process involved manual screening, grit removal, contact stabilization activated sludge treatment, final settling and chlorine disinfection. The old concrete tanks above ground were deteriorating.

The new system involved coarse and fine screening, a raw sewage pump station, a grit removal system, the ICEAS SBR system (ITT Water & Wastewater – Sanitaire ICEAS advanced technology), UV disinfection, aerobic digestion to produce Class B biosolids, and the existing outfall to Shamokin Creek.

The SBR tanks waste activated sludge treatment involved a Prethickened Aerobic Digestion with Gravity Thickening (PAD-G) system consisting of a thickener and series of aerobic digesters to produce Class B biosolids and nitrify/denitrify sludge.

For the new treatment plant, the existing belt filter press system was proposed to be used, but with conveyor system upgrades and a new canopy for the dump containers. ABJ/Sanitaire Equipment and Technologies provided the ICEAS SBR system, influent pumps by Gorman-Rupp Co., PAD-G process by Enviroquip (Ovivo), grit system and influent fine screen by Lakeside Equipment, and UV system by Trojan Technologies.

A typical ICEAS process consists of three time-based phases that include aeration, settling and decant, like a typical SBR system. However, with the technology used at MCMA, the influent is received continuously during all phases of the cycle. This allows the ICEAS process to be controlled on a time rather than flow basis and ensures equal loading and flow to all basins.

The ICEAS basin consists of two zones: the pre-react zone, which receives and baffles the influent flow, and the main react/settle/decant zone. The pre-react wall baffles the incoming flow to prevent short-circuiting and also provides pretreatment of the wastewater.

With continuous inflow, a high concentration of soluble BOD (and hence a high F:M ratio) is available to the microorganisms in the pre-react zone, encouraging biosorption, and thus acting as a biological selector for proliferation of desirable organisms.

The main react zone has anoxic mixers, aeration diffusers and a decant device to provide carbonaceous removal of BOD/COD, nitrification/denitrification using aerobic/anoxic nitrogen removal phases, and phosphorus removal with biological uptake/chemical precipitation.

With upgrades planned within the existing treatment plant premises, the construction process involved simultaneous decommissioning of the existing equipment and demolition of the existing process tanks and buildings. It also involved construction of new process tanks and control buildings and installation of new equipment.

In addition to site constraints and the need for a proper process transition, one of the major challenges was to achieve proper wastewater treatment to keep the plant in compliance with its NPDES permit throughout construction and commissioning.

COORDINATION DURING CONSTRUCTION/STARTUP

The construction process and the transition to the new treatment system involved a number of challenges. These included:

Restricted site conditions. Demolition and construction had to proceed simultaneously. The digestion tanks had to be demolished to construct and start up the new treatment plant. This meant operating the old plant using less than the required unit processes during construction. The plant operators used old thickener tanks for sludge thickening, but with no aeration or digestion. The resulting thickened sludge is suitable for landfill without further treatment. The city staff ran the sludge to the press and then to the landfill during the transition period.

Clarifier/UV coordination. The old system used clarifiers and a chlorine contact tank at the downstream end of the process train. Since the old chlorine contact tank had to be demolished during construction of the new treatment process (control building, influent pump station and screening), effluent from old clarifiers had to be conveyed to the new UV system, at higher elevation than the clarifiers. This meant the clarifiers had to be in flooded conditions for the operation of the old plant during construction. Wooden baffles were placed in the flooded clarifiers and were used for about six months without any TSS permit violations.

Biological seed for new SBR system. Since the old digesters had to be demolished during construction, the new SBRs did not have a large volume of seed material for startup. Solids from old contact stabilization and re-aeration tanks provided enough mixed liquor suspended solids for one SBR to start up to permit compliance in 24 hours during the transition from the old process to the new. For the second SBR unit, the city obtained seed sludge from a nearby treatment plant also using an SBR system. There was no charge, as the contractor was hauling dewatered sludge from the old plant to

Figure 1: Mount Carmel WWTP – Variations in WWTP Inflows

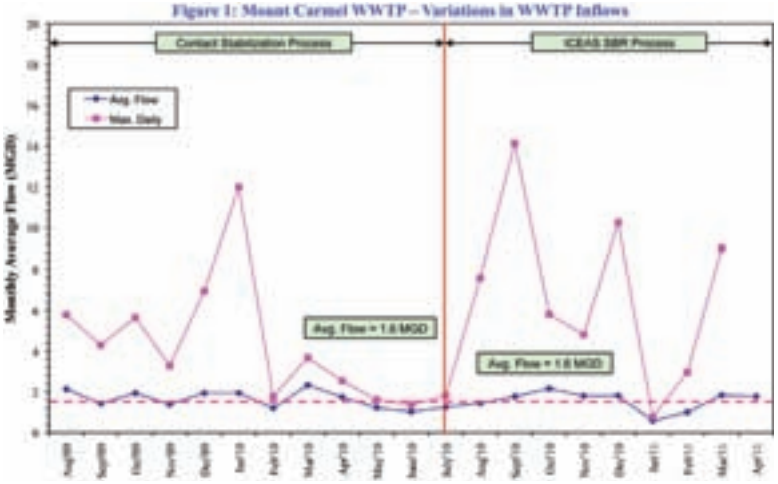


Figure 2: Mount Carmel WWTP – Variations in Effluent BOD Concentrations

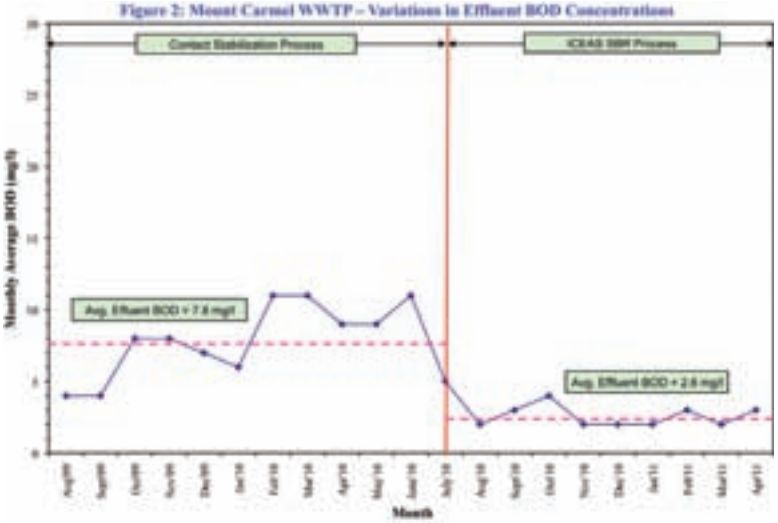
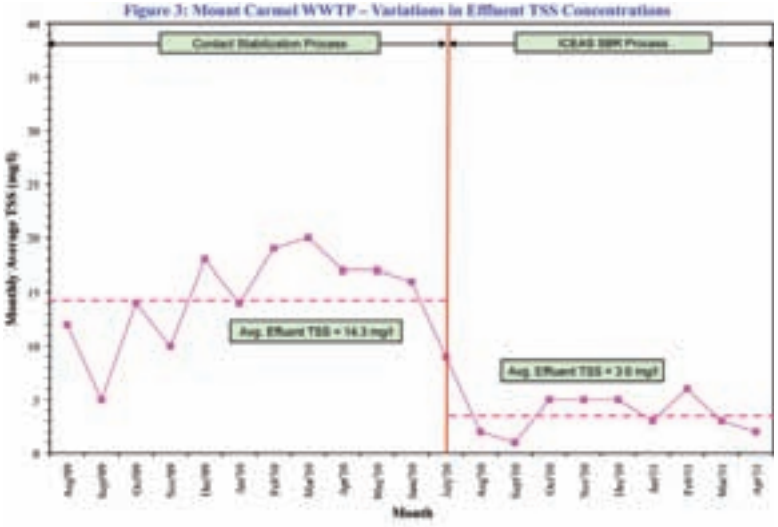


Figure 3: Mount Carmel WWTP – Variations in Effluent TSS Concentrations



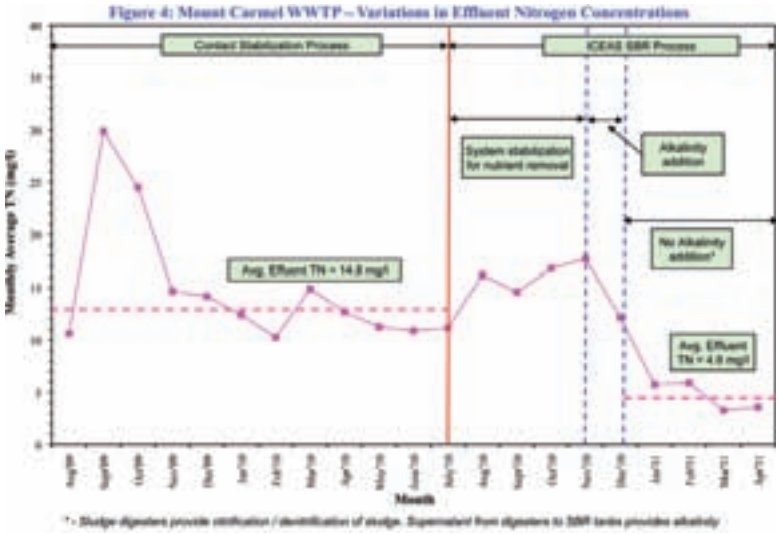
the landfill and simply backhauled the seed sludge from the other plant, which was on the route.

Operator training. The operators had to be trained on the new tertiary treatment equipment, such as the large influent pump station, mechanical screening unit, SBR system, UV unit and aerobic digestion system.

STARTUP AND OPERATION

Brinjac assisted the MCMA with design, construction and startup, and the project was completed in 2010. The new ICEAS SBR wastewater treatment system has been in operation since August 2010.

Figure 4: Mount Carmel WWTP – Variations in Effluent Nitrogen Concentrations



Since the transition period from the existing system to new treatment plant was challenging, the engineers monitored and analyzed the operational data before and during construction and commissioning. The plant Discharge Monitoring Reports (DMRs) were reviewed for analysis. Figures 1-4 show the observed plant inflows (average and peak daily), effluent BOD and effluent TSS from August 2009 to March 2011.

The one-year contact stabilization process performance data was depicted by DMRs from August 2009 to August 2010, whereas the performance of the newly commissioned ICEAS SBR system is depicted by DMR data from September 2010 to March 2011. Since plant operations were kept in permit compliance during upgrades and transition phases, no construction period affected the treatment processes.

Startup and transition to the new ICEAS SBR system was carried out in 24 hours with no interruption of flow and with immediate effluent permit compliance. Since one reason for selection of the ICEAS SBR technology for the new treatment system was to handle higher daily peak flows due to the diversion of flows from CSOs to the wastewater treatment system, peak daily flows were monitored along with the average daily flows.

The NPDES permit for the treatment plant requires effluent quality of 25 mg/l BOD (average monthly), 30 mg/l TSS (average monthly), and 200/100 ml fecal coliform count as geometric mean May to September and 1000/100 ml as geometric mean October to April. As apparent from Figure 1, the frequency and magnitude of daily peaks after upgrades was higher due to the elimination of CSOs in the collection system and diversion of those flows to the treatment plant, indicating higher inflow fluctuations to the treatment system.

