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APRIL 2010

How We Do It: Ammonia compliance in Fairplay, Colo.

PAGE 18

Greening the Plant: Solar energy in Charlemont, Mass.

PAGE 16

In My Words: A young operator's perspective

PAGE 40

Garbage In, *Resource* Out

LANDFILL GAS FUELS A BIOSOLIDS PROCESS IN MANATEE COUNTY, FLA.

PAGE 20

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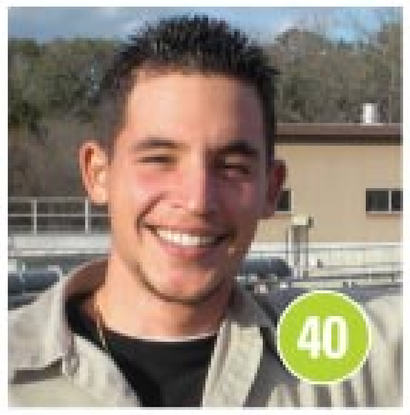
contents

April 2010

features



departments

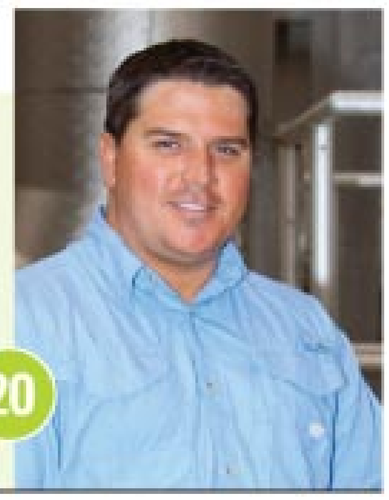
COMING NEXT MONTH: MAY 2010

Annual Company Directory

- Top Performer – Plant: RAE Water & Sewer District, Bozeman, Mont.
- Top Performer – Operator: Pete Baranyai, East Chicago, Ind.
- Top Performer – Plant: Southerly Wastewater Treatment Plant, Columbus, Ohio
- How We Do It: Special activated sludge process in Mansfield, Ark.
- PlantScapes: A rain garden in Twinsburg, Ohio
- Greening the Plant: Microturbine cogeneration in Delhi Charter Township, Mich.
- In My Words: Advice on preparing samples for outside lab analysis

on the cover

Christian (Chris) Collins is biosolids supervisor and Manatee Agricultural Reuse System (MARS) coordinator for Manatee County, Fla. He oversees a unique biosolids program that uses landfill gas as a fuel source for a drying and pelletizing system. (Photo by Villetto Photography)



Try It, Buy It

MAYBE IT'S TIME FOR THE CLEAN-WATER PROFESSION TO ADOPT A RECRUITING AND TRAINING TECHNIQUE THAT HAS WORKED WELL FOR NUMEROUS OTHER INDUSTRIES

By Ted J. Rulseh, Editor

When interviewing treatment operators for stories for this magazine, I usually ask, "How did you get involved in this profession?"

Surprisingly often, the answer is some variation on, "I needed a job." Sure, many people choose the clean-water business out of pure interest, or out of a passion to do good for the environment.

Many others — some of whom "grow up" to be outstanding operators and leaders — come into the profession almost by chance, often intending to use it as a bridge to something else. But then they take an interest. They stay. And they make it a career.

And maybe right there is a partial answer to the challenge the industry faces in recruiting new people to replace the many veterans planning to retire in the coming years. In a word: Internships.

CAN YOU SAY 'INTERN'?

Internships are common in just about every industry. They're offered to high school, technical college or university students as part of their preparation for careers. No doubt even some clean-water agencies offer them.

Why are internships potentially more valuable for clean-water professions than for others? Because young people don't gravitate toward wastewater treatment the way they do toward electronics, computer programming, engineering, banking, graphic design, journalism.

In fact, let's face it: to many young people (people of any age, for that matter), wastewater treatment sounds boring, demeaning, even repulsive. Of course, it actually is none of those, as people who try it soon discover. So why not let more young folks try it?

Brandon Johnson of New Braunfels (Texas) Utilities, subject of this month's "In My Words" feature, is an example of a young person who tried it. He didn't start with an intern-

ship — he moved right into an entry-level job after high school. He started out just needing a job. Now he's happily building a career.

THE DOORWAY IN

Traditional recruitment tools — talking to guidance counselors, exhibiting at job fairs, conducting tours for high school and college classes — are fine as far as they go. But they rarely go far enough. How about offering internships, real hands-on work for a summer, to kids who simply "need a job"?

These days especially, many students need jobs. A treatment plant that advertised for summer internships would almost surely get an abundance of inquiries, especially with a well-worded solicitation. So you take in the applications.

Let's face it: to many young people (people of any age, for that matter), wastewater treatment sounds boring, demeaning, even repulsive. Of course, it actually is none of those, as people who try it soon discover. So why not let more young folks try it?

You screen for those who seem inclined toward a profession that involves science, math, and mechanical and technical aptitude. And you choose the best candidate.

You end up not just telling or showing a young person. You end up letting them live the experience long enough for genuine interest to take hold.

COSTS AND BENEFITS

I can hear it already: There's no money in the budget for another person. And what would an intern do besides get in the way?

First of all, internships don't cost a lot. High school or college students on summer or part-time jobs work for low pay, especially when they know they're gaining experience that will give them an advantage in the job market. And as for daily tasks, how many treatment plants have the staff to get at all the little things that need doing? An extra pair of hands surely wouldn't hurt.

What's more, it can be satisfying to staff members to teach a young person the ropes. Acting as mentors helps reaffirm their convictions about the profession. And the enthusiasm of a young, curious person has a way of rubbing off.

So, what about it? Is it time for the clean-water industry to create, collectively across the country, thousands of summer or evening/weekend jobs for energetic young people looking for work and career direction?

Maybe it's too late to get organized enough to offer that internship this summer. But what about next year? From where I sit, internships look like an excellent way to bring high-quality people into the clean-water business. tpo

Knowing Their Bugs

WITH MICROBES FRESH FROM THE REGIONAL WATER QUALITY CONTROL PLANT, STUDENTS IN PALO ALTO LEARN THE SCIENCE INVOLVED IN TREATING WASTEWATER

By Diane Gow McDilda

PHOTOS COURTESY OF THE CITY OF PALO ALTO

Jan Raissle, contracted to do outreach and education for the City of Palo Alto, makes a presentation called Microbes in Sewage for a seventh-grade class.

By the time students graduate from high school in Palo Alto, Calif., some know the equipment and microbes in the city wastewater treatment plant like the bushes and bugs in their own backyards.

Wastewater treatment and good stewardship are introduced in elementary school, where students learn about the flora and fauna in nearby creeks and the differences between storm and sanitary sewers. They can even visit the treatment plant or volunteer to stencil storm drains. By middle school, the lessons become more academic and involve laboratory work.

"The kids have seen different programs throughout their public education career," says Karin North, associate engineer with the city's environmental compliance division. "You'd be hard pressed to find a student who doesn't know where their wastewater discharges to and the importance of protecting the San Francisco Bay."

QUICK LEARNERS

North's office is at the Regional Water Quality Control plant on the southwest tip of the San Francisco Bay. Her responsibilities include giving plant tours to residents and students, working on NPDES and biosolids permitting, investigating ways to reduce personal care products in wastewater, and leading teams in mercury pollution prevention. In addition, she manages the city's educational outreach program.

The Microbes in Sewage program includes a plant tour as well as a video, classroom instruction, and hands-on activities.

The city contracts with consultant Jan Raissle for the outreach program. "She knows everyone and everyone loves her," North says. Outreach is challenging and rewarding. North believes Palo Alto students may not be typical.

"Many of their parents teach at Stanford University," North says. "The kids are sophisticated, and it's important that they hear different forms of the message every year."

The students' aptitude helps them to link their school lessons with the outside world. While a lesson may start with water quality in the bay, it's a quick step to discussing the great garbage patch, twice the size of Texas, that floats in the Pacific Ocean.

STAYING ALIVE

The lessons' sophistication increases with the grade levels. "Microbes in Sewage," one of the more popular lessons, is geared toward middle schoolers. It takes about 50 minutes. It includes an introduction, an explanation of the difference between stormwater and wastewater, and a video explaining wastewater treatment. The students then get a virtual tour of the treatment facility via a brochure that explains each microbial step in the process.

After that, it's time for the hands-on work stuff: Students put on gloves and use microscopes to examine slides of fresh microbes from the treatment plant. Their reactions vary from disgust to fascination, North says.

The students also complete a worksheet. "They draw three of the microbes, and with the help of a book and poster, they identify them," says North. "They love it and the teachers love it."

The activated sludge is brought to the classroom in a liter bottle. Sugar and an aquarium bubbler are added to the container to keep the microbes alive and kicking.

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.**

TIME AND MONEY

For high school students, Palo Alto offers "Sewer Science," a week-long lesson that also involves microbes from the treatment plant. "We do 'Sewer Science' once a year," North says. "But it's hard to get teachers to give up a whole week of class time, and it takes a lot of staff."

With the current program, the schools can educate more students with fewer resources. The city allocates $50,000 a year to educational outreach. And North makes sure the program is never stagnant.

"I have quarterly meetings with Jan," she says. "We talk about what's going on and how to incorporate new topics." One of those is a pharmaceuticals program that will educate students on safely disposing of medicines, rather than flushing them down the drain.

It's a challenge to keep it interesting, but the programs make students familiar with parts of the city and with people they might not otherwise know. "Outreach is a full-time job," North says. **tpo**

A student checks out microscopic life during the Microbes in Sewage program.

> "The kids are sophisticated, and it's important that they hear different forms of the message every year."
> **KARIN NORTH**

A view of the Water Resources Education Center building showing traditional landscaping.

Turning the Tide

PHOTOS COURTESY OF THE MARINE PARK WATER RECLAMATION FACILITY

A PUBLIC PARTNERSHIP IN A NATURAL AREA HELPS BUILD SUPPORT FOR A TREATMENT PLANT EXPANSION IN VANCOUVER, WASH.

By Mary Shafer

Can a wastewater treatment plant also work as an energy conversion facility? Marine Park Water Reclamation Facility in Vancouver, Wash., provides an answer: It helped convert the public's angry energy against a plant expansion into a groundswell of support for a wider vision.

The Marine Park Natural Resource Area (MPNRA) is an integrated complex of wastewater treatment, municipal engineering, public water education, and recreation. Its hub is the Water Resources Education Center.

Assistant city engineer Tom Boyer is proud of this 3.6-acre facility. "It's all designed to inspire visitors to become better stewards of water resources," he says.

A nearby overlook provides a view of the Columbia River and 48 acres of wildlife-rich wetlands. The site connects visitors to the city's Renaissance Trail, a paved waterfront path for walkers, runners, and bicyclists. Along with a transportation corridor, the trail provides a buffer between the plant and the public.

> "It's all designed to inspire visitors to become better stewards of water resources."
>
> **TOM BOYER**

BUILDING A PARTNERSHIP

The 10-mgd (average) Marine Park Water Reclamation Facility, one of two secondary treatment plants in Vancouver, was completed in 2000 and serves a population of 95,000. The original 1976 plant was approaching capacity by 1989. Officials overcame resistance to expansion by building a partnership with the community.

Together, they developed a plan to accommodate the upgrades while addressing community desires for public waterfront, recreation space, and wetlands preservation.

The old plant was next to natural wetlands. The move to a new site on 12.3 acres of industrial land to the north opened public access to the waterfront. The education center opened in early 1996.

The Portland and Seattle offices of CH2M HILL led design of a natural resource area, supported by Vancouver's Architects Associative; city engineering; plant management and operating staff; and local landscape architects Walsh and Associates.

The area is bounded by the Renaissance Trail, which links to nearby Marine Park, a 26-acre site with play equipment, picnic shelters, and a boat launch. The education center was a critical element. It encourages residents to rediscover the waterfront and re-establish the city's historic connection to the Columbia River.

MULTIPLE FUNCTIONS

The 16,000-square-foot, two-story brick Water Center building has an expansive deck overlooking the Columbia River and wetlands.

Share Your Ideas

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

It contains an exhibit hall, classroom, theater, gallery for nature-inspired art, water sciences laboratory, aquaria, computer game room, and offices.

On its top floor, the window-lined Bruce E. Hagensen Community Room offers spectacular views of the river. It has a catering kitchen, multimedia presentation fixtures, and wireless Internet access.

The Water Center provides diverse exhibits and lessons, including a sewer mapping display, groundwater exhibits, a virtual exhibit with interactive media, and an online game. Tour leaders can use a map of the Columbia River Basin, designed into the upstairs classroom floor, to explain water concepts.

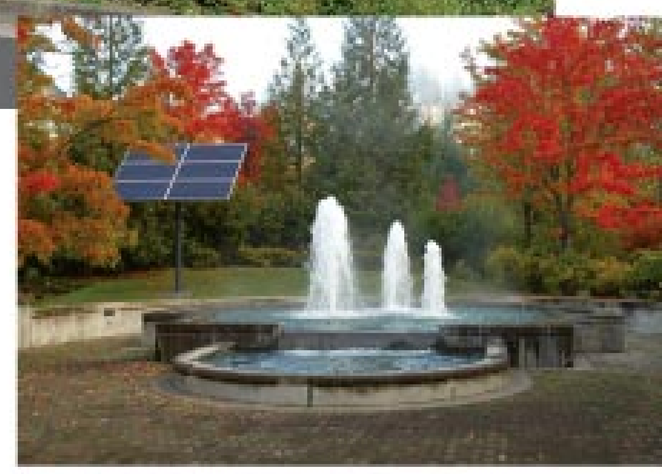
A natural wildlife garden graces the grounds, showing visitors examples of earth-friendly landscaping that they can replicate in their yards. A short walk away, a 3,000-square-foot platform offers views of the few remaining natural Columbia River riparian areas in the region. These wetlands are under the stewardship of the Water Center and provide a natural classroom where visitors can learn about ecosystem protection and restoration.

The wetlands provide habitat for all Columbia basin salmon stocks, including several endangered species. They also provide perching and foraging habitat for raptors. There is a bald eagle nesting site within the wetland and an osprey nest nearby.

MISSION ACCOMPLISHED

Water Center staff oversee and operate the exhibits, events and educational offerings and help with volunteer stewardship and paid and unpaid internship opportunities. Trained volunteer Aquaguides help with field trips.

Public volunteers assist at special events and contribute to special projects, while business volunteers get out into the field to work with staff through special programs. Students take part in Service Learning programs, such as beach cleanups.



The education center (above) hosts tour groups that include school classes. Decorative amenities include a fountain.

Thousands of visitors come to the center each year. An attractively lighted fountain there often provides a backdrop for graduation and wedding photos — another testament to a site that has become a welcome part of the community. **tpo**

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top performer: **PLANT**

Members of the team at Massena: Operator Sean Smith, superintendent Nick Zappia, operator Tim Dumas, and operator Steve Mailhot. (Photography by Jennifer McCluskey)

Helping Hands

THE NEW YORK VILLAGE OF MASSENA COMES UP WITH A HIGHLY COST-EFFECTIVE SOLUTION TO STOP COMBINED SEWER OVERFLOWS — WITH HELP FROM A STATE ASSISTANCE PROGRAM

By Jim Force

"The operators had an excellent operation in place to maximize wet-weather capacity. The plant is always in contact-stabilization mode, which allows solids to be stored in the stabilization tank away from the influent flow."

TIM MILLER

The Massena (N.Y.) Village Wastewater Treatment Plant serves a community of 11,000.

TALK ABOUT TAKING THE BULL BY THE HORNS.

In Massena, N.Y., recurring combined sewer overflows (CSOs) were creating havoc. But rather than spend money on consultants and shelf-bound studies, plant superintendent Nick Zappia and his staff took matters into their own hands.

With the help of the New York Department of Environmental Conservation (DEC), they devised a plan and made several changes in their treatment plant. Results? They've reduced the number of overflow events from 40 a year to fewer than five. Here's what they did:

- Increased maximum flow through the plant from 6.8 to 10 mgd.
- Reduced the duration of bypasses by modifying the emergency bypass bar screen.
- Improved control of sludge settleability by enhancing the process-control program.

Even with such dramatic improvement, superintendent Zappia remains modest. "We couldn't have done this without the support of our treatment plant staff, the DEC, and my boss, Hassan Fayad, public works superintendent," he says.

Counters Tim Miller who worked on the project for the DEC, "It's not what we do. It's the operators. Nick and his staff worked hard to make this happen."

WICKED WINTERS

Massena lies on the far northern edge of New York State, three miles from the Canadian border. Summers are temperate, but the winter thermometer can fall to as far as 20 below zero. Snowmelt and rainfall are abundant.

The Massena Village Wastewater Treatment Plant serves a population of about 11,000. It was built in 1959 and improved through major upgrades in 1980 and 1998. Today, an average daily flow of 3.3 mgd passes through primary treatment, an activated sludge system that operates in the contact-stabilization mode, final clarifiers, and a Trojan Technologies UV light disinfection system. Treated effluent flows to the Grasse River, a tributary of the St. Lawrence River.

Plant design is for 4.8 mgd, with limits of 30-mg/l BOD and 45-mg/l TSS. Fecal coliform requirements are 200/100 ml on a 30-day basis, and 400/100 ml per seven-day period. In addition, plant staff tests for zinc, ammonia, and phenolics. The plant maintains an overflow retention facility (ORF) that must be monitored for BOD, TSS, SS, pH, temperature, ammonia and phenolics, and seasonally for fecal coliform during overflows.

An anaerobic digester stabilizes biosolids, and a belt press dewaters the material to a cake that is hauled away by a private contractor for landfilling.

Zappia and six operators are dual-licensed, responsible for the wastewater plant, the drinking water plant, and six pumping stations. They rotate tasks each week to keep personnel fresh and up-to-date on all skills in the department.

SOMETIMES OVERWHELMED

As with many communities in the northeastern United States, sanitary and storm sewers are combined in Massena. A total of ten combined sewer overflow outfalls exist within the collection system, and two more are located within the treatment plant itself:

- The ORF, located just before the aerated grit chamber, can provide primary settling and disinfection before direct discharge through a separate outfall.
- An emergency bypass ahead of the influent pumps provides another outfall. Any flow exceeding the capacity of the influent pumps is discharged through the bypass.

At a wet-weather peak design of only 6.8 mgd, the Massena plant was frequently overwhelmed. In fact, during a 15-month period

profile

Massena (N.Y.) Village Wastewater Treatment Plant

BUILT:	1959 (expanded 1980, 1998)
TREATMENT LEVEL:	Secondary
PROCESS:	Activated sludge
POPULATION SERVED:	11,000
FLOWS:	4.8-mgd design, 3.3-mgd average
RECEIVING WATER:	Grasse River
BIOSOLIDS:	Anaerobic digestion, dewatering, landfill
ANNUAL BUDGET:	$700,000 (treatment plant and pump stations)
STAFF:	Nick Zappia, plant superintendent; Brad Kershner, senior operator; John Lavair, Tim Dumas, Jack Diagostino, Steve Mailhot, operators; Sean Smith, heavy equipment operator
WEB SITE:	www.massenaworks.com

A Komline-Sanderson gravity belt thickener produces cake biosolids, which are hauled to landfill by a private contractor.

Operator Tim Dumas performs a pH test.

from January 2003 to April 2004, the plant experienced 23 ORF discharges totaling more than 13 million gallons, and four emergency bypass discharges lasting more than 17 hours total.

Then, in 2004, a new requirement in the plant's SPDES permit called for maximization of flows through the treatment plant as a best-management practice. "We had to submit a hydraulic capacity evaluation of our collection system to the DEC," recalls Zappia. "I talked with Joe Kuta, my DEC contact in Region 6, and he pointed me to Tim Miller in the DEC facility operations assistance section."