However, the BOD and TSS removal data in Figures 2 and 3 indicated a more consistent effluent quality and improvements in BOD and TSS removal compared to the original contact stabilization system.

In addition, DMR data for other effluent parameters including fecal coliform, total nitrogen, total phosphorus, and percent UV transmission indicated that the treatment plant remained in compliance with the NPDES permit after upgrades. Overall, treatment operations during the transition from contact stabilization to ICEAS system were successfully maintained without violating any permit limits, overcoming the challenges during startup operations.

In addition, the new 2.25 mgd ICEAS treatment system provided the desired operational flexibility in terms of peak flows, effluent quality and nutrient capability at the Mount Carmel Wastewater Treatment Plant.

ABOUT THE AUTHOR

Stephen N. Zeller is a project manager with Brinjac Engineering in Harrisburg, Pa.; Tom Gallagher is chief operator of the Mount Carmel (Pa.) Wastewater Treatment Plant; and Archis Ambulkar is an environmental engineer with Brinjac Engineering. Zeller can be reached at szeller@brinjac.com. **tpo**

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By Scottie Dayton

Two-stage digestion upgrade

Problem

A major expansion at the London (Ohio) Wastewater Treatment Plant would raise the design capacity to 5.8 mgd and include a biosolids processing facility to replace conventional digesters. The city wanted a system that improved reliability and ran automatically.

Solution

Design engineer CH2M HILL selected the **two-phase Class A system with ATP/ESD process from CB&I** to handle 34,000 gpd in 10 to 12 batches. The reactor in the anoxic thermophilic process (ATP) acidifies the feed materials and maintains 149 degrees F for one hour to reduce pathogens.

Thickened primary and waste activated sludge are blended, then heated with a hot water to sludge exchanger as well as a heat recovery system that cools the reactor sludge before feeding the 450,000-gallon, mesophilic, egg-shaped digester. The system eliminates heating of the digester which retains the material for 13 days at 98.6 degrees. The process is U.S. EPA-certified, so no testing was required. Class A biosolids were achieved within 45 days of startup.

RESULT

The automated system reduces digester retention time, produces Class A biosolids, and allows unmanned operation on weeknights and weekends. **815/439-4015; www.cbi.com.**

Fabric structures provide protection

Problem

The fiberglass enclosure for a clarifier tank at the Leadville (Colo.) Wastewater Treatment Plant had structural faults. The manufacturer was no longer in business, and other fiberglass structure companies did not make the required enclosure. Officials hired building contractor Duran & Lucero in Leadville to research options.

Solution

The company chose a 75- by 70-foot-long **Hercules truss arch building from Clear-Span Fabric Structures.** The triple-galvanized steel tubing withstands 90 mph winds and snow loads of 90 pounds per square foot. The design, with no internal columns, has ample height for a catwalk across the middle and a door on each end of the building. The noncorrosive, sound-absorbing white fabric cover admits natural light. The fabric's translucent and reflective qualities stabilize indoor temperatures so that the building stays cooler in the summer and warmer in the winter.

RESULT

The facility has a durable structure that withstands the harsh Colorado climate. **866/643-1010; www.clearspan.com.**

Modular fiberglass shelters install easily

Problem

The engineering firm representing the Ashland (Pa.) Wastewater Treatment Plant had to enclose a fluidized-bed bioreactor developed by Envirogen Technologies. The design involved a filtration system with multiple pipes.

Solution

The engineers selected **RM Products to design an insulated structure** tailored to the filtration system. The modular building was taller than the standard 9-foot height. Besides a service door, the front face had a custom entrance with lift door. It and a second larger lift door at the rear enabled workers to access equipment on either end of the building or bring equipment in without dismantling the piping. Intake and exhaust fans, heat and lighting were included.

RESULT

The contractor assembled the unit on site with little assistance from RM's technical team. **800/363-0867; www.rmfiberglass.com.** tpo

Great Strides

By Ted J. Rulseh

Peggy Badten got within 20 feet when photographing this great blue heron, hunting for fish in Moccasin Creek, just below the outfall of the Aberdeen (S.D.) Wastewater Treatment Plant.

"We get many types of wildlife around the treatment plant," says Badten, pretreatment coordinator and chemist at the plant, in northeastern South Dakota. The heron, part of a nesting pair, stopped by last April and "was perfectly content to have his picture taken," Badten recalls. "He was too busy fishing to notice me."

The bald eagle appeared on a very cold morning in late February. "I was checking the plant outfall when I looked south along the creek, and there it was," Badten reports. "Eagles are not rare around here but I'd never seen one this close up. Ever since the eagle showed up I have not been without my camera when I go out to check the outfall." tpo

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SAFETY IS SERIOUS BUSINESS AT THE LEOMINSTER WASTEWATER TREATMENT PLANT, RECIPIENT OF THE WATER ENVIRONMENT FEDERATION'S GEORGE W. BURKE JR. AWARD

By Trude Witham

Project manager Bob Chalifoux makes sure his team members at Leominster take personal responsibility for safety. (Photography by Ed Collier)

"Twenty-five years without a lost-time accident is unusual for a plant this size, since we have many processes and pieces of equipment."

BOB CHALIFOUX

Operator Tim Smith takes measurements using a YSI Pro20 dissolved oxygen meter.

THE CITY OF LEOMINSTER (MASS.) WATER POLLUTION Control Facility has gone 25 years without a lost-time accident, which statistically makes it one of the safest treatment plants in New England.

In 2010, the plant won the Water Environment Federation's George W. Burke Jr. Award, presented by the New England Water Environment Association at WEF's regional conference in February 2011.

The annual award encourages an active and effective safety program in wastewater facilities of all sizes. Applicants are selected based on the effectiveness of formal policies and procedures, written documentation, and integration of safety into the workplace. The award is based on man-hours worked, rather than plant size.

Operated by Veolia Water North America, the 9.3 mgd Leominster plant also won the award in 1998. Other honors include EPA Region 1 O&M Excellence Awards in 1998 and 1999, an O&M Excellence honorable mention from the Massachusetts Water Pollution Control Association in 1989, and an O&M Excellence Award from the Massachusetts Department of Environmental Quality Engineering in 1987. These awards are the result of an excellent safety program and culture at the plant.

"Twenty-five years without a lost-time accident is unusual for a plant this size, since we have many processes and pieces of equipment," says Bob Chalifoux, project manager at the plant.

He says the goals of Veolia's safety program are to provide a workplace free of hazards, to reduce opportunities for accidents, and to improve employees' effectiveness. Facility leaders make sure employees receive proper training and that they get the proper equipment. They also instill a sense of personal responsibility for a safe workplace.

STEPS TO SAFETY

The safety program at the Leominster plant was developed and is maintained by Veolia's Environmental Health, Safety and Security Department. The program is tailored to the plant's work environment and everyday activities.

The written policies and procedures are readily available to the staff and are continually developed, evaluated and updated. The staff receives regular companywide safety updates and safety awareness material, which management reviews with the staff to help them keep policies and procedures fresh in their minds.

Managers also review company Safety Alerts with the staff, covering specific seasonal or current topics such as flu prevention, heat-related illness, slips/trips/falls, overexertion and winter driving.

Plant staff members rotate in leading the monthly meetings, where any safety-related issues or concerns are aired, action items defined, and people assigned responsibilities, with due dates.

Requiring staff members to take part in training as students and teachers helps them retain information and encourages more interaction and participation. Training topics include hazard communications, personal protective equipment, fire protection, lock-out/tag-out, laboratory safety, chemical handling and emergency response. Staff members also get supplemental training on topics like first aid and CPR from company health and safety professionals, universities, vocational schools, professional trade organizations and state agencies.

profile

City of Leominster (Mass.) Water Pollution Control Facility

BUILT:	1936; upgrades 1964, 1983
POPULATION SERVED:	42,000
EMPLOYEES:	12
FLOWS:	9.3 mgd design; 6.0 mgd average; 30.5 mgd peak
TREATMENT LEVEL:	Secondary
TREATMENT PROCESS:	Activated sludge, nitrification, phosphorus removal
RECEIVING WATER:	Nashua River
BIOSOLIDS:	Trucked off site and incinerated
WEBSITE:	www.leominster-ma.gov/dpw_department_water.htm
GPS COORDINATES	Latitude: 42°31'19.72"N; Longitude: 71°44'16.87"W

There is a monthly safety inspection, and everyone is involved in checking items such as emergency lights, eyewash stations, emergency showers, fire extinguishers, first aid kits and emergency alarms.

Operators check the operational safety of treatment equipment on daily rounds. In an annual internal safety audit and a quarterly rotation program, plant managers visit other plants to conduct health, safety and security audits. "If these outside auditors see something that doesn't look right or that should

The Veolia Water Leominster (Mass.) Water Pollution Control Facility crew includes, back row, from left, Rich Conant, maintenance manager; Joe Sangster, maintenance worker; Tim Smith, operator/lab technician; Bob Chalifoux, project manager; Matt McGown, operator; Ray Testagrossa, operator; and Bob Aro, heavy equipment operator; front row, Kate Orcuich, operator; and Ray Pandiscio, operator.

ENCOURAGING SAFETY

A highlight of the Leominster wastewater treatment plant's safety program is teaching awareness and encouraging personal safety, a criterion for WEF's George W. Burke Jr. Award.

This involves active employee participation during monthly safety meetings. Safety topics are set before the meeting, and the topic is presented using videos, hands-on demonstrations, slide presentations and handouts. A competency exam concludes the meeting and ensures that the staff understood the material. Staff members also have time to ask questions and offer suggestions on how to improve the training or plant operations.

For example, an employee suggested a piece of personal protective equipment — an antislipping device that slides over a boot and has metal studs in the bottom for gripping icy surfaces. Management provided that item.

Another staff member learned about In Case of Emergency (ICE) training programs while attending a national training event and suggested the training for the Leominster staff. ICE is a licensed training institute and continuing education provider that conducts a variety of emergency medical training programs and services for emergency service and health care providers, community organizations and businesses.

"Personal safety is the main goal of our program," says Bob Chalifoux, project manager at the plant. "Our policy consists of three simple points: think first, work safely, enjoy a full life."

be addressed, they communicate that to the host facility," says Chalifoux. "Another set of eyes is always good."

STAYING FOCUSED

But safety isn't just about having policies, meetings and periodically checking equipment. It's about making sure every employee has the right training and tools.

"Keeping employees engaged and focused on what they're doing is key," says Chalifoux. "During our safety orientation for new employees, we tell them that if they don't understand something, they shouldn't be afraid to ask. If we don't have the skills for a particular task, we will go and get that skill set. Because of this philosophy, the operators are not afraid to ask. They don't feel intimidated. We're a small group, and everyone wants to go home at the end of the day."

Besides safety training, plant leaders make sure operators are properly trained on equipment, technologies and wastewater principles and practices. Training is through internal and external meetings, seminars and workshops, and state-required continuing education. Detailed standard operating procedures cover tasks such as how to perform a lab test and how to chemically clean a tank.

All operators are certified in wastewater treatment, and most are certified in water treatment, as well.