Zappia notes that operators might not be familiar with the assistance section, which offers free advice and help to treatment plants facing situations like Massena's. "Tim Miller stepped in and offered help," Zappia says. "Had we farmed this out, I'm sure it would have cost us thousands."

Improvements to the aeration system helped the Massena plant increase treatment capacity substantially.

"Tim helped us establish a baseline by bringing in a flowmeter. We spent a day flow-testing all four of our pumps and establishing baselines for every possible combination."

NICK ZAPPIA

Miller explains, "Our objective was to figure out how to get more (flow) through this treatment plant. We determined that the Massena operators could handle it, and we set up a cooperative technical assistance plan in 2004."

TAKING A LOOK

The first step was to review the plant's wet-weather operating plan, and examine the process-control program. "The operators had an excellent operation in place to maximize wet-weather capacity," Miller says. "The plant is always in contact-stabilization mode, which allows solids to be stored in the stabilization tank away from the influent flow. The staff had target values set for mixed liquor suspended solids (MLSS) concentrations in the contact and stabilization tank."

Next, Massena and the DEC conducted a desktop evaluation of the aeration tank and the clarifier to see if the plant could treat additional flow. The team concluded that since wet-weather events add only groundwater and surface runoff to the incoming wastewater, there would be no significant BOD loading changes with the additional flow.

Further, they determined that clarifier design enhancements at Massena (15-foot depth, inboard launder, and baffling) probably could handle the suspended solids removals that higher flow rates would require.

"The Massena design improves suspended solids capture by

Superintendent Nick Zappia and his team devised a plan that dramatically reduced bypassing of wastewater.

GETTING TECHNICAL

The New York DEC Technical Assistance Program is designed to provide on-site custom assistance to wastewater treatment plants, specifically to correct problems or maintain SPDES compliance. Cooperative effort between the DEC staff and the local treatment plant management is the key to success.

The focus is to implement innovative and cost-effective methods of improving performance. The assistance is available at no cost to communities and industries. Common activities include:

- Comprehensive performance evaluations
- Composite corrective programs
- Process-control enhancement
- Training.

Tim Miller, recently retired from DEC but involved in the assistance program for Massena, says, "It's a little like the carrot-and-stick approach. If we help, it's better for everybody. We visited Massena seven or eight times and worked closely with the operational staff there." The DEC assists eight to 10 plants a year in a program that began in 1983.

preventing an updraft wall effect that can increase effluent solids during high flows," Miller says. "The Water Environment Federation's MOP 8 confirms the benefits of weir location and baffling."

TO THE TEST

The team concluded the existing system could indeed handle hydraulic flow rates up to 10 mgd with no loss of effluent quality. But desktop analysis is just that. To prove their theories, Massena and the DEC developed a protocol to evaluate the plant at flows greater than 6.8 mgd using four high-flow stress tests.

"If the plant demonstrated any instability, we could stop the test before any effluent violations occurred," says Zappia. The team ran the tests at flow rates of 7.3 mgd and 9.2 mgd, and simulated 10 mgd and 10.8 mgd with good results. "The tests show that the activated sludge process and UV units could treat short-term flows up to 10 mgd," says Miller.

But to treat these higher flows reliably, it was essential to maintain the proper sludge quality. Therefore, the village purchased a portable suspended solids meter to provide daily monitoring of MLSS levels in the aeration tanks. In addition, the plan called for an increased return sludge flow during wet-weather conditions. DEC and the operations staff felt the best approach was a steady return sludge, using the clarifier and stabilization tank to store solids during wet weather.

Based on the stress tests, the plant staff has set the weir in the distribution box to allow 9.2 mgd to be directed to the biological process using three pumps at full output. If the fourth pump comes on, the remaining flow is split between the biological process and the ORF.

BYPASS PROTOCOL

Next, the Massena operators turned to the emergency bypass. During intense rains, the flow would rise rapidly in the influent channel and potentially go out the emergency bypass, even when capacity through the secondary process and/or ORF unit was still available.

They fabricated a new bar screen for the bypass, getting input from the Massena public works department welders, and included a channel in front of the screen. Then, by adding three 2- by 6-inch stop boards in the channel, they increased the storage capacity there by 16.5 inches.

"That allows us to direct more flow to the plant and less out the emergency outfall," explains Zappia. Using the plant SCADA system, the staff also implemented a monitoring program at the influent channel to identify and correct any influent pump plugging problems. "Once a week we run our pumps at 100 percent capacity," says Zappia. "We know what the maximum flow is, so if the pumps are obstructed, we can back-flush, or open them up and inspect and clean them.

"Tim helped us establish a baseline by bringing in a flowmeter. We spent a day flow-testing all four of our pumps and establishing baselines for every possible combination (e.g. one pump running, two pumps running)."

These days the rains (33 inches a year) and spring runoffs (from 70 inches of snowfall) continue in Massena, and the old combined sewer system still delivers high flows to the treatment plant. But the water quality of the Grasse River doesn't suffer as before, thanks to a very effective team effort.

"DPW superintendent Fayad gave us the green light and was always supportive of our actions," says Zappia. "And as far as who did what, whoever was in the maintenance slot for that week would work directly with Tim. Everyone had a hand in it." tpo

more info:

Komline-Sanderson
800/225-5457
www.komline.com

Trojan Technologies
519/457-3400
www.trojanuv.com

Solar Proves its Power

A SMALL WASTEWATER TREATMENT PLANT IN MASSACHUSETTS CUTS ITS ANNUAL ELECTRICITY BILL IN HALF WITH A FIXED-ARRAY PHOTOVOLTAIC SYSTEM

By Doug Day

PHOTOS COURTESY OF THE CHARLEMONT WASTEWATER TREATMENT PLANT

With little available property, a photovoltaic system mounted on poles next to the filtration beds has been an effective solution for the Charlemont treatment plant.

Dawn Peters laughed when writing a $108 check for the monthly utility bill for the Charlemont (Mass.) Wastewater Treatment Plant.

Granted, Charlemont is a small, rural town of 1,300 people, and the 20,000-gpd plant serves only part of the town, about 190 households. Still, its annual electric bill is about half of what it used to be, thanks to a photovoltaic solar system installed in 2005.

The town's sewerage district was created in the early 1990s and the plant went online in January 1992 to help protect the Deerfield River, a popular resource for fly fishing, kayaking, canoeing, tubing, swimming, and camping. "A lot of the septic systems near the river weren't working, and a lot of people didn't have septics and were dumping right into the river," Peters says.

Thirteen years later, the treatment plant became the first in the state to use solar energy when it tapped into funds from the Massachusetts Renewable Energy Trust. The program covered half the $150,000 installation cost through a cash grant and with production credits over three years. The district paid the balance out of cash reserves.

> "The week we turned it on, the electric rates went up. We were grinning. Every time the rates go up, we win."
> **DAWN PETERS**

SMALL BUT EFFECTIVE

The 14.5-kW system includes 96 solar panels from Isofoton of Málaga, Spain. A local worker-owned company, PV Squared (Pioneer Valley PhotoVoltaics Cooperative), installed them in arrays of 12 panels on eight 16-foot metal posts near the plant's filtration beds and ran all the wiring, completing the project in less than a month.

From installation to operation, the project has had no impact on operations or operators, other than a significant savings. "It just sits there and it works," says Peters. "That's what I love about solar. PV Squared does a maintenance check every two years to make sure everything is operating correctly, and that's it."

The plant's annual electric bill was more than $5,000 before the photovoltaic addition and is now around $2,500. "The week we turned it on, the electric rates went up," Peters says. "We were grinning. Every time the rates go up, we win." The district planned for a 17-year payback, but Peters believes it will be shorter than that.

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.**

FIXED SYSTEM

The system went online in May 2005 and was designed to provide about half of the plant's annual electricity. It is actually providing about 54 percent of the power for the plant's pumps, motors, lights and other equipment. The only items operators have to watch are the single cooling fans on each inverter that coverts DC power to AC.

The panels are permanently aligned to maximize sun exposure but do not track with the sun — that would have cost more. "You would be adding moving parts that require maintenance and use power," Peters says.

Since the system does not use storage batteries, any excess electricity goes right back into the grid. "When the sun is out and we're getting good electricity production, the electric meter is running backwards," says Peters. "That is so nice to see. I used to stand there and just stare at it for a few minutes."

The solar energy system includes photovoltaic inverters from Fronius USA.

Contrary to what many people believe about solar, the panels produce some power on overcast days — about 15 to 20 percent of maximum output.

IS BIGGER BETTER?

Peters says the district would have liked a bigger system to provide all the plant's power, but that would have been too costly, there wasn't enough room on the property, and the building roof isn't aligned properly to take advantage of sunlight. "If we had the space, we would definitely consider doubling the size," says Peters.

The Charlemont plant is very basic, with settling tanks and recirculating sand filters. "We don't have aeration, which is a big consumer of electricity," Peters says. "To the large plants, our electric bill is laughable." On the other hand, she says, large plants have more complicated systems, and many were designed at a time when energy efficiency was less of a concern. That gives them even more savings opportunities.

GROWING PROGRAM

The state's solar rebate program issued awards for 23.5 MW of solar power in less than two years with a goal of 250 MW by 2017. More than 1,200 homeowners, businesses, and municipalities took advantage of the program, which is now part of the Massachusetts Clean Energy Center, formed to promote a green economy by supporting research and development, entrepreneurship, and workforce training.

The two programs were merged this year to provide "a one-stop shop for development and deployment of clean energy innovations," according to Ian Bowles, Energy and Environmental Affairs secretary and chair of the center's board of directors.

In fiscal 2009, the trust provided $55 million for more than 800 renewable energy projects, including wind, hydroelectric, biogas, and fuel cell projects in nearly 300 cities. That included $28 million for 10 MW of photovoltaics, $4 million for 49 wind projects, $1.7 million to improve output from five hydroelectric plants, and $1.5 million for bioenergy and biofuels.

Massachusetts now requires new plants to be designed for efficiency and to include alternative energy sources. Older plants are also being refurbished with green technology. "I'm so happy to see that," says Peters, a long-time fan of solar energy. And every month, she can feel happy as she writes out that utility check. tpo

more info:

Fronius USA LLC
810/220-4414
www.fronius.com

Isofoton
202/463-7877
www.isofoton.com

A Fix for Ammonia

AN INTEGRATED FIXED-FILM ACTIVATED SLUDGE FACILITY HELPS A COLORADO SANITARY DISTRICT ACHIEVE CONSISTENT COMPLIANCE DESPITE A HARSH CLIMATE

By Ted J. Rulseh

The Fairplay (Colo.) Sanitation District faced a challenge with inconsistent ammonia removal. The treatment plant consisted of aerated lagoons totaling more than 7.4 million gallons at about 10,000-feet elevation.

Influent water temperatures were regularly recorded between 43 and 50 degrees F. In addition, groundwater table fluctuations affected the performance of the aeration lagoons.

Because of the harsh climate, with freezing temperatures most of the year, the plant was not achieving nitrification consistently. The lagoons brought the additional challenges of excess algae growth in summer and freezing in winter.

The district solved the problem by constructing an AnoxKaldnes Hybas biological treatment process that consistently treats the wastewater even during harsh weather. The plant (300,000-gpd maximum month design, 100,000-gpd average daily flow) now easily meets ammonia permit limits that range seasonally from 20 to 45 mg/l.

"I have been a licensed wastewater operator since 1978, and this is the easiest, most forgiving mechanical wastewater plant I have ever operated."

DAVID STANFORD

PHOTOS COURTESY OF H2O CONSULTANTS

David Stanford, contract wastewater operator, records pH and temperature readings from the Allen-Bradley (Rockwell Automation) computer operations system at the Fairplay Wastewater Treatment Plant, using a handheld PC with Hach Co. WIMS Portable for downloading to the district's database program. The WIMS program automatically generates monthly Discharge Monitoring Reports for the plant from the district's computer.

The plant became operational in winter 2008. Ammonia levels in effluent discharged to the Middle Fork of the South Platte River are around 0.1 mg/l, from influent typically containing 20 to 30 mg/l, according to David Stanford, president of H2O Consultants, who operates the plant for the district.

SMALL AND EFFICIENT

The district leaders were concerned with finding a solution to work in the harsh climate and provide consistent effluent quality. The process would also need to be able to meet effluent quality regulations well into the future.

The district's engineer worked with Kruger Inc., a Veolia Water Solutions & Technologies company, to design an integrated fixed-film activated sludge (IFAS) process with internal recycle for partial denitrification. The small footprint maximizes heat retention by not allowing the wastewater time to cool off before treatment. The completely covered process allows effective treatment while providing winter protection for both the operators and equipment.

Before construction, stainless steel aeration equipment for the aeration basins and the dry IFAS media (in bags) were stored on the grounds at the Fairplay plant.

Share Your Idea

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

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

The IFAS system media in the basins, showing the stainless steel screens used to keep the media in the basin when it is added.

The facility includes an anoxic reactor, 125,000 gallons of aerobic volume, and two rectangular clarifiers connected with the headworks, pumping systems, laboratory, disinfection and ancillary equipment in a single structure. The new flow scheme consists of:

- Headworks, including comminutor, 3-mm spiral screen and grit removal.
- Influent pump chamber.
- Two trains each of one anoxic reactor and two aerobic reactors containing AnoxKaldnes K1 media.
- Secondary clarification.
- UV disinfection.

One of the existing lagoons was converted to an aerated sludge holding pond for waste activated sludge (WAS). The IFAS reactors are 15 feet square by 16 feet side water depth (SWD) with media fills of 65 percent in the first reactor and 38 percent in the second. The design mixed liquor suspended solids is 3,000 mg/l.

The biological system is designed to treat screened influent down to 10-mg/l soluble BOD5 and 1.0-mg/l effluent NH3-N. The return activated sludge (RAS) rate has a maximum of 150 percent of influent flow, and the internal recycle design rate is 70 percent.

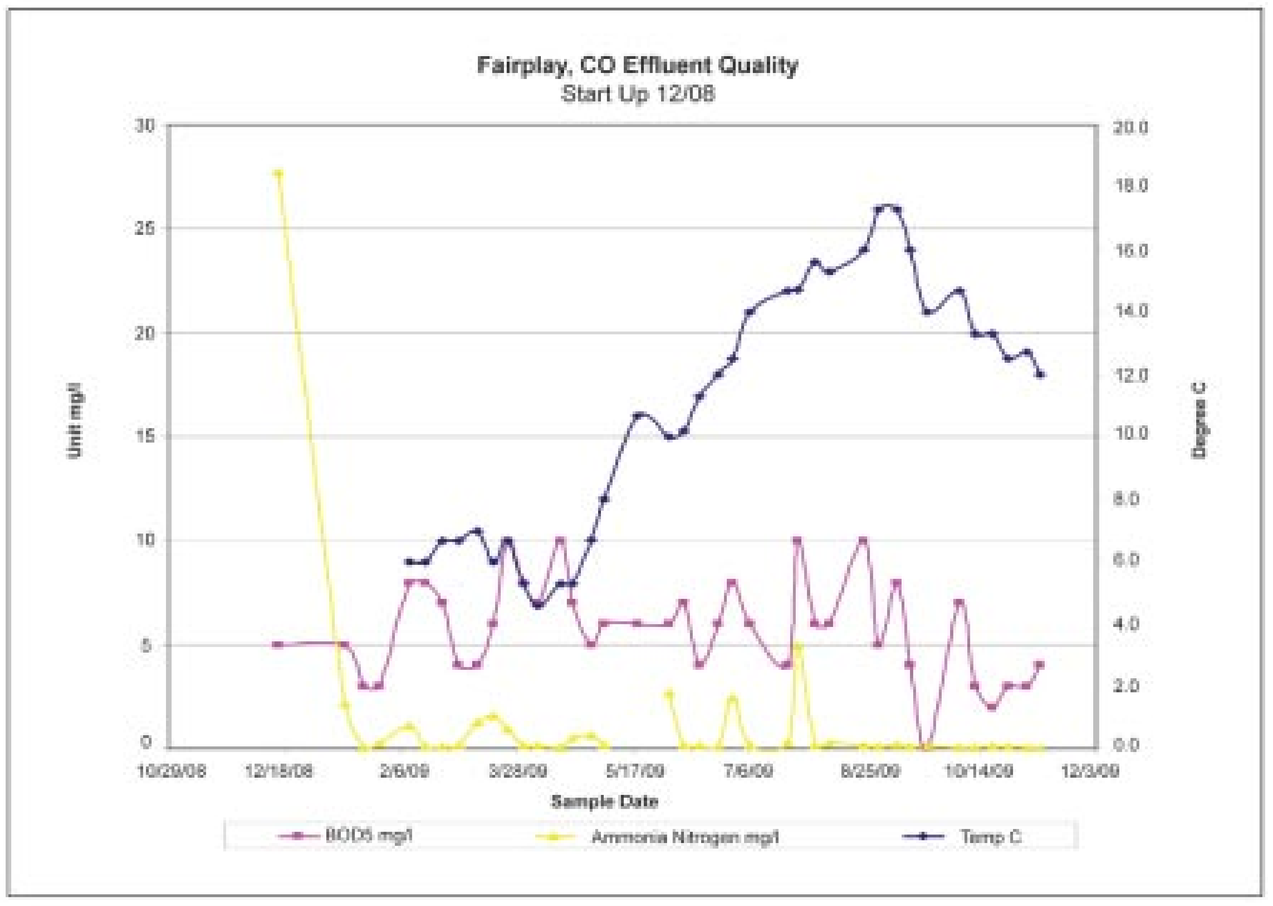
The plant is designed to have manpower requirements comparable to the previous lagoon system. An operator makes a walk-through each day and spends a half day on site twice per week. Because of the remote location and harsh climate, the plant design focuses on simplicity and consistent performance with little operator attention.

PROCESS DESCRIPTION

Hybas is the trademarked name for the Kruger AnoxKaldnes IFAS technology. The core principle of the process is the use of nonclogging biofilm carriers placed in an aerobic reactor with activated sludge mixed liquor. An engineered aeration system mixes the media and mixed liquor in the reactor.

The carrier media does not require backwashing, has a low headloss, and provides a high specific surface area for biofilm development. The media is retained within the reactor using stainless steel retention screens, while the mixed liquor passes through and is settled in the secondary clarifiers. An added benefit of the IFAS principle is that it increases nitrification capacity without increasing the solids loading rate to the clarifiers.

The biofilm carrier elements are made of high-density polyethylene and have a specific gravity of about 0.95. The addition of media to the aeration basins makes it possible to maintain nitrifying biomass in a much smaller footprint than with conventional activated sludge systems.



The yellow line on the graph shows total ammonia in the plant effluent and the drastic decline after installation of the IFAS process.

A volume of 6,427 cubic feet of AnoxKaldnes K1 media, aeration grids and media retention sieves have been installed for the 0.3-mgd plant upgrade. The predenitrification zone is designed to combine nitrified internal recirculation, raw influent, and RAS to achieve total nitrogen removal and partial BOD reduction upstream of the aerobic IFAS zones.

The pieces of media function as what operator David Stanford calls "bug condos." Bacterium attach to the plastic media so that even if excessive sludge is wasted from the system, the process still performs.

SIMPLE AND EFFECTIVE

Stanford is pleased with the ammonia removal and overall performance of the plant, designed by Burns and McDonnell Engineering. "I have been a licensed wastewater operator since 1978, and this is the easiest, most forgiving mechanical wastewater plant I have ever operated," he says.

"Andrew Waddoups, our engineer from Burns and McDonnell, told me at the beginning that this plant would depend on only two things: aeration and sludge wasting. As long as you waste from the plant at the proper rate on a continuing basis, and make sure your blowers are operating correctly, the process will perform.