HIGHLY QUALIFIED

The Leominster plant is in good hands with 12 staff members, some of whom have many years of service. In addition to Chalifoux (project manager, Grade 7) with 28 years of experience, the team includes:

- Mark Champney, instrumentation, Grade 7, 28 years
- Ray Testagrossa, operator, water/wastewater, Grade 7, 26 years
- Richard Conant, maintenance manager, Grade 7, 26 years
- Joe Sangster, maintenance, Grade 3, 23 years
- Kim Fournier, lab manager/administrator, Grade 5, 15 years
- Ray Pandiscio, operator, water/wastewater, Grade 6, 14 years
- Wess Gallant, operator, water/wastewater, Grade 6, five years
- Brian Caron, operator, water/wastewater, Grade 6, two years
- Robert Aro, heavy equipment operator, one year
- Kate Orcuich, water operator, one year
- Tim Smith, operator/lab wastewater, Grade 2, one year

Veolia also operates the water treatment plants for the city and encourages all employees there to be dual-certified. That allows greater flexibility in staffing and provides more training and development opportunities.

The wastewater lab conducts tests for BOD/CBOD, TSS, total solids, ammonia, phosphorus, orthophosphorus, fecal coliform, chlorine residual, dissolved oxygen, pH and alkalinity. The lab also runs several process control tests to determine total pounds in the system, sludge volume index, and mean cell residence time.

The staff does all the grounds work and maintenance, and the plant gives tours for school groups and community members.

The Leominster plant and Veolia Water are installing an Actiflo phosphorus removal system from Veolia that should be online in early 2012.

The crew at the Leominster plant has built custom safety cages over many of the pumps and mechanisms to help ensure operator safety.

"Keeping employees engaged and focused on what they're doing is key. During our safety orientation for new employees, we tell them that if they don't understand something, they shouldn't be afraid to ask."

BOB CHALIFOUX

PLANT HISTORY

The first wastewater treatment plant in Leominster was built in 1936 as a primary clarification/activated sludge facility. It was expanded in 1964 with the same basic process. Rapid development during the 1960s and early 1970s required another expansion. In addition, the state imposed tougher standards for solids, organics, nitrogen and phosphorus removal.

In 1977, the city hired an engineering firm to design an advanced wastewater treatment facility with more capacity to meet the tougher standards. The design was completed in 1979, and construction of the 9.3 mgd, $20 million advanced secondary activated sludge plant began in 1980.

In July 1983, the city entered a public-private partnership with Envirotech Operating Services (EOS), now Veolia. One of the oldest public-private partnerships in the nation for wastewater treatment,

Operator/lab technician Tim Smith works on a monthly water test.

Leominster Wastewater Treatment Plant PERMIT AND PERFORMANCE

	PERMIT	EFFLUENT
BOD	15 mg/l	2.3 mg/l
TSS	20 mg/l	3.6 mg/l
Ammonia	1.3 mg/l	0.35 mg/l
Phosphate	1.0 mg/l	0.47 mg/l
Dissolved oxygen	6.0 mg/l	9.8 mg/l
Fecal coliform	200 cfu/100 ml	3 cfu/100 ml
Total residual chlorine	0.026 mg/l	0.01 mg/l

the agreement gave Veolia responsibility for operating and maintaining the plant.

In October 1983, the new plant began operation, and Veolia decommissioned the old plant in November 1983. To reduce costs, some of the old facilities, such as the administration building and sludge storage tanks, were renovated for the new processes.

In the new plant, wastewater enters through two sewer systems that discharge to an aerated grit chamber. It then flows to primary settling tanks, aeration tanks, lime and ferric chloride addition, final settling tanks, chlorine contact chamber and final aeration.

Key equipment suppliers were Foxboro (Invensys Operations Management), Pulsafeeder, Wallace & Tiernan (Siemens), Komline-Sanderson, Worthington Pumps (Flowserve), Philadelphia Mixing Solutions, Spencer Turbine Blowers, Fischer & Porter (ABB), and Passavant (Siemens).

THE ROAD AHEAD

Several plant upgrades are in progress, including the addition of a high-rate clarifier for phosphorus removal (the Actiflo system from Veolia) to meet the permit requirement for a monthly average of less than 0.20 mg/l phosphorus by November 2011. Other improvements include new chemical feed systems, an emergency generator that will power the entire facility in case of power failure, and improvements to the high-voltage electrical system. These improvements are to be complete by early 2012.

Veolia will continue to operate the plant under its 20-year contract, renewed in 1996. Meeting permit requirements, completing the upgrade, and continuing the safety program are the main goals.

"It was a high honor to win the safety award from the New England region," says Chalifoux. "It's also nice to receive local recognition, and the mayor of Leominster, Dean Mazzarella, has commended us for a job well done."

Chalifoux is not about to rest on his laurels. "My entire career has been in wastewater, and I know that you have to be constantly on top of things," he says. "You can have all the safety and training procedures in the world, but it comes down to one thing: you need the right people doing the right job, and we have that." tpo

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(See ad page 36)

The reactor basin at Eden's wastewater treatment plant is 14 feet deep. Brush aerators ran constantly to try and mix it all, but they could only mix and aerate the top half. The results were a high, wasteful level of dissolved oxygen at the top of the basin, and a mass of sludge at the bottom that wasn't impacted by the treatment process. Superintendent Melinda Ward sought a "green" solution for these problems, and she found exactly what she needed in SolarBee® mixers.

In 2009 Ms. Ward installed Eden's first SolarBee SB10000 unit, and big improvements were immediate. "We could actually see the solids moving," she said. "It's amazing how the SolarBee brings them to the top of the basin!" The SolarBee provided improved mixing of the entire basin for better oxygen utilization, and the ability to maintain high suspended solids throughout the basin while reducing the aeration run time to the minimum needed for a healthy DO. An unexpected but welcome benefit was better sludge settling at the clarifier, leading to reduced effluent BOD and TSS.

Superintendent Ward was so impressed, she ordered two more SolarBees to achieve even better results and more energy savings. These solar-powered units work 24/7 virtually for free. And now, because the costly aerators are operated less, the facility's electric bill has been cut nearly in half!

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All the Right Moves

STUDENTS IN A WASHINGTON COMMUNITY LEARN ABOUT THE TREATMENT PROCESS STEP BY STEP TO THE "SEWAGE SHIMMY"

By Pete Litterski

When Emily Johnson is out and about, she knows she is succeeding on the job when a local student walks up and starts writhing in odd ways, often while making strange noises.

Parents and people walking by might wonder what the kids are up to, but Johnson recognizes one of the steps from the Sewage Shimmy — a teaching tool she created as part of the curriculum for the City of Bellingham's "Water and Me" program.

Johnson, an environmental educator with the Bellingham Public Works Department in northwestern Washington, says the program is presented to about 1,000 fifth graders per year — more than 30 classes from all Bellingham public schools and several private schools.

Between the Sewage Shimmy and a rubber duck that takes a video journey through the water cycle, the program has tools that help students retain what they learn about everything from the source of their drinking water to the importance of releasing clean effluent into Bellingham Bay.

BUILDING THEIR OWN

Before taking a field trip to the Post Point Wastewater Treatment Plant, students hear a one-hour presentation from Johnson or a colleague on Bellingham's water treatment, wastewater treatment and stormwater systems. The talk takes a broad view on the processes, the water cycle and watersheds, "So the kids can see how this all relates," says Johnson.

Students take a field trip around the Bellingham treatment plant.

Students use kits with colored felt and straws so they can build their own models of Bellingham's water and stormwater systems. The educators leave behind two videos for the teachers to show to their students before their field trip.

"Go With the Flow" follows the path of a rubber duck from a freshwater intake pipe to the city's water treatment plant and then through water mains into a home. From the home, the duck travels down a drain, into the sewer system, to the treatment plant, and through the treatment steps. In the end, the students see the duck floating in Bellingham Bay. "They're really fascinated by the rubber duck," Johnson says.

PHOTOS COURTESY OF CITY OF BELLINGHAM

In a drinking water treatment exercise, students get a cup with water containing grit to represent raw water. They pour it through a screen to remove the debris, then treat it with alum and pour it through a sand filter before adding a powder to represent chlorine.

During the treatment plant tour, the students learn that the plant is very computer-oriented: Operators oversee the system via SCADA. "The operators are the brains," plant operations manager Larry Bateman tells the kids. "The computers are the eyes."

One stop students find most interesting is at the facility's incinerator. An operator opens the fire pit door so the kids can "ooh and aah" over the roaring flames. "Not a lot of people get to see burning poop in their lives," Bateman says.

THE REAL THING

When the students arrive at the water plant, Johnson and colleagues offer some hands-on instruction. The students get a cup with water and grit in it to represent raw water. They pour it through a screen

What's Your Story?

***TPO* welcomes news** about your public education and community outreach efforts for future articles in the Hearts and Minds column. Send your ideas to editor@tpomag.com or call 877/953-3301.

Environmental educator Emily Johnson teaches students the Sewage Shimmy.

DOING THE SEWAGE SHIMMY

Here are the steps of the Sewage Shimmy, a dance Emily Johnson teaches to fifth graders in the City of Bellingham's "Water and Me" education program.

1. Bar Screen: Scoop out the big stuff. Squat down, make your fingers like a comb, reach down and pretend to lift big stuff up and throw it over your shoulders. Grunt like you're trying to lift a refrigerator.

2. Grit Removal: Let the heavy pieces fall to the bottom. Plug your nose with your hand (it's stinky in there), lift the other arm, and wiggle your fingers as you slowly shimmy down to a squat. Start with your voice high and let it fall down low, like a cartoon character falling out of the sky.

3. Primary Clarifier: Scrape the scum and sludge off. Stick one arm out and turn slowly around in a circle. Make a noise like a squeegee cleaning a window.

4. Aeration Basin: Add oxygen and let the bacteria feast. Run around the person next to you with your fingers at your mouth, pretending to eat like Cookie Monster. Make munching noises.

5. Secondary Clarifier: Scrape scum and sludge off again. (Same as step 3.)

6. Chlorine Contact: Zigzag through the chlorine maze. Walk back and forth three times, then dive with your arms. Say "Splash!"

7. Effluent Pipe: Shoot out into the bay nice and clean. Swim around with your arms, pretending you're under water. Hold a bubble in your mouth and puff out your cheeks.

to remove the debris, then treat the water with alum and pour it through a sand filter before adding a powder representing chlorine.

At that point, Johnson demonstrates pH test strips. "They get a lot of science lessons in a short time, and the teachers really like it because it matches well with the fifth grade curriculum," Johnson says.

After the water treatment activity, the students open journals they've been given and are asked to circle all the ways they use water. Then they talk about what happens after water goes down the drain. That's when Johnson brings out sealed jars that mimic what wastewater looks like at different treatment stages.

One jar contains a pick comb to rake out larger solids, and the next has a screen to filter out grit. Jars show how sludge and scum scrapers work, and one jar filled with soda and currants shows how microorganisms consume waste materials and form clumps that drop to the bottom.

As the class wraps up, "We talk about things that we can't really show," says Johnson. "We talk about caffeine and other things like medicines that we can't take out of the water. We talk about what happens when communities are located on a river and have to use water that includes someone else's effluent."

ON TOUR

After the demonstrations, at the wastewater treatment plant tour, the shimmying starts. Johnson invented the Sewage Shimmy, a series of dance moves to help students remember the entire treatment operation.

"We teach the kids a dance move for each stage of the treatment process," Johnson says. "Sometimes we'll have a dance-off at the end." One of the last stops is the lab. There, the staff projects a microscopic image of a sample of activated sludge from the secondary clarifier.

"They have worksheets in their journals, and they get protozoa to look for on the screen as we look at the life cycle of organisms in the wastewater treatment process," Johnson says.

Johnson gets many thank-you notes from students after they return to school. "Often they are addressed to the operator at the incinerator," she says. "They love that, with the fire and noise." **tpo**

LARGE-SCALE DISINFECTION

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It's Not Black Magic

OXIDATION REDUCTION POTENTIAL (ORP) CAN BE A VALUABLE TOOL FOR SEEING WHAT IS HAPPENING IN UNIT PROCESSES LIKE ANOXIC AND ANAEROBIC TANKS

By Ron Trygar, CET

During my 28 years in wastewater treatment, I've worked at treatment plants in positions from utility worker to operations manager. One of my best jobs was with a Rural Water Association as a wastewater circuit rider. During that time, I met a fellow named Charlie who was having problems with a new sequencing batch reactor (SBR) treatment plant.

A circuit rider helps out-of-compliance plants get back into compliance. Charlie was having a tough time meeting the state and federal standards for nutrients discharged to a local creek. The facility was a two-tank SBR designed to meet advanced standards of 5-5-3-1 mg/l annual averages (CBOD-TSS-total nitrogen-total phosphorus). The plant couldn't consistently meet the less than 3 mg/l total nitrogen and/or the less than 1 mg/l total phosphorus values.

A sequencing batch reactor treats wastewater as a batch process, and each tank operates independently. While a batch of wastewater is treated, a programmable logic controller (PLC) regulates the various valves, motors, mixers, blowers and pumps. The timing of these devices is critical, especially when trying to meet strict effluent standards.

FLOWS RUNNING LOW

Charlie's plant was designed to treat 1.1 mgd, but due to water conservation and reduction of I&I, and because of over-design, the plant was well below capacity in its early years. The influent flow and BOD loadings remained well below design parameters, until a state prison opened years later and began sending its wastewater to the plant. This low flow and loading caused compliance problems.

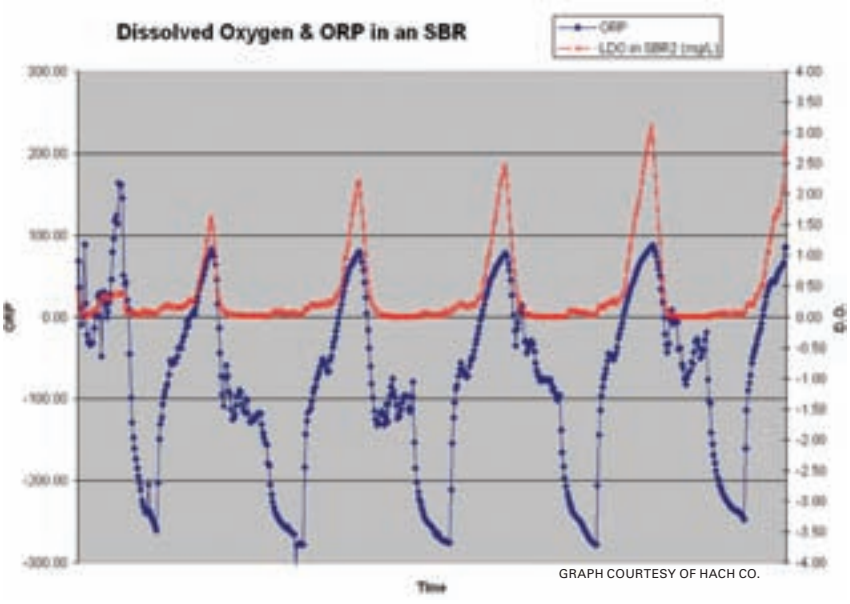
PHOTO BY RON TRYGAR

A small ORP meter shows a negative mV reading in an anoxic basin.

Charlie had been trained by the manufacturer representatives to use dissolved oxygen as the main process control tool and to always maintain a 0.2 mg/l or less DO reading when the tanks were in the anaerobic or anoxic phases. He was not familiar with using oxidation reduction potential (ORP) as a process control tool.

I loaned him a portable ORP meter and described how he could use it to determine if the cycles of the SBR batch were anaerobic, anoxic or aerobic. These respiratory environments are necessary for bacteria to perform certain nutrient removal activities.

Charlie's facility was experiencing two issues. First, the plant was able to nitrify the influent ammonium, but could not completely denitrify, causing the excursions in total N. Second, total effluent phosphorus was high, and the facility did not appear to be removing much phosphorus at all.



GRAPH COURTESY OF HACH CO.

DO and ORP readings in an SBR process. ORP is useful in tracking aerobic, anoxic and anaerobic environments.

TWO-PART REACTION

The biological removal of nitrogen is a two-part reaction called nitrification and denitrification. Nitrification takes place under aerated conditions, where nitrifying bacteria known as *nitrosomonas* convert the influent ammonium to nitrite, and then another group of nitrifying bacteria known as *nitrobacter* convert the nitrite to nitrate. These bacteria require free oxygen, as well as alkalinity, correct pH, temperature and time.

To finally remove the nitrogen, we allow facultative bacteria to consume organic matter (raw wastewater) under anoxic (no free

What's Your Lab Story?

The Lab Detective feature in *TPO* will help operators learn analytical techniques that help diagnose and solve treatment problems. Are you struggling with a process issue?

Send a note to editor@tpomag.com. Your question may become the topic of a future column.

dissolved oxygen) conditions. Facultative bacteria can use free dissolved oxygen, nitrate, sulfate and carbon dioxide as a sort of oxygen source. They prefer free DO, since it's not combined with anything like nitrate or sulfate.

If free DO is not available, they break apart the chemical bond holding the nitrogen and oxygen together in a nitrate molecule (NO_3) and utilize the oxygen, freeing the nitrogen to become nitrogen gas. This process of reducing the nitrate to nitrogen gas is called denitrification.

Charlie's treatment plant was having problems denitrifying. The original SBR cycle times set by the process engineers were too short for the anoxic phase to become truly anoxic — the blowers would come on before denitrification could take place.

Using the ORP meter, Charlie monitored the anoxic time cycle. He kept the aeration blower off until the ORP meter read -50 mV, then allowed the aeration blower to come on. In the original setting, the blower would have come on after just 15 minutes of off time, and the DO meter showed 0.2 or less mg/l. Charlie found that the blower needed to remain off for an additional 45 minutes to get into the anoxic environment. He made adjustments to the PLC's time settings based on these findings, and then set his sights on the total phosphorus issues.

ATTACKING PHOSPHORUS

For phosphate-accumulating organisms (PAOs) to release the maximum polyphosphate during the anaerobic (fermentation) phase, there must be zero dissolved oxygen and no nitrate available to these obligate aerobic bacteria. The bacteria utilize the incoming BOD containing volatile fatty acids as a food source.

To absorb this material into their cells, they break apart an internal polyphosphate bond, providing energy to consume the fatty acids. In this cycle, or zone of treatment, a dissolved oxygen meter should read zero, whereas an ORP meter would read in the -150 to -250 mV range. In Charlie's SBR tank during the mixed fill cycle, it took another 60 minutes over the allotted one hour for the ORP to reach this negative mV reading.

Once the ORP reached the target reading, the reactor was allowed to enter the react fill stage and the aeration blower came on to provide dissolved oxygen. In this aerated environment, 1.0 to 2.0 mg/l of DO is maintained, and the oxygen allows the PAOs to burn up the stored food they collected in the anaerobic zone.

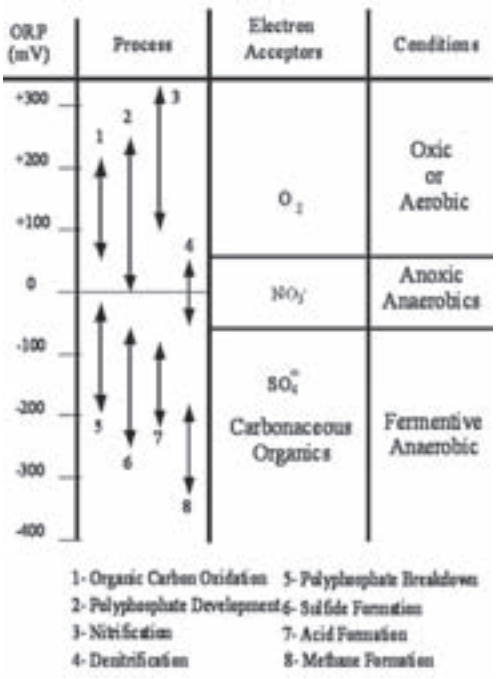
They use the energy gained to maintain their cells and to reproduce. During cell maintenance, the PAOs reabsorb the polyphosphate they released earlier and even absorb more phosphorus than they started with. This extra phosphorus comes in with the influent wastewater as orthophosphate, (PO_4^{-3}), and we call this biological process "luxury uptake." It can allow a facility to reach very low effluent total phosphorus. The phosphorus is now contained within the bacterial cells and is removed by wasting the solids out of the treatment flow scheme.

THE WHOLE PICTURE

This example shows that while DO is a valuable process control tool, it has limits when used in an anoxic or anaerobic basin or in SBR phases. Once the proper environmental conditions were provided to the bacteria, the nutrient removal processes worked well, and Charlie soon met all the effluent limits. In fact, he noticed that the whole plant seemed to work much better — the floc changed characteristics, settling improved, effluent turbidity decreased, and BOD and TSS were well below permitted limits. Charlie later said, "ORP was a lifesaver."

Some operators and engineers continue to look upon ORP as black magic, but it gives operators another method to see the whole picture of what is happening in unit processes like anoxic and anaerobic tanks, and collection systems as well. But ORP is like any other process control tool — it must be used correctly.

When the liquid environment contains more oxidizing agents than reducing agents, the ORP shows a high (positive) value. When there are more reducers than oxidizers, ORP reads in the negative



ORP and metabolic processes. (Goronszy, et al, 1992)

ORP does not read DO or measure the amount of oxygen. It just tells us if the conditions are favorable for certain biological activities.

range. ORP does not read DO or measure the amount of oxygen. It just tells us if the conditions are favorable for certain biological activities.

DIFFERENT RANGES

For example, raw wastewater contains much ammonia nitrogen and little DO. The ORP normally reads in the negative range (-50 to -150 mV). The more septic in the wastewater, the lower the ORP reading. If you read the ORP in a chlorine contact tank, you see the opposite: ORP climbs very high due to the amount of an oxidizer like chlorine. The ORP reading might be as high as +400 to +700 mV.

In aeration tanks, we see ORP values around +50 to +200, and if nitrate is also present, the ORP might go up to +300 mV. When trying to denitrify in an anoxic tank or zone we like to see ORP from +50 to -100 mV (see accompanying graph). There are various types of ORP probes, some using platinum and others silver. Know what type of probe you have and maintain it accordingly.