"You have a circular plastic media with a whole lot of surface area, and your nitrifying bacteria adhere to the plastic. When you examine the media, you can see with the naked eye the biomass growing on it. When you keep such a large biomass in play — when you're running at 3,000-mg/l MLSS — your uptake of ammonia is awesome." tpo

more info:

Hach Company
800/227-4224
www.hach.com

Kruger Inc., a division of Veolia Water Solutions & Technologies
919/653-4574
www.krugerusa.com

Rockwell Automation Inc.
519/623-1810
www.rockwellautomation.com

top performer: **BIOSOLIDS**

Biosolids from three Manatee County plants are handled at a residual management facility at the Southeast Water Reclamation Facility. (Photos by Villetto Photography)

Garbage In, *Resource Out*

LANDFILL GAS POWERS A DRYER THAT PRODUCES CLASS AA PELLETS USING BIOSOLIDS FROM THREE TREATMENT PLANTS IN MANATEE COUNTY, FLA.

By Diane Gow McDilda

MANATEE COUNTY BORDERS THE GULF OF MEXICO IN SOUTHWEST FLORIDA. Named for the sea cows that swim in its waters, it's a laid-back tourist destination with more than 150 miles of beaches. The county hasn't grown as fast as other parts of Florida, but that doesn't mean it isn't progressive, especially in handling solids from three water reclamation facilities (WRFs).

"We saw the writing on the wall: Class B solids are a thing of the past," says Christian (Chris) Collins, who serves as both the biosolids supervisor and the MARS (Manatee Agricultural Reuse System) coordinator for the county.

The writing came in the form of legal action. "There's a push Florida-wide to stop land spreading of Class B solids," Collins says. After the lawsuits started, land application sites began to disappear, and the county looked at various systems to upgrade the quality of its biosolids. Using criteria such as reputable long-term service, experience in the field, and solid safety records, the county chose the Andritz Separation Inc. drum drying system to produce Class AA biosolids pellets.

"The Andritz dryer and pelletizer is basically a drum dryer with a heat source at our end," says Collins. In this case, the heat source is landfill methane, which fuels the burner that heats the dryer to produce nitrogen-rich pellets.

COME TOGETHER

The county's biosolids come from the North, Southeast, and Southwest WRFs. Solids are transported via pipeline or truck to the residuals management facility (RMF) at the Southeast WRF, where they are dried and pelletized.

The three reclamation facilities use activated sludge systems. At the Southeast WRF, the 11.0-mgd flow is split between three anoxic basins and three aeration basins, followed by four clarifiers. Waste activated sludge from the clarifiers is pumped to a gravity belt thickener and then on to two 1-million-gallon sludge storage tanks, where it is aerated using coarse-bubble diffusers. Stabilized solids are dewatered using two belt filter presses.

At the North WRF, the 5.4-mgd flow is treated with two Carrousel oxidation ditch treatment units, each with a 0.6-million-gallon anoxic

Stud Stephens, biosolids operator III, lifts an Ashbrook Simon-Hartley belt filter press plow row for cleaning.

profile

Southeast Water Reclamation Facility, Manatee County, Fla.

BUILT:	1988 (upgrades in 2002, biosolids facility constructed in July 2008)
FLOWS:	11.0-mgd design, 4.9-mgd average, 5.3-mgd peak
TREATMENT LEVEL:	Tertiary, sand filters and nitrification/denitrification
TREATMENT PROCESS:	Activated sludge
RECEIVING WATER:	Zero discharge; all effluent reused
OPERATORS:	Christian Collins, supervisor; Paul Fulford, senior operator; Stud Stephens, operator III; Matt Duff, operator II
BIOSOLIDS PROCESS:	Anaerobic digestion, belt filter press dewatering
BIOSOLIDS VOLUME:	4,000 dry tons/year
BIOSOLIDS USE:	Land application of Class AA pellets (~90 percent solids)
WEB SITE:	www.mymanatee.org

PHOTO COURTESY OF THE MANATEE COUNTY TREATMENT PLANTS

Workers unload the Andritz separation drum during construction of the dryer and pelletizer at the residuals management facility.

The Andritz drum drying system produces Class AA biosolids pellets for beneficial use.

basin and a 3.1-million-gallon aeration basin, followed by two clarifiers. Waste activated sludge from the clarifiers is pumped to two dissolved-air flotation thickeners, two aerobic digesters, and then on to three belt filter presses.

The Southwest WRF treats its 18 mgd using four primary clarifiers and four aeration basins, two sized at 1 million gallons and two at 0.75 million gallons, followed by four secondary clarifiers. Biosolids are managed first by two gravity thickeners with dissolved-air flotation, then on to six 2-meter belt filter presses.

The Ashbrook Simon-Hartley (Klampress-85) belt filter presses used at each WRF produce material at about 16 percent solids. Solids from the North and Southwest facilities are pumped straight from the belt filter presses into 30-cubic-yard trucks. A single contractor hauls material from both plants, each about 10 miles from the RMF.

On arrival at the Southeast plant, solids are emptied into bins outside the dryer building. Solids generated at the Southeast WRF are pumped directly to a bin inside the dryer building. Solids from the outside bins are pumped to the bin inside the dryer building, where the pelletizing process begins.

Since the inception of pelletizing, operators at the three reclamation facilities have had to pay more attention to biosolids consistency. "It has surely created more awareness," says Collins. "The dryer works better when processing cake in the 15 to 20 percent solids range. In the past, the plants wanted to make the cake as dry as possible because it saved on hauling costs."

MAN FROM MARS

Chris Collins

Before becoming Manatee County's biosolids supervisor, Chris Collins spent several years coordinating the Manatee Agricultural Reuse System (MARS), a network that makes sure reclaimed water is consistently available throughout the county. He still holds the position, splitting his time between water reclaim and biosolids.

The MARS was activated in 2006 to provide an alternative water source and alleviate draws on one of the most stressed aquifer recharge areas in Florida. "My job is to coordinate the flow of reclaimed water throughout the county," Collins says. "I have daily interaction with chief operators at the reclamation facilities and set up the flow of reclaimed water accordingly."

When the dryer came online in 2008, the MARS was operating smoothly, and Collins didn't want to give up his work with reclaimed water. "My main goal is getting people educated on reclaimed water and where it comes from," he says. "When homeowners have a sprinkler system operated with reclaimed water, they assume there should never be a problem getting water, but there are times when a facility is having issues and has to shut down the reclaim pumps."

Reclaimed water systems don't have the reverse 911 safety features of a potable water system. That means when the system is down, the phone starts ringing. "I actually enjoy handling the phone calls because anytime I can talk about my work, it makes me happy," says Collins. So far, he has a success rate of 100 percent: Everyone he speaks with ends up thanking him for the explanation and education.

INTO THE DRUM

From the bin, material is conveyed to the dryer drum, where air heated in the burner dries the solids. As the material tumbles about the screened drum, pellets form. Separate consecutive screens sort them by size. Pellets that are too small go back to the beginning and mix with incoming material. Pellets that are too large are crushed and go to the beginning.

"About 25 percent go back to the beginning and 75 percent go

Members of the Manatee County residuals management team: From left, Paul Fulford, senior biosolids operator; Stud Stephens, biosolids operator III; Chris Collins, supervisor; Matt Duff, biosolids operator II; James Pusateri, biosolids operator III.

Manatee County Water Reclamation Facility
REUSE PERMIT REQUIREMENTS

PARAMETER	PERMITTED AVG.
BOD	20 mg/l annual avg. 30 mg/l monthly avg. 45 mg/l weekly avg. 60 mg/l max.
TSS	5.0 mg/l
Total residual chlorine	1 mg/l
Fecal coliform	25/100 ml
Turbidity	1.0 NTU
pH	6.0 to 8.5

to the silos," Collins says. "The two storage silos can hold 100 tons of pellets each, and we produce about 20 tons a day." The three plants produce enough solids to run the dryers four days a week.

"We don't have enough sludge to run seven days a week," says Collins. "We're planning to get with local utilities to see if we can take their biosolids." For now, Collins and his crew of four get the dryers up and running on Monday and operate them through Thursday, enough time to empty the storage bins. Then they shut down from Friday through Sunday. When it comes to routine maintenance or fixing repairs, the downtime is a benefit.

IT'S A GAS

From inception, the team planned for the dryer to operate on county-generated methane, but the exact source needed to be decided. The staff considered using digester methane from the Southwest WRF, but only briefly. That plant is in the middle of town, surrounded by houses, and near Sarasota Bay. In addition, the plant does not produce enough methane to run the dryer.

A more realistic methane source was the Lena Road Landfill,

"It's been non-stop activity. We all love it because we're not just pushing buttons, there is always something going on. Someone's watching SCADA, someone's on the floor. We're taking solids from three plants, so if something happens, we have to fix it. We have to keep it running."

CHRIS COLLINS

"On Friday we have the maintenance guys come over," says Collins. "Some maintenance items can go unattended while we're running, like a small meter leak — that's not enough to keep us down. But larger things, like the oxygen temperature gauges, we have to take care of immediately, and we don't want to wait until Friday."

For the time being, pellets are taken to the Lena Road Landfill where they are mixed with soil and used as cover material. "It's a symbiotic relationship," says Collins. "They give us their methane, and we provide them with cover material."

on 1,200 acres next to the Southeast WRF. With the North and Southwest plants just 10 miles away, landfill gas was clearly the most viable option.

The landfill generates about 2,000 cfm of methane, more than the burner needs. Excess methane is flared. "We are tied into their air permit," says Collins. "We're going through an air permit upgrade right now. There's a lot more data to collect."

Air permitting has been one of the more challenging aspects of the project. "We have to collect an astronomical amount of data on a daily and hourly basis," Collins says. "And we have to have it

"On Friday we have the maintenance guys come over. Some maintenance items can go unattended while we're running, like a small meter leak — that's not enough to keep us down. But larger things, like the oxygen temperature gauges, we have to take care of immediately, and we don't want to wait until Friday."