If you have a biological nutrient removal (BNR) process, learn more about ORP and its capabilities. Dr. James Barnard, the leading authority on BNR, stated the importance of ORP in a recent WEF webinar on phosphorus removal: "Operators should consider using ORP for control of anoxic conditions."

If you'd like to learn more about using ORP or need more information on nitrogen control in wastewater treatment plants, contact me at the email address below.

ABOUT THE AUTHOR

Ron Trygar is senior training specialist in water and wastewater at the University of Florida TREEO Center and a certified environmental trainer (CET). He can be reached at rtrygar@treeo.ufl.edu.

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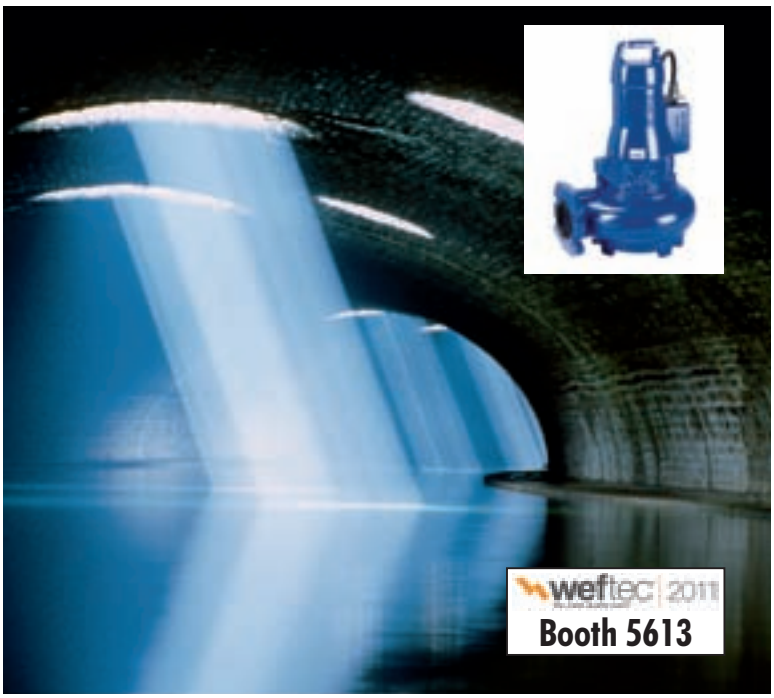
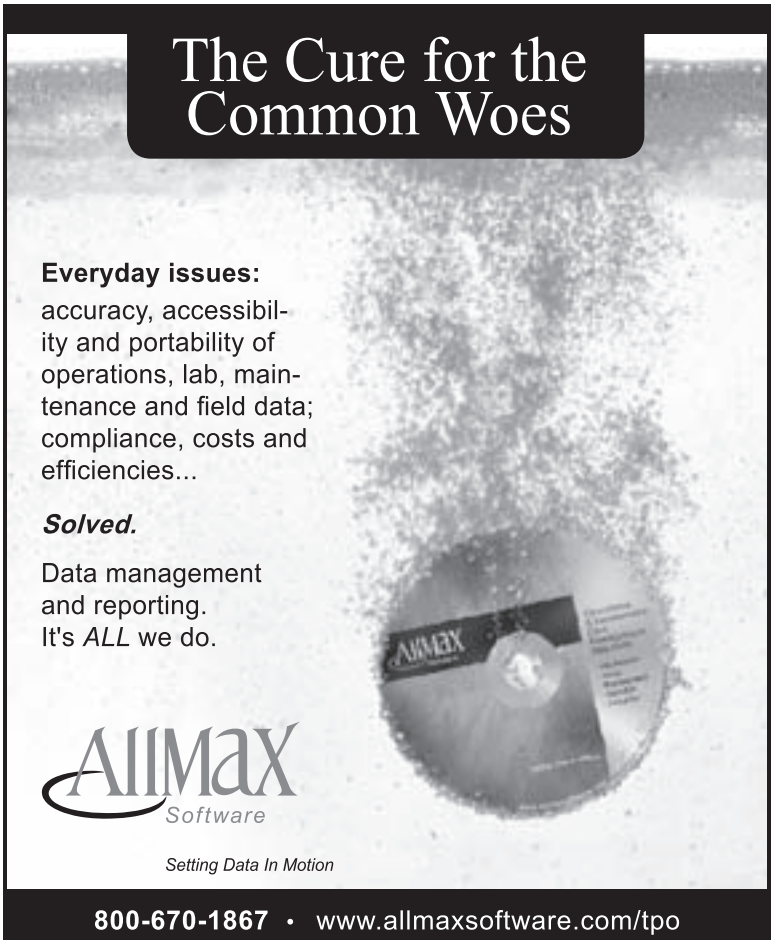




Running Lean

PROVEN TECHNIQUES BORROWED FROM THE MANUFACTURING SECTOR CAN HELP WASTEWATER OPERATIONS IMPROVE QUALITY AND EFFICIENCY

By Ted J. Rulseh

The expression "running lean" can have negative connotations — of operating on a starvation budget, overworking staff, cutting corners on maintenance. But there's another definition of "lean" that connotes no such thing.

Generally written as "Lean" (capital L), this concept holds that processes can run better and give staff more satisfaction if wasteful activities are found and eliminated. The goal of Lean is that every step and every action in a process adds value, so that no time, material and talent are wasted and the desired result is achieved with the optimum quality at the lowest cost.

There is no reason why Lean techniques used in sectors from manufacturing to health care to hospitality can't improve wastewater operations, says Charles (Chuck) Scholpp, director of Hach Integrated Information Management Business Development.

Scholpp, a senior leader with more than 10 years of experience managing professional teams, has been with Hach Company since 2003. His role includes developing integrated software, hardware and services to help water and wastewater utilities optimize their operations.

Before joining Hach, he was a process engineer and Six Sigma leader for an engineered composite materials company. He holds an MBA degree from Kellogg School of Management, a master's degree in engineering management from the McCormick School of Engineering at Northwestern University, and a bachelor's degree in management engineering from Worcester Polytechnic Institute.

Scholpp spoke with *Treatment Plant Operator* about opportunities to apply Lean concepts in the wastewater treatment sector.

Charles (Chuck) Scholpp

"Lean is basically a methodology for looking at a value stream in a wastewater operation and removing activities that do not add value."

CHUCK SCHOLPP

tpo: In simple terms, what is the meaning of Lean in the context of improving wastewater treatment processes?

Scholpp: Lean is basically a methodology for looking at a value stream in a wastewater operation and removing activities that do not add value. Those are things that if you were a paying consumer you would not want to pay money for — essentially things that are not necessary to the process of physically cleaning water.

tpo: What do you mean when you say "value stream"?

Scholpp: The value stream is the set of activities done within a given process. It's the steps taken to complete a task or to transform inputs into outputs. A value stream can be general or very specific. You could have a value stream across the entire organization from where wastewater enters the facility to where clean water exits. Or you might have a value stream specifically around aeration control.

tpo: Where does the concept of Lean come from?

Scholpp: Lean began in the Toyota production system in the 1980s. In the 1990s, the term Lean manufacturing was coined, and the concept has evolved since.

tpo: How prevalent is Lean in the wastewater sector today?

Scholpp: We don't see it often, though I have talked to people in the industry who are familiar with the term. Today, we see a lot of siloed thinking where operations does its thing and the lab does its thing. As for systemic thinking on how to drive waste out of whole processes, we don't see a lot of that.

tpo: Why is it important in these times for wastewater managers and operators to explore a concept like Lean?

Scholpp: Budget challenges with lower tax revenue and federal and state budget deficits are making the dollars available for wastewater scarce. So it is more of a necessity to know where to invest those dollars in the most impactful way. That's something Lean can help with because you're taking out waste and learning how to use the savings to drive whatever improvements you're looking for. Another core Lean concept is building quality into the process. For wastewater managers, ensuring safe water is a priority, and Lean helps make sure a consistent quality is delivered.

On the regulations side, we continue to have permit parameter limits (or MCLs — maximum contaminant limits) getting tighter. Furthermore, a recent announcement from the EPA said there is a drive to go to all-electronic reporting. That will happen over the next year or so. And so the methodology for the way forms are filled out is changing as well.

tpo: Do Lean concepts help address the issues of retaining institutional memory as workers leave or retire?

Scholpp: Potentially yes. Lean concepts and technologies apply for workers of any age. The benefit of Lean is that processes get documented, analyzed, and standardized, thereby putting knowledge to paper and leveraging teams to solve problems, rather than relying so much on individual contributions.

With the change in the workforce, you can't afford to have your institutional knowledge in one or two key people. There's still a lot of value in what people have inside their heads. It's simply much better also to leverage technology and leverage data so that institutional

knowledge stays with the organization when senior people leave the organization.

tpo: What are some areas where you typically see waste in wastewater?

Scholpp: We see waste between laboratory and process operations — we often see tension between those two groups, where the instrument lab is primarily focused on driving regulatory parameters and the process lab is there to drive process control. We often see a breakdown in consensus on which data is correct.

Beyond that, energy is a key area of focus for wastewater today. Chemical consumption would be a close second. Third would be the regulatory arena. Some plants are operating right at the edge of their regulatory limits, and so the operators are stressed, worrying about whether they will have a spike that results in a violation.

The beauty of Lean is that it doesn't matter what your operation is or what your unique problems are. Everyone has problems, and Lean provides a set of tools to identify what they are and improve the process.

tpo: What do some of those Lean tools look like?

Scholpp: An important one is value stream mapping, where you look at a process you're trying to improve and bring a team together to map out exactly what steps are followed throughout that process. It's really important for that team to be cross-functional because there are multiple inputs to any process. When you assemble a cross-functional team and start creating process maps and discussing the process, that's where the real learning takes place. That is the time when the real wastes start to come into focus.

tpo: Can you describe the Lean technique known as the kaizen?

Scholpp: "Kaizen" is a Japanese word that means "improvement," or "change for the better." Many companies, such as Hach, regularly hold kaizen bursts. A kaizen burst is typically a weeklong process improvement event. You would typically assemble a team on a Monday morning. The members come prepared with a definition of the problem to be solved and the objectives they want to achieve, and some quantitative metrics around the issues.

There is usually a little training about Lean tools, including process mapping. There's also training around what we call the eight wastes: Motion, inventory, waiting, quality defects, overprocessing, transportation, overproduction and unused creativity.

The group goes through a current-state process map to identify and quantify the wastes, then draws a process map of the future state — how they would like the process to look. By the third and fourth day they're actually executing the new process. The last day is devoted to putting together action plans for anything that was not completed and developing a report-out that includes key performance indicators, who is responsible for each item, and how progress will be monitored over time.

tpo: What happens after the kaizen is complete? How can a team make sure the improvements last?

Scholpp: You can bring people together, do your value stream mapping, and create some great solutions, but if you take your eye off the ball, if you stop monitoring that process, things will go back to the way they were. To drive continuous improvement, you need metrics, you need goals, and you need a management team that cares enough to continue to follow up.

> "A Lean culture is one that really wants to drive continuous improvement, where there is a willingness to work together and use data to drive decision making, as opposed to opinions, or 'the way we've always done it.'"
>
> **CHUCK SCHOLPP**

"Putting a Lean culture into place can fundamentally change the way you operate your plant. It can produce breakthrough improvements because you approach problems in a completely different way."
CHUCK SCHOLPP

tpo: So Lean becomes more than isolated projects — it's a long-term way of doing business?

Scholpp: Yes. What you need to do is create a Lean culture, and in my opinion it has to start at the top. A Lean culture is one that really wants to drive continuous improvement, where there is a willingness to work together and use data to drive decision-making, as opposed to opinions, or "the way we've always done it."

tpo: What kinds of data are used to drive decision-making?

Scholpp: You need data around the process steps. Not only do you have to map out the steps, but you have to quantify what happens. You can look at cycle time — how long does a given task take? How many people are involved? How much material is used? What are the costs? What is the quality? As you drive data around each process step, you further identify where there is waste, and how much waste, and what level of savings is possible, so that when you look at the process, you can focus on the critical few parameters.

tpo: Do you find that people resist the kind of change that Lean implies?

Scholpp: That is often the case initially. There's a high level of risk aversion in some organizations. To do something different from the way you did it yesterday always involves risk. It also involves change, and it doesn't matter what industry you're in, change is difficult and often scary for people. It's important to have a champion who drives the Lean culture and can help create a safe environment where people feel comfortable challenging the status quo. You're not going to make improvements by doing things the way you've always done them.

That said, risks must be carefully considered. Lean thinkers regularly ask, "How can we mitigate risk?" A risk assessment should be conducted for each change that is planned and actions taken to mitigate any identified risks. Collaborative decision-making in place of authority-based management also helps mitigate risk.

tpo: What role does technology have in advancing Lean methods?

Scholpp: One of the most prolific areas of non-value-added work we see in treatment plants is manual, paper-based data entry. That's an easy and relatively inexpensive thing to eliminate with appropriate technology.

We see people checking boxes, putting things down on log sheets, transferring data to spreadsheets and to regulatory reports. They're doing it because that's the way they've always done it, or they believe that's the way the regulations say they have to do it. In reality, most data gathering can happen automatically. And then those same people can focus on what the data is telling them.

Too often, we hear people say, "We don't have enough time, we don't have enough manpower, we can't improve this or that because we're too busy." The question is: What are you busy doing? If you're busy collecting and checking data, you can solve that problem so you can have the time to do more value-added work.

Find Out More

One good resource for learning about Lean methods is the **Lean Enterprise Institute (www.lean.org).** This nonprofit organization has a mission to advance Lean principles in all economic sectors. It provides a wide range of educational programs, publications, and other information.

tpo: Conceptually, how does that work?

Scholpp: The idea is that instead of having manual, siloed systems, you have an over-arching system that you can enter data into and that pulls automatically from lab or process instruments or your existing SCADA system. You pull all the data feeds together, and then you can automatically spit out a report or do your data mining from that one centralized system.

tpo: How would you summarize the benefits of Lean and a Lean culture?

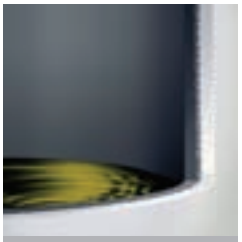
Scholpp: Putting a Lean culture into place can fundamentally change the way you operate. It can produce breakthrough improvements because you approach problems in a completely different way. You can develop a changed perspective on the limitations and constraints you're facing.

Lean allows you to do more with less. There isn't a treatment plant out there that is not busy. The question is: How do we help people work smarter, not harder? Lean is a fundamental way to enable many things — purchasing a new technology, avoiding a plant upgrade, or keeping rates low for your user base. All these things can come out of Lean. **tpo**

Tanks, Structures and Components

By Pete Litterski

ANTIOXIDANT PROTECTION



OR-1000 system from Poly Processing

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CLARIFIER PARTS

Rectangular clarifier parts from Fairfield Service Company

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Dewatering containers from Wastequip

DEWATERING CONTAINERS

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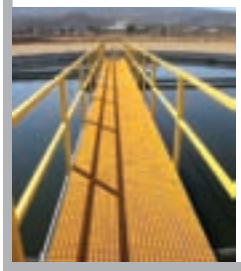
Collapsible storage tanks from MPC Containment temporarily store wastewater. Tanks are also offered in special materials for chemical or fuel storage. Standard or custom sizes range from 250 to 210,000 gallons. Rounded corners redistribute shell stress uniformly. The curvature creates tangential stress, reducing leaks. **800/621-0146; www.mpccontainment.com.**



Composite molded gratings from Fibergrate

COMPOSITE MOLDED GRATING

Composite molded gratings from Fibergrate are offered with a meniscus or applied grit surface to provide slip resistance for walkways and stairs. The gratings will not rust or rot and resist corrosive water, acids, alkalis and other chemicals. **800/527-4043; www.fibergrate.com.**

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Exelys continuous thermal hydrolysis process developed by Kruger USA

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tion-lysis-digestion process, it optimizes energy production. The system allows for higher solids loading, effectively increasing the digester capacity by up to 50 percent. **919/677-8310; www.krugerusa.com.**

Storage containment systems from Tank Connection

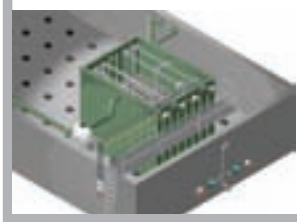
TAPERED PANEL TANKS

Tank Connection supplies storage containment systems including rolled, tapered panel (RTP) tanks for wastewater applications. The company website (www.liquid-tanks.com) lets users determine specifications. Users can select and specify a tank in less than five minutes. Reference designs for RTP, bolted construction, shop-weld and field-weld construction are available. **620/423-3010; www.tankconnection.com.**

BOLTED STAINLESS TANKS

The bolted stainless steel tanks from American Structures offer a lasting expandable storage solution. Stainless steel with specially designed hardware adds durability and cuts maintenance. The recyclable tanks use sheet materials factory-formed to the tank curvature after the bolt holes have been punched and all factory-installed openings have been cut. Engineering calculations are provided with the drawings if required. Tanks in capacities to five million gallons come with accessories such as manways, roof vents, nozzles, roofs, ladders and cages, platforms, exterior web trusses, piping, level indicators, heaters and agitation systems. Roofs can be stainless, aluminum or fiber-reinforced plastic. **715/235-4225; www.ameristruc.com.**

Stainless steel tanks from American Structures



Titan Mem-Box from Smith & Loveless

RETROFIT MEMBRANE

The Titan Mem-Box from Smith & Loveless provides a retrofit membrane system for aeration basins and packaged systems to double plant capacity while reducing operating costs. It improves effluent quality, providing potential for reuse, and complete nitrification is possible. The unit has a compact design to fit existing plants. It inserts into an existing aeration basin. A clean-in-place method reduces operating costs and requires less chemicals and operator time. **913/888-5201; www.smithandloveless.com.**

PERIPHERAL DRIVE CLARIFIERS

Peripheral drive clarifiers from Schreiber use leverage to rotate the scraper and skimming assembly. The center bearing design uses precision chrome-alloy steel balls and hemispherically faced spacers. The heavy-duty bearing assembly is rated with a B-10 life of more than 100,000 hours. All equipment for the continuous removal of floatables and settled solids is suspended from a rotating bridge or lightweight rotating beam arm.

The skimming equipment allows continuous removal of floatables regardless of wind direction. Helical scraper assemblies are curved so as to transport the solids into the central hopper in one revolution. The scraper design does not require grouting of the tank bottom. **205/655-7466; www.schreiberwater.com.**

Peripheral drive clarifiers from Schreiber

GAS HOLDER COVERS

Ultrastore membrane gas holder covers from Ovivo are PVC-coated fabric membrane digester covers designed for plants that use biogas for energy. Features include high storage capacities, easy installation, UV protection, snow and wind resistance, and capacities to 175,000 cubic feet. The covers maintain a pressurized storage volume, ensuring that gas is ready to use as fuel. **801/931-3000; www.ovivowater.com.**

Ultrastore membrane gas holder covers from Ovivo

AUTOMATED WEIR CLEANING

The WeirWasher automated cleaning system from GillTrading.com can submerge, resurface, and telescope to reach all tank areas and control algae growth on weirs and effluent launders in a circular secondary clarifier. The spray apparatus passes under radial tank components and resurfaces to continue cleaning. Additional telescoping motion allows the system to access the trough. The device controls algae growth in the effluent launder with the ducking surface scum skimmer radial trough design. **866/447-2496; www.weirwasher.com.**

Spiraflo clarifier from Lakeside Equipment

PERIPHERAL-FEED CLARIFIERS

The Spiraflo clarifier from Lakeside Equipment has a peripheral-feed design that creates an optimal hydraulic flow pattern. The unit produces high-quality effluent, improves solids collection and removal, promotes full utilization of tank volume, eliminates short-circuiting, handles peak flows effectively, and retains suspended solids in the sludge blanket. **630/837-5640; www.lakeside-equipment.com.**

REDUCE SLUDGE HANDLING

Bio Energizer from Probiotic Solutions can eliminate dredging, reduce BOD and FOG, control odors, and increase treatment plant capacity. It can eliminate sludge from lagoons at one-tenth of the cost of dredging while the lagoons stay online. In aerobic digesters, the product increases volatile solids destruction, improves settleability, allows a cleaner decant, and increases digester performance and capacity. **800/961-1220; www.probiotic.com.** tpo

Bio Energizer from Probiotic Solutions

Gorman-Rupp Names Knudsen Eastern District Manager-Engineered Systems

Eric Knudsen

The Gorman-Rupp Co., Mansfield Division, named Eric Knudsen eastern district manager-engineered systems. He will cover Maine, Vermont, New Hampshire, New York, Massachusetts, Connecticut, Rhode Island, Delaware, Maryland, Pennsylvania, Virginia, West Virginia and North and South Carolina. Based out of Clifton Park, N.Y., Knudsen has 15 years experience in the municipal and industrial pump market.

Moyno Offers Max-Flow Annihilator Brochure

Moyno Inc. offers a brochure that provides detailed descriptions, key performance benefits, technical information, photos and graphs of its Max-Flow Annihilator grinder system.

Weir Power Names Arnold President

Kim M. Arnold

Weir Power & Industrial, a division of Weir Group PLC in Glasgow, Scotland, named Kim M. Arnold president/managing director of Weir Specialty Pumps, Salt Lake City. Arnold replaces James Board, who transferred to another Weir P&I company in the same capacity. Arnold joined the company in 2003 as vice president of sales & marketing. He has 30 years experience in the engineered and manufactured products area and is chairman of the U.S. Department of Commerce Environmental Technology Trade Advisory Committee (ETTAC).

Industrial Scientific Introduces Interactive 'Ask Dave' Blog

Industrial Scientific launched "Ask Dave" (www.askdaveblog.com), an interactive blog authored by Dave Wagner, director of product knowledge. Wagner has 20 years experience in the development and application of portable gas monitoring instruments and systems.

Meltric Releases 2011-2012 Catalog

Meltric Corp., manufacturer of industrial-duty electrical plugs and receptacles, released its 2011-2012 product catalog. The 231-page catalog features Decontactor Series switch-rated plugs, receptacles and connectors.