CHRIS COLLINS

PHOTO COURTESY OF THE MANATEE COUNTY TREATMENT PLANTS

Aerial view of Southeast Water Reclamation Facility.

on record when the Department of Environmental Protection visits the site."

Because the heating value of methane is lower than that of pipeline natural gas, the burners use a blend. Natural gas is used to start the system, and then landfill gas is blended in. The final operating mixture is 80 percent landfill methane and 20 percent natural gas.

IN THE FUTURE

The county is pleased with the success of the pelletizing process, which transforms biosolids from Class B to Class AA, suitable for distribution as fertilizer. The county is now looking for a contractor to purchase all the pellets. "Their only responsibility would be to hold a Florida fertilizer license and take all of our product," Collins says. "County staff will continue to operate and maintain the facility."

When a contract is signed, Collins will continue as MARS coordinator and biosolids supervisor. He doesn't expect his workload to change — and that's a good thing. "It's been non-stop activity," he says. "We all love it because we're not just pushing buttons. There is always something going on. Someone's watching SCADA, someone's on the floor. We're taking solids from three plants, so if something happens, we have to fix it. We have to keep it running." **tpo**

more info:

Andritz Separation Inc.
800/433-5161
www.andritz.com

Ashbrook Simon-Hartley
800/362-9041
www.as-h.com

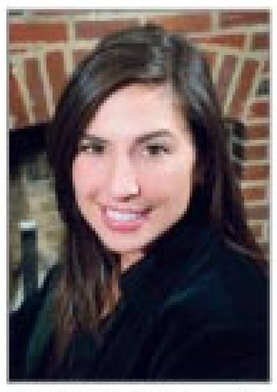
Bilco Launches New Web Site

The Bilco Co. has launched a new Web site, www.bilco.com, featuring product information, CAD details, specifications and submittal drawings. It also contains a trade show calendar, company news and downloadable product instructions and literature, case studies and videos.

Management and Operational Resources Transitions Ownership

Mark Simms, Sac City, Iowa, is the full owner of Management and Operational Resources after a transition in ownership. Simms, president/CEO, was one of three original founders of the company in 2004 and will continue in that role for the water and wastewater treatment operational services company. He is a graduate of Kirkwood Community College's water/wastewater technician program, has managed several treatment plants and holds the highest level of certification offered by the State of Iowa for wastewater operators.

Abboud Elected to WWEMA Board of Directors

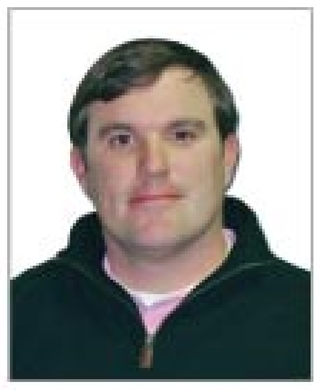

Nadia Abboud

Nadia Abboud, marketing manager, water purification, for Severn Trent Services, has been elected to a three-year term on the board of directors for the Water and Wastewater Equipment Manufacturers Association.

AWWA Publishes Security and Emergency Planning Book

The American Water Works Association has published *Security and Emergency Planning for Water and Wastewater Utilities.* The book, available at AWWA's online bookstore, www.awwa.org/bookstore, includes new laws, regulations, policies, procedures and requirements. Topics include natural, accidental and intentional threats, U.S. federal legislation and regulation, the Water Sector Specific Plan, vulnerability assessments, emergency management systems, water contamination warning systems, threat response, response training, remediation and recovery, and more.

Godwin Pumps Names Managers


Will Buddin


Bill Price

Godwin Pumps has named Will Buddin branch manager for its Raleigh, N.C.-based rental branch and Bill Price to the newly created position of Asset, Logistics and Transportation manager, based in Bridgeport, N.J. Buddin has seven years experience in the equipment industry and holds a bachelor's degree from The Citadel. Price has 20 years of industry experience.

Fort Lauderdale's WaterWorks Program Wraps Up Early

WaterWorks 2011, a $690 million program management initiative to overhaul Fort Lauderdale's water, wastewater and sewer infrastructure is reaching completion. CH2M HILL, an engineering, procurement, construction and operations firm, is expected to transition out of the project nearly one year ahead of schedule. Project goals included providing modern wastewater to all customers, improving the quality and reliability of drinking water, and leaving capabilities in place to sustain continued infrastructure development.

Mil-Ram Receives Product of the Year Award

Mil-Ram Technology received the 2009 Product of the Year Award for its TA-2048MB gas detection digital Modbus rack-mount controller from *Occupational Health & Safety* magazine at the annual National Safety Council Congress and Expo. Twelve winners were recognized in 11 award categories from among 40 entries. tpo

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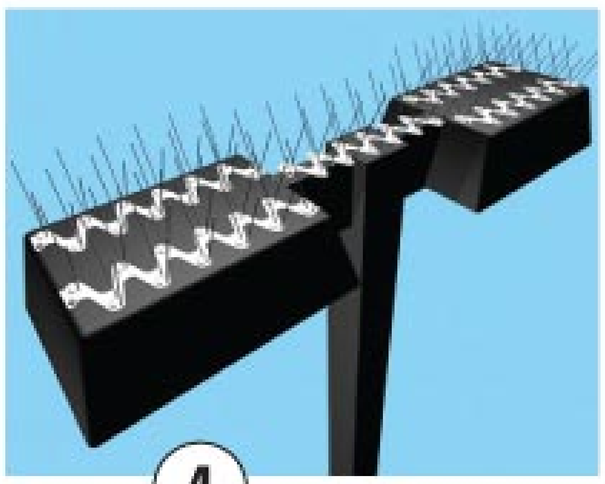
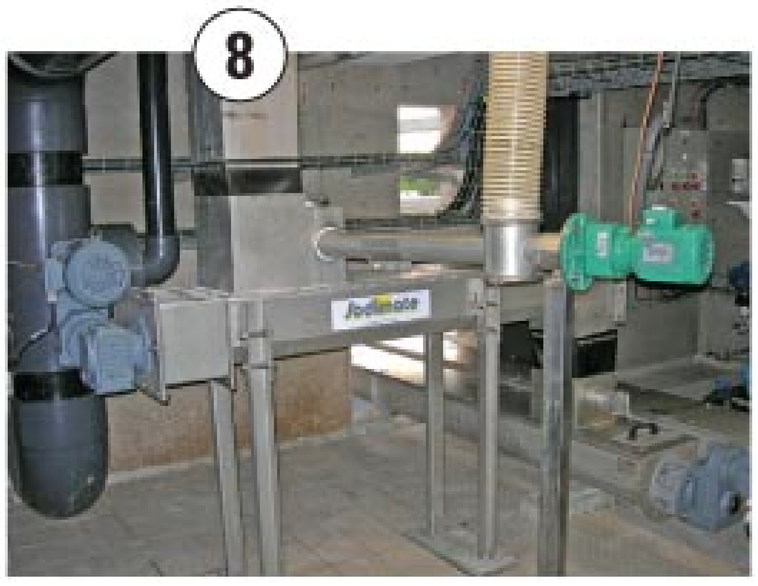




1. GORMAN-RUPP OFFERS ENGINE-DRIVEN TRASH PUMP

Gorman-Rupp Co. has an engine-driven version of its Ultra V series trash pump. The self-priming heavy-duty centrifugal pumps handle 1,825 gpm at 170 feet of total dynamic head. The series, introduced in 2005, has higher efficiency, increased suction port size, improved impeller design geometry, and a reduced noise level over previous models. **419/755-1011; www.gormanrupp.com.**

2. DUPERON OFFERS LOW-FLOW SCREENER

The FlexRake low-flow screener from Duperon features a front-clean, front-return bar screen designed for 1-mgd or smaller plants with channels 2-8 feet deep and 1.5-2 feet wide. UHMW SmartLink technology eliminates submerged lower sprockets, tracks or bearings and corrosion, while allowing "dry" operation. Thru-Bar scrapers clean three sides of the bar as well as cross members. The unit also features tear-shaped bars for efficiency and requires no scheduled lubrication or maintenance. **800/383-8479; www.duperon.com.**

3. HARTZELL OFFERS SERIES 41 FIBERGLASS CENTRIFUGAL FANS

Series 41 fiberglass centrifugal fans from Hartzell Fan Inc. are corrosion resistant and feature a one-piece, solid-molded fiberglass FA wheel. The backward curved fans are available from 12 to 60 inches and 800 to 90,000 cfm with static pressures up to 18 inches. **800/336-3267; www.hartzellfan.com.**

4. FLYBYE INTRODUCES BIRD DETERRENT

Bird spikes from Flybye Bird Control Products are a safe, cost-effective way to reduce the health risks associated with the bacteria and parasites in bird droppings. Installing the spikes on ledges around treatment plants deters medium-sized birds from landing and roosting. Because the spikes are made from lightweight stainless steel and have no plastic parts, ultraviolet rays cannot penetrate the base and break down the adhesive bonds. **800/820-1980; www.flybye.com.**

ABRESIST OFFERS EXTENDED LIFE PIPE COATING

Abresist basalt and Alresist alumina ceramic pipe lining from Abresist Corp. is designed for abrasive slurry systems and pneumatic systems in pressure or vacuum conditions, extending the life of piping systems up to 5 to 15 times longer than 1/2-inch wall cast iron. Pipes, elbows and fittings are custom-engineered for each application and can be provided in a variety of end connections to retrofit existing systems or for new installations. **800/348-0717; www.abresist.com.**

5. HENKEL INTRODUCES LOCTITE SEALANT

Loctite head bolt and water jacket sealant from Henkel Corp. is designed for use on threaded fasteners that penetrate into water or chemical jackets. The product lubricates threads, ensuring consistent torque values during assembly; seals and locks bolts to prevent prema-

ture loosening, and acts as an anti-seize agent, eliminating corrosion and facilitating removal. The sealant performs well on bolts with 1/2- to 3/4-inch diameters and long engagement areas. The black anaerobic paste resists temperatures of -65 degrees F to 300 degrees F and handles pressures to 10,000 psi. It is available in a 50-ml tube for hand application. **800/562-8483; www.henkela.com/mronew.**