Singer Valve Names Caudle Account Sales Manager

Singer Valve Inc. named Wes Caudle account sales manager for the central United States. He will be responsible for North and South Dakota, Wisconsin, Minnesota, Iowa, Michigan, Illinois, Indiana, Nebraska, Oklahoma and Texas. Caudle brings 13 years experience in manufacturing, technical sales and marketing to his position.

PureLine Names Lienau Eastern Midwest Account Manager

Chris Lienau

PureLine Treatment Systems named Chris Lienau eastern Midwest account manager. He will oversee sales and contract relations in Illinois, Indiana, Ohio and portions of Michigan.

Synagro Acquires Drilling Solutions

Synagro Technologies Inc. acquired Drilling Solutions LLC of Lafayette, La., with operations in three states. The acquisition provides Synagro with access to the oil and gas sectors, leveraging the company's dewatering expertise. Additionally, the acquisition aligns closely with Synagro's centrifuge repair business, Hypex, and allows Drilling Solutions to improve the operating efficiency of its closed-loop dewatering systems. Mark Guidry was named general manager of Synagro Drilling Solutions.

Enduro Composites Acquires Bay Products

Enduro Composites Inc. acquired Bay Products Inc. of Stateline, Nev. The design and manufacture of BPI's complete line of Odor Control Systems have been transferred to Enduro's manufacturing facilities in Houston and Freeport, Texas. Martin Crawford, president of BPI, will join Enduro.

ABB Releases Brochure on Paperless Data Recorders

ABB released a brochure describing its SM Series of videographic (paperless) recorders for capturing, storing and analyzing process data. A PDF copy of SM Series Videographic Recorders can be downloaded at www.revbase.com/tt/sl.ashx?z=33b57d1d&dataid=253034.

Hach Revises Product Website

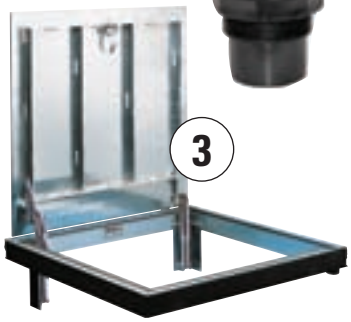
Hach Co.'s revised website, www.hach.com, has a more powerful search, check-by-check checkout process for both products and services, and simpler navigation. The site includes anticipated delivery dates, documentation, videos, optional accessories and more. It also suggests substitutes for obsolete parts.

Leonard Engineered Products Named NETZSCH Pumps Distributor

NETZSCH, manufacturer of progressing cavity pumps and rotary lobe pumps, signed Leonard Engineered Products Co. as its distributor in Southern California.

Layne Christensen Opens Center of Excellence

Layne Christensen Co. opened its Center of Excellence facility in Phoenix, Ariz. The 60,000-square-foot facility centralizes the engineering and sales efforts of the Water Technologies Group, including designers, engineers, chemists, PLC programmers, water treatment specialists and service technicians. The location is tooled and staffed for water and wastewater system engineering, arsenic media regeneration, Deionization (DI) regeneration, membrane cleaning, equipment fabrications and pilot testing. The center also holds NSF61 certification for the regeneration of Layne's arsenic removal media, LayneRT. tpo



1. CONERY MFG. INTRODUCES BASE ELBOW

The BERS-0800 8-inch base elbow from Conery Mfg. is designed for pumps weighing up to 4,000 lbs. Features include an ANSI flanged discharge and pullout. A 6-inch pullout flange and nonsparking design with bronze pullout is available. Guide pins are designed to accept 2- or 3-inch rails. **419/289-1444; www.conerymfg.com.**

2. ECHO INTRODUCES AIR TRANSDUCER ULTRASONIC TRANSMITTER

The Air Transducer ultrasonic level transmitter from ECHO Process Instrumentation Inc. is designed for noncontact level measurement and Duplex pump control. It features ultrasonic technology and a microprocessor chip for level measurements within plus/minus 1 mm, PVDF (polyvinylidene fluoride) transducer and 3-degree effective beam angle. The 3m and 10m range versions come with two SPDT (single pole double throw) relays, RS485 Modbus, 4-20 mA output and 9-36 V DC power supply. **850/609-1300; www.echopi.com.**

3. BILCO OFFERS ALUMINUM FLOOR ACCESS DOOR

Type J-AL aluminum access doors from The Bilco Co. are available with stainless steel hardware for enhanced corrosion resistance. Available in single- or double-leaf design and reinforced for 300 psf or H_2O loading conditions, the door provides access to underground areas, including water and wastewater treatment facilities, pump stations, commercial and institutional buildings and public utilities. The channel frame design and built-in drain coupling allow the door to be used in applications where water penetration into the opening is a concern. **203/934-6363; www.bilco.com.**

4. FLUID DYNAMICS OFFERS POLYMER FEED SYSTEM

The dynaBLEND liquid polymer dilution/feed system from Fluid Dynamics is designed to activate all types of liquid polymers for wastewater processes. The system features a non-mechanical mixing chamber and injection check valve for easy disassembly and inspection. **888/363-7886; www.dynablend.com.**

5. DEVCON OFFERS DFENSE BLOK ABRASION PROTECTION

DFense Blok wearing compound from ITW Devcon is an alumina ceramic bead-filled epoxy compound that, when used with DFense Blok Surface Wetting Agent, increases drop impact strength. It can be used in the repair, rebuilding and protection of pipe elbows, scrubbers, ash handling systems, cyclones, fan blades, pump boxes, float cells, screw conveyors, augers and other abrasion applications. Available in 30-pound pails, the product is mixed 2:1 and has a working time of 25 minutes at room temperature. A nonsagging compound, it can be applied by trowel at a thickness of 3/4 inch on vertical surfaces and 1/2 inch on overhead surfaces. It achieves functional cure in 4-5 hours and can withstand temperatures up to 300 degrees F. **800/933-8266; www.devcon.com.**

6. HACH INTRODUCES MINILAB POCKET PH METER

The miniLab pocket pH meter from Hach Co. is designed to produce stable readings from small samples in seconds. A member of the H-Series family, the meter uses ion-sensitive field-effect transistor (ISFET) technology to detect pH and stores dry, requiring no filling solution. The meter is available in three models with variations in calibration, display and resolution. **800/227-4224; www.hach.com/minilab.**

7. CAMPBELL SCIENTIFIC INTRODUCES DUAL-TURBIDITY PROBE

The OBS500 dual-turbidity probe with CleanSensor antifouling from Campbell Scientific combines a backscatter sensor with a second sidescatter sensor and multiple antifouling methods for measurements in biologically active water. The CleanSensor uses a shutter/wiper mechanism to protect and clean the optics. The device includes a chamber filled with a biocide that continuously leaches out over the optics while the probe is in the closed position. **435/227-9000; www.campbellsci.com.**

8. CHEMINEER INTRODUCES AGITATORS WITH SWING OUT SEAL

The Model 20 HT/GT agitator from Chemineer features a high-efficiency gearbox with helical gearing, parallel shaft configuration and swing out seal change design for easy maintenance. To replace the seal, the user rotates the gearbox 90 degrees around the pivot pin, opening the top of the seal pedestal for removal of the coupling half and seal assembly. The agitator's modular design reduces the number of replacement parts needed and is made to meet AGMA, OSHA, ANSI, IEC, DIN, EU and ATEX standards and requirements. A variety of seal options are available. **937/454-3200; www.chemineer.com.**

9. OPTO 22 INTRODUCES THERMOCOUPLE

The SNAP-AITM-4i thermocouple and millivolt input module from Opto 22 is designed for temperature monitoring and data acquisition. The module accepts up to four inputs from a range of thermocouples. Channel inputs are individually configurable and channel-to-channel isolated. **951/695-3000; www.opto22.com.**

10. MELTRIC INTRODUCES SERIES PLUG, RECEPTACLE LINE

The DSDC Series of plugs and receptacles from Meltric Corp. are made for direct current applications of 200 amps at 250 volts DC, up to 100 amps at 600 volts DC or up to 30 amps at 750 volts DC. Safety features include dead-front shutter that prevents the user from access to live parts and a padlockable pawl for easy locking in the connected or disconnected mode. **800/433-7642; www.meltric.com.**

11. SENSOREX INTRODUCES EXACT PHOTOMETER

The FCLA 7000 eXact photometer from Sensorex provides field spot testing as well as fixed sensor calibration support for the Sensorex FCL400 Series free chlorine sensor and CLD400 Series chlorine dioxide sensor. The photometer is EPA-compliant for regulatory testing and carries the CE mark. It comes with 1,000 test strips to perform free chlorine tests at 0-6 ppm. It also can use HR strips to test from 6 to 11 ppm or an additional glycine strip to bind chlorine for chlorine dioxide measurement. **714/895-4344; www.sensorex.com.**

(continued)

product spotlight

Sonic-Pro S3c flowmeter from Blue-White Industries

Flowmeter Combines Two Technologies in Same Unit

By Ed Wodalski

The Sonic-Pro S3c hybrid ultrasonic flowmeter from Blue-White Industries combines selectable Doppler technology and Transit Time in a single device, so that operators can use just one meter to suit the application.

Ultrasonic flowmeters send sound waves through the external surface of a pipe, into the flow stream, and back, says Bill McDowell, sales engineer. Those waves are then analyzed to determine flow. Typically, meters use either Doppler-type or Transit Time technology.

A Doppler-style meter requires particles of some type to be in the flow stream — bubbles, sand, dirt or some other particulate. Sound waves bounce off the particles and a receiver records the echoes to measure the flow.

"These meters are used extensively in wastewater because other types of meters can get clogged by particles," McDowell says. "With a Doppler meter, you can clamp the sensor on the outside of the pipe and determine flow rate without cutting into the pipe." However, Doppler-type meters don't work well when fluid is clear or no particles are present.

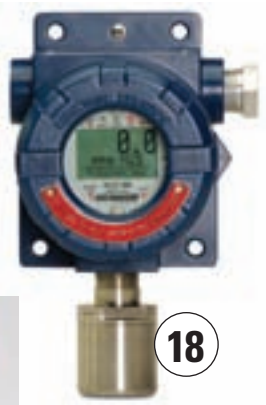
To measure relatively clear liquids, a meter needs to use Transit Time technology.

"Here, the meter times how long it takes for a sound beam to go from one sensor to the other and back again," says McDowell. "But that technology must be used on relatively clean fluids."

With both technologies in the same device operators don't have to choose which to buy. The Sonic-Pro can be used on 2- to 100-inch metal pipe or on plastic pipe as small as 1 1/2 inches. It comes with carrying case, or can be installed permanently. Each meter has a data logging system with 10,000-event internal memory. Data is also saved to an SD card (the included 32 MB card holds 500,000 entries).

Other features include fully configurable 4-20 mA and 0-1,000 Hz output and three levels of security: no display or touchpad, display with no local touchpad, or full-featured display along with five-button menu on the meter that accepts programmable changes.

All three versions can be linked to a computer via RS232, RS485 or USB connections, as well as Ethernet for remote access. Process control relays enable the meter to be configured for high/low/range rate alarm or to flow total for either manual-triggered batch operations or flow-triggered batch operations. The meter has a NEMA 4X (IP66) wash-down enclosure. It accepts AC (96 to 264 V) or DC (15 to 30 V) current, automatically adjusting to the voltage. **714/893-8529; www.blue-white.com.**



12. METALFAB INTRODUCES BULK BAG DUMP HOPPER

The bulk bag dump hopper from Metalfab Inc. features a smaller plant footprint with resized, more efficient bin vent filter than previous models, providing a virtually dust-free way to dump and fill a process system with material received in paper bags. The design incorporates a baffle and bin vent, which can be attached to a central dust collector, or optional bin vent filter over the dump area to maintain a dust-free environment. The unit has a hinged door to keep foreign materials from falling into process material when not in use and expanded metal grid to prevent bag pieces from getting into the system. **800/764-2999; www.metalfabinc.com.**

13. NEWSON GALE INTRODUCES CABLE REEL

The VESM02 cable reel from Newson Gale Inc. provides secure static ground protection for difficult field applications, such as tanker trucks and mobile tanks or drums. The self-retracting reels are housed in durable, lightweight steel with powder-coated finish, suitable for use outdoors or indoors, per NEMA 4/IP56/ingress protection. The reel has 50 feet of Cen-Stat Static-Dissipative Hytrel protected cable with adjustable stop ball. **732/987-7715; www.newson-gale.com.**

14. ECD OFFERS ONLINE PHOSPHATE ANALYZER

The CA-6 online analyzer from Electro-Chemical Devices uses colorimetric analysis to measure phosphate and total phosphate levels. The analyzer is available in models that measure phosphate at 0-5 mg/l, 0-50 mg/l or 0-200 mg/l and total phosphate at 0-2 mg/l or 0-100 mg/l. Weighing less than 40 pounds, the analyzer can be wall mounted or set on a bench using the optional Bench Top Stand. **800/729-1333; www.ecdi.com.**

15. SCHNEIDER ELECTRIC INTRODUCES VARIABLE-SPEED DRIVES

The Altivar 212 variable-speed drive and the S-Flex enclosed version from Schneider Electric are designed for pump and fan applications. The AC drives adjust motor speed to the required flow of air or fluids, reducing stress on belts, piping and ductwork. **847/397-2600; www.schneider-electric.us.**

16. LUDECA OFFERS SELF-LEVELING SYSTEM

The Levalign Expert self-leveling system from LUDECA INC. measures the flatness and straightness of machine bases and foundations, split machine casings, as well as flatness and parallelism of circular, rectangular and odd-shaped flanges. The system consists of a self-leveling motorized rotating laser and sensor that interface wirelessly with a dedicated geometric measurement computer. The surface profile of the measured component is displayed in 3-D graphics. Features include InfiniSplice that allows for the merging of measurement files and the freedom of repositioning the rotating laser to another location during measurement to bypass obstructions to line-of-sight and measure complex-shaped surfaces. **305/591-8935; www.ludeca.com.**

17. NEPTUNE OFFERS SERIES 500 PUMPS

Series 500 pumps from Neptune Chemical Pump Co. feature a Variable Oil By-Pass stroke adjustment, allowing the valve checks extra time to seat, even in heavy liquids. Other features include the ability to be adjustable from 10 to 100 percent of capacity via the micrometer dial and EZE-CLEAN valve cartridges that can be removed for cleaning without disturbing piping to the pump. The pumps can deliver up to 80 gph simplex and 160 gph duplex at pressures up to 3,000 psi. **215/699-8700; www.neptune1.com.**

18. OLDHAM INTRODUCES GAS DETECTION TRANSMITTER

The OLCT 200 fixed gas detection transmitter from Oldham is designed for use with multiple gas detection technologies, including electrochemical, catalytic bead, infrared and photoionization detection sensors. The unit can simultaneously display two different gases. It can be configured for two-wire and three-wire 4-20 mA analog output, Modbus RTU digital output, HART communication and wireless communication. Optional onboard programmable relays can be configured with either a painted aluminum or stainless steel explosion-proof housing, or a cold-climate heater. **800/338-3287; www.oldhamgas.com.** tpo

TREATMENT PLANT OPERATOR tpo

CLASSIFIED ADVERTISING

OCTOBER

AERATORS

5 Each Surface Aerators - Stainless Steel Aqua Turbo Systems 7.5 HP, 460 V, 3 Ph. Contact: Festus Public Works, 950 N. 5th St., Festus, MO 63028; 636-937-6646. Attn: R.L. Stephens. (o-11)

BLOWERS

VFC200P-5T, FUJI Pumps, Regenerative Blowers, Ring Compressors. All models, accessories. Authorized distributor. Authorized parts and repair center. Call 888-227-9822. www.carymfg.com. (PBM)

CONSULTING/ENGINEERING

Meuth Systems Precision water leak detection services for utility districts across Texas. Residential testing within 75 miles of Austin. Phone: 512-450-4992. (o-01)

EDUCATION

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

MISCELLANEOUS

UV DISINFECTION EQUIPMENT: Attention: Small wastewater treatment plant owners and operators. Very easy installation and affordable. Up to 17 gpm. Brand new product. US patent pending. **www.thefecalfighter.com.** 614-207-9030 or callagher@sbcglobal.net. (oBM)

PARTS & COMPONENTS

EQUIPMENT FOR WASTEWATER TREATMENT PLANT: FLYGT PUMPS, 120 gpm, 30 ft. head, rebuilt spare w/new 90 el. Also two used with rails. Roots blowers, 180 cfm, 6 psig, new Desig no. 65-RAI. 180 cfm, 6 psig installed with tanks, 10 hp motor, 1150 rpm. Also 560 cfm 6 psig rebuilt spare. 560 cfm 6 psig installed with tanks, 25 hp motor, 1150 rpm. FILTER PRESS plate & frame, 85 plates, 30 in. x 30 in. pressure, 175 psig, filter surface 750 sq. ft. Digital photos available. 727-937-3222 FL. (o11)

POSITIONS AVAILABLE

Sales Reps Wanted. Gulf Coast region; North & Southwest US; Southeast US. Check www.gapvax.com for details or call 888-442-7829. (M11)

people/awards

John Mele, area manager North Atlantic Region for HOBAS Pipe USA, received the 2011 Harry P. Croft Award from the New Jersey Water Environment Association for distinguished and outstanding service.

The **Las Vegas Valley Water District** received the Innovation in Customer Service Level II Award from the CS Week organization.

The **Water Environment Federation** will honor the first 17 recipients of the WEF Fellow Recognition Program during WEFTEC Oct. 15-19 in Los Angeles. The program honors the professional achievements, stature and contributions of WEF members in various water fields. Fellow recipients will be permitted to use the WEF Fellow designation after their names in a professional capacity. The 2011 recipients are:

- Pedro Alvarez, Rice University, Civil & Environmental Engineering, Houston, Texas
- Walter Bailey, DC Water & Sewer Authority, Washington, D.C.
- James L. Barnard, Black & Veatch, Leawood, Kan.
- Paul L. Bishop, National Science Foundation, Arlington, Va.
- Pen-Chi Chiang, Institute of Environmental Engineering, National Taiwan University Taipei, Taiwan
- Stephan D. Frank, Metro Wastewater Reclamation District, Denver, Colo.
- Paul L. Freedman, Limno Tech, Ann Arbor, Mich.
- Thomas E. Kunetz, Metropolitan Water Reclamation District of Greater Chicago, Ill.
- Eric R. Lecuyer, Central States WEA, Crystal Lake, Ill.
- Bruce E. Logan, Penn State University, University Park, Pa.
- Nancy G. Love, University of Michigan, Ann Arbor, Mich.
- Tim Madhanagopal, Orange County Utilities, South Water Reclamation Facility, Orlando, Fla.
- John T. Morris, Morris Water Resources Consultants, San Marino, Calif.
- John T. Novak, Virginia Poly Institute & State University, Blacksburg, Va.
- Krishna R. Pagilla, Illinois Institute of Technology, Chicago
- James Tony Parrott, Metropolitan Sewer District of Greater Cincinnati, Ohio
- Spyros Pavlostathis, Georgia Institute of Technology, Atlanta

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

education

California

The California Water Environment Association has these courses:

- Oct. 5, 12 – Introduction to Wastewater Math, Gilroy
- Oct. 6, 13, 20 – Introduction to Wastewater Treatment, Watsonville
- Oct. 19 – Introduction to Wastewater Treatment, Gilroy

Visit www.cwea.org.

Georgia

The Georgia Association of Water Professionals has a Fall Conference & Expo and Laboratory Symposium in Athens on Nov. 15. Visit www.gawponline.org.

Illinois

The Illinois Water Environment Association has a Laboratory Seminar in Schaumburg on Oct. 20. Visit www.iweasite.org.

Michigan

The Michigan Water Environment Association has these courses:

- Oct. 25 – Health and Safety Seminar, East Lansing
- Nov. 9 – Process, East Lansing

Visit www.mi-wea.org.

New York

The New York Water Environment Association has a Confined Space course in Potsdam on Oct. 11. Visit www.nywea.org.

Ohio

The Ohio Water Environment Association has a Biosolids Workshop on Dec. 8. Visit www.ohiowea.org.

Texas

The Texas Water Utilities Association has these courses:

- Oct. 11 – Wastewater Collection, Waco
- Nov. 7 – Wastewater Collection, Corpus Christi
- Nov. 8 – Pumps and Pumping, Gatesville
- Nov. 15 – Wastewater Collection, San Marcos

Visit www.twua.org.

The Water Environment Association of Texas has an Asset Management Workshop in Austin Nov. 2-3. Visit www.weat.org.

Wisconsin

The Wisconsin Department of Natural Resources is offering these courses:

- Oct. 3-4 – Activated Sludge-Intro, Chippewa Falls
- Oct. 5-6 – Activated Sludge-Advanced, Chippewa Falls
- Oct. 12-13 – Primary Treatment-Intro and Advanced, Green Bay
- Oct. 18-19 – Disinfection-Intro and Advanced, Oconomowoc
- Oct. 24-25 – Phosphorus Removal-Intro and Advanced, Stevens Point
- Oct. 26-27 – Lab-Advanced, Stevens Point
- Nov. 10 – Microscopy, Oconomowoc

Visit www.dnr.state.wi.us. tpo

CALENDAR OF EVENTS

Oct. 2-4
Atlantic Canada Water & Wastewater Association 2011 Annual Conference, Delta St. John's Hotel and Conference Centre, St. John's, Newfoundland. Visit www.acwwa.ca.

Oct. 4-7
Wisconsin Wastewater Operators Association Annual Conference, La Crosse. Visit www.wwoa.org.

Oct. 15-19
Water Environment Federation WEFTEC 2011, Los Angeles Convention Center, Los Angeles. Visit www.weftec.org.

Nov. 2-4
Nebraska Water Environment Association Conference, Holiday Inn, Kearney. Visit www.ne-wea.org.

Nov. 9-10
New England Water Environment Association North East Residuals, Biosolids and Energy Conference, Seekonk, Mass. Visit www.newea.org.

Nov. 13-16
North Carolina American Water Works Association and Water Environment Association Annual Conference, Embassy Suites Concord Convention Center, Concord. Visit www.ncsafewater.org.

Nov. 16-18
Indiana Water Environment Association Annual Conference, Indianapolis. Visit www.indianawea.org.

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

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