6. SEW-EURODRIVE LAUNCHES DR MOTOR SERIES

The energy-efficient DR motor modular system from SEW-Eurodrive offers three efficiency levels: DRS Standard, DRE High Efficiency and DRP Premium Efficiency, which meets EISA 2007 and NEMA Premium standards for the U.S. The DR motor also offers customizable options, including brake size, cost-optimized encoders and mounting type. **864/661-1120; www.seweurodrive.com.**

OIL SKIMMERS OFFERS MODEL 6V BRILL RECOVERY SYSTEM

The Model 6V Brill oil recovery system from Oil Skimmers is designed to remove petroleum-based oils, animal and vegetable fats, grease and oily waste floating on water. Oil sticks to the outside of a specially formulated polyurethane, closed-loop collector tube that snakes over and around debris. It is lifted out of the water and drawn through scrapers that remove the oil. The clean tube is returned to the water surface to gather more oil. Tubes can withstand temperatures up to 200 degrees F and will not fracture in freezing conditions. Made with non-clogging, long-lasting components, the unit can run unattended 24 hours a day, year-round. The system can remove as much as 100 gallons of waste oil per hour, which can be decanted into drums for reuse or resale. **800/200-4603; www.oilskim.com.**

7. HIGHLAND TANK OFFERS ADVANCED FILTRATION SYSTEMS

Advanced Filtration Systems from Highland Tank are designed to remove a variety of hydrocarbons, from BTEX to crude oil, from water. The system features oleophobic filters that utilize a hydrocarbon removal technology that bonds hydrocarbons to the filter media, making them hydrophobic and visoelastic and removing them from the water. **814/893-5701; www.highlandtank.com.**

8. SODIMATE OFFERS MBV PADDLE SLUDGE MIXER

The MBV paddle sludge mixer from Sodimate is designed for sludge stabilization with quick or hydrated lime, producing a granular mixture product for agricultural spraying. The unit can mix from 0.5 to 15 tons per hour of dewatered sludge. Two counter-rotating shafts, fitted with intersecting and adjustable paddles, optimize the mixture. The unit has a stainless steel body and carbon-steel, abrasion-resistant steel or stainless steel rotors. **773/665-8800; www.sodimate-inc.com.**

9. VAL-MATIC OFFERS STAINLESS STEEL AIR VALVES

Stainless steel wastewater air valves from Val-Matic Valve & Manufacturing Corp. are available in sizes from 1 to 4 inches for single housing and from 1 to 8 inches for dual housing. The thinner wall valves are designed for the harshest conditions. **630/941-8042; www.valmatic.com.** tpo

product spotlight

Octopus Datalogger Offers Remote Monitoring

By Ed Wodalski

The Octopus telemetry logger from Halma Water Management is designed for multiple applications, including open-channel level and flow monitoring, flow and rainfall measurement, pump usage, and network pressure monitoring.

The logger offers five-year battery life, remote programming, multiple inputs and outputs and a fully submersible waterproof housing. It has multiple integrated telemetry options, including GSM and PSTN Landline, to transmit data automatically to the user. A switch option enables it to drive additional equipment, such as samplers.

"Whatever type of data needs to be logged, if it can be captured, it can be stored via the Octopus and then be plugged into SCADA systems," says Griff Machinski, Eastern U.S. sales manager for Fluid Conservation Systems Inc., U.S. sales and service arm for Halma Water Management products.

"It can work off its own radio telemetry, Short Message Service (SMS) or e-mail messaging. The datalogger plugs into any combination of sensor inputs, digital or analog, 4-20 milliamps." The telemetry unit can be used to monitor systems or tank levels. It also offers the benefits of a SCADA system in remote areas where power is not available.

Octopus telemetry logger from Halma Water Management

Data is processed using the Winfluid software package and is available for local PC and PDA download. Full telemetry programming, reporting and alarm options are offered. Made of diecast aluminum, the logger has an operating temperature range of -4 to 158 degrees F. **For information: 800/531-5465; www.fluidconservation.com.**

top performer: **PLANT**

Learning *New Tricks*

THE STAFF AT MARCO ISLAND MAKES A SUCCESSFUL TRANSITION FROM AN ACTIVATED SLUDGE FACILITY TO HIGHLY AUTOMATED MEMBRANE BIOREACTOR TREATMENT

By Jim Force

The newly updated Marco Island treatment plant is designed to meet strict discharge requirements created to protect the Gulf of Mexico. (Photography by Penny Taylor)

"Before, we only knew activated sludge. Now we know membranes, too. I think that gives our people a leg up in wastewater operations, especially in mechanical areas."

JEFF POTEET

IF YOU GREW UP RIGHT-HANDED, IT'S NOT EASY TO SWITCH TO LEFT-HANDED. THAT'S THE KIND of change the operations staff at the Marco Island (Fla.) Reclaimed Water Production Facility had to make in changing from a contact-stabilization plant to membrane bioreactors two years ago.

"It was a challenge, to say the least," says manager of utility operations Jeff Poteet. "It's pretty hard to go from one mindset — activated sludge — to highly automated membrane treatment. It doesn't run by itself. Our operators had to learn to watch for different issues."

Poteet, wastewater treatment manager Jake Hepokoski, lead wastewater operator Charley Remaks, senior project manager Dr. Bruce Weinstein, and their crew *have* learned the new system, and it's operating very well. That's the result of a comprehensive training program and extra attention they've paid to automation and control, including the creation of a new position devoted to instrumentation and troubleshooting.

MORE WATER, MORE TREATMENT

The big change at Marco Island was necessitated by increased flows and stricter discharge requirements. In an effort to protect the clean Gulf of Mexico waters that lap the local beaches and draw tourists and winter residents, city officials have launched a seven-year plan to phase out all septic systems (see sidebar).

That program was about 60 percent complete by the end of 2009, and it has only begun to increase flows. More flow will develop as the septic tank elimination program is completed and the largest parts of the expanded sewer system come online over the next two years. At the same time, the Marco Island facility had little room to expand, as it's located alongside one of the island's main canals and hemmed in by new commercial and residential development.

Combined, these factors led to the selection of the membrane bioreactor (MBR) process, which offers a high level of treatment while also saving space by eliminating conventional secondary clarifiers and tertiary filtration systems. "It was the only way to go," says Weinstein. "It's tight, but we've been able to triple our treatment capacity in the same footprint."

The Marco Island facility is about 40 years old, and the original treatment technology has been improved and expanded in many phases since the 1970s. Until the recent process change, the plant operated as a 3.5-mgd contact-stabilization-mode activated sludge process.

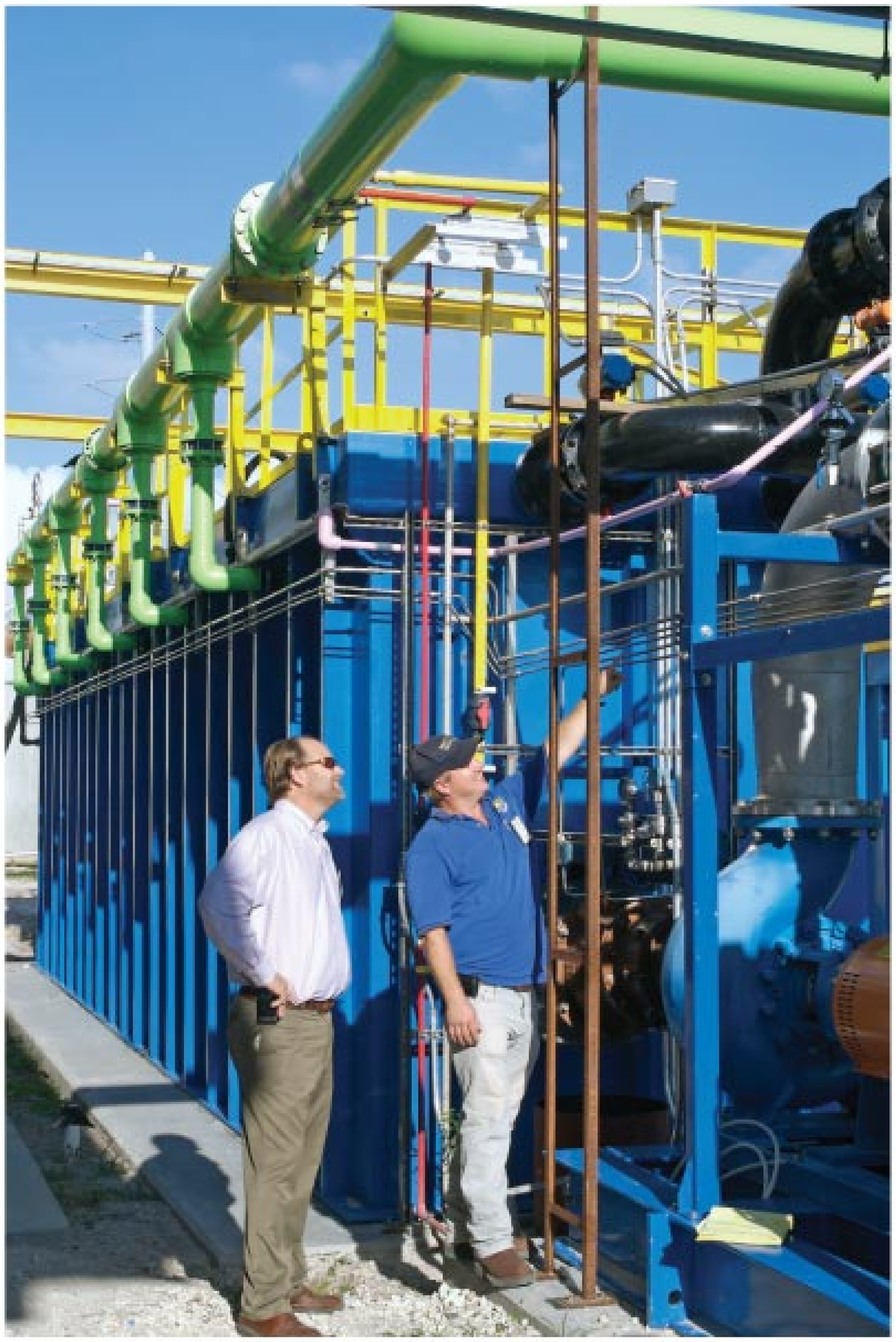
The changeover took place in three phases. The first phase did not increase the permitted capacity, but it added the first section of the MBR process while keeping a portion of the contact-stabilization-treatment train online. The staff took a 1.0-mgd package plant and converted it to a 3.0-mgd MBR. In the second phase, additional MBR units went into operation, and the remaining contact-stabilization process was taken out of service and demolished.

In subsequent phases, completed in late 2009, additional MBR capacity was installed so that the facility now has four trains online to handle up to 5 mgd, plus a fifth train that provides process redundancy.

profile

Marco Island (Fla.) Reclaimed Water Production Facility

BUILT:	1969 (last upgrade 2007)
POPULATION SERVED:	15,000 (35,000 in winter)
FLOWS:	4.92-mgd design, 1.8-mgd average
TREATMENT LEVEL:	Advanced
TREATMENT PROCESS:	Membrane bioreactor
BIOSOLIDS:	Dewatered, landfilled by contractor
RECEIVING WATER:	Reclaimed for irrigation, deepwell injection
ANNUAL BUDGET:	$2.5 million (operations)
WEB SITE:	www.cityofmarcoisland.com



Jeff Poteet, manager of utility operations (left), and Jake Hepokoski, wastewater treatment manager, check the pressure gauges on one of the GE-Zenon membrane filter trains.

Disinfection of effluent takes place in chlorine contact basins from Odyssey Manufacturing Co.

DISCONNECTING THE TANKS

Until five years ago, about 40 percent of Marco Island's residential parcels were unsewered. Since then, in an effort to protect water quality, the community has embarked on a seven-year program to disconnect all septic tanks and direct wastewater to the sewer system.

"We're about 60 percent complete," says manager of utility operations Jeff Poteet. A city ordinance requires property owners to disconnect their septic systems within 365 days of a notice of sewer availability. Failure to do so can result in a violation notice and possible legal action.

Septic tanks and drainfields do not need to be removed, but the contents of the tank must be pumped and treated, and the tank must be crushed and filled by a state-certified contractor.

The city can supply the necessary plumbing, or the property owner can hire a licensed contractor.

To minimize disruption of the landscaping, lateral trenches are dug by hand, and shrubs and flowerbeds will be replaced or replanted by the city. A pictorial sequence of a septic tank disconnect is on the city's Web site.

"Now we monitor different parameters and have had to learn new tasks. Biology is still important, but our systems now are more mechanical. We listen to make sure the pumps sound right, and we watch the valves and compressors. We've had to learn what the data means."

CHARLEY REMAKS

WATCHING THE CALENDAR

Construction managers had to keep a sharp eye on the calendar: They had to squeeze activity in between the rainy season (May-August) and the arrival of winter residents around the first of January. "That's a major reason we did this upgrade and expansion in phases," Weinstein says. "We had a finite window to get things done each season."

Today, raw sewage enters the Marco Island facility through a headworks equipped with 2-mm rotary drum screens. The flow then passes to one of two equalization tanks (750,000 gallons and 500,000 gallons). Then a splitter box directs the water to twin-modified Ludzack-Ettinger (MLE) biological processes where denitrification occurs in the anoxic zone, and nitrification in the aerobic zone.

After biological treatment, the mixed liquor from the aeration basin feeds the four trains of a ZeeWeed membrane system supplied by GE-Zenon (a Division of GE Water & Process Technologies).

Each membrane tank is designed to hold six cassettes of reinforced hollow-fiber membranes with a nominal pore size of 0.04 microns. The MBR operates at a mixed liquor suspended solids (MLSS) concentration of some 8,000 to 12,000 mg/l — quite a bit higher than for conventional treatment.

The membrane fibers are automatically cleaned with a clean-in-place back-pulsing process that forces permeate water back through the membranes. The membranes are also aerated to scour debris from the fibers, provide mixing within the process tank, and provide oxygen for the microorganisms.

When necessary, in-tank chemical cleaning can be automatically performed if membrane fouling reduces permeability below a specified level. The flexible four-train system allows operators to schedule cleaning during periods of low demand with one train offline.

Treated effluent flows into a chlorine contact system (Odyssey Manufacturing Co.) that uses sodium hypochlorite for disinfection. Then it is pumped to two 500,000-gallon reclaimed water tanks. The produced water

Jeff Poteet helped his team adjust from an activated sludge system to a highly automated membrane treatment approach.

Members of the Marco Island team: from left, Brian Rikkola, plant operator; Charley Remaks, lead wastewater operator; Steve Shelton, plant operator; Jeff Poteet, utility operations manager; Jake Hepokoski, wastewater treatment manager; Daniel Bernabee, plant operator; and Brad Price, plant operator.

is used for irrigation at two golf courses, Hideaway Beach, the elementary school, condominiums, and hotels.

Any excess is pumped to a deepwell injection site. The facility is staffed around the clock: Teams of eight plus a chief operator work 12-hour shifts. A citywide crew of nine specialists provides maintenance. A Wonderware SCADA system controls plant processes.

CDM served as the consultant on this project. Dan Higgins Construction built the first phase, and Cardinal Construction is building the second and third phases.

A DIFFERENT BALLGAME

While the Marco Island team agrees that MBRs were the right solution, the change required special attention and training, especially in instrumentation and control. "We were used to monitoring the biological processes here, paying attention to settling in the clarifier as a measure of performance," Remaks says.

"But now we monitor different parameters and have had to learn new tasks. Biology is still important, but our systems now are more mechanical. We listen to make sure the pumps sound right, and we watch the valves and compressors. We've had to learn what the data means."

Poteet and Hepokoski explain that Marco Island team members were trained extensively in the new process and were closely involved in construction before the MBRs started up. And as the changeover to membranes neared, plant management and operations took a comprehensive orientation program that included a number of activities:

- Traveling to the membrane manufacturer's site in Canada to view equipment as well as specific instrumentation and control sequences that would apply to the Marco Island project.
- Visiting other nearby installations that had similar membrane technology. An MBR project at Bonita Springs was being built concurrently with the Marco Island installation and provided useful information.

MARCO ISLAND (FLA.) RECLAIMED WATER PRODUCTION FACILITY
PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
BOD	200 mg/l	<5 mg/l	20 mg/l
TSS	138 mg/l	<5 mg/l	20 mg/l
Nitrates		4.9 mg/l	12 mg/l
Fecal coliform		ND	90% non-detect

ND = Not detected

"We realized that we needed a dedicated instrumentation and control person to manage the system and be able to troubleshoot alarms. Your typical operator doesn't walk around with a laptop."
JEFF POTEET

- Hosting an extensive training program conducted by equipment manufacturer representatives. The training sessions consisted of computer simulations, classroom exercises, and in-the-field applications. All members of the Marco Island operations staff and the utility's maintenance team took the training.

IT'S ALL ABOUT CONTROL

It didn't stop there. Mindful of the state-of-the-art instrumentation that controls the MBR system, Marco Island created a new position in instrumentation and control and filled it with an experienced specialist.

"We realized that we needed a dedicated instrumentation and control person to manage the system and be able to troubleshoot alarms," says Poteet. "Your typical operator doesn't walk around with a laptop."

Ivo Krizek fills that position. He was hired in August 2009 as senior instrumentation and control technician after a career of more than 20 years in systems integration, some of it involving pollution-control processes. "My job is to make sure the equipment is operating properly and to implement changes as necessary, citywide," Krizek says. "My main focus has been on the new systems at the reclaimed water facility."

Each of the first four MBR systems had its own dedicated equipment. "But with the fifth train, the equipment is shared," he says. "We had to change code to do that." Krizek works closely with instrumentation specialists from the membrane manufacturer and appreciates their help and technical support.

His responsibilities extend beyond the reclaimed water facility to the eight lift stations on the island and a reverse osmosis plant that treats brackish water for the water utility. "Most of our systems are connected to an Ethernet, some by fiber optics," Krizek says. "We have PLCs scattered all over the island, running equipment and tied back into our SCADA system."

Despite the extra effort, Poteet is happy with the results of the Marco Island project. "Overall, I'm extremely pleased," he says. "We've had great support from GE-Zenon, our effluent is superb, and our staff has come a long way in the last two years.

"Before, we only knew activated sludge. Now we know membranes, too. I think that gives our people a leg up in wastewater operations, especially in mechanical areas." As evidence, Hepokoski notes the passing rate for the wastewater operator certification test in Florida is about 50 percent. But recently, all three of Marco Island's candidates passed it on the first try. **tpo**

more info:

GE Water & Process Technologies
866/439-2837
www.zenon.com

Invensys Operations Management - Wonderware
949/727-3200
www.iom.invensys.co

Odyssey Manufacturing Co.
813/635-0339
www.odysseymanufacturing.com

people/awards

Wesley Sydnor was named Kentucky vice president and **Tim Kraus** was named Kentucky delegate for Kentucky Tennessee Water Environment Association.

The Central States Water Environment Association honored **Jim Roth** with the Arthur Sidney Bedell Award, the **Western Lake Superior Sanitary District** with the George Burke Jr. Facility Safety Award, **Dan Busch** with the William D. Hatfield Award, and **Marc R. Zimmerman** with the WEF Laboratory Analyst Excellence Award.

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

education

American Water Works Association

AWWA announced the publication of a new edition of The Water Dictionary, a desk reference providing definitions for more than 15,000 water- and wastewater-related words and phrases. It is available online at www.awwa.org/bookstore.

Illinois Water Environment Association

The IWEA offers an Advanced Water Treatment Technology course in Chicago April 27-29. Visit www.iweasite.org.

Indiana Water Environment Association

The IWEA offers the Wastewater Challenge in Shelbyville May 18-19. Visit www.indianawea.org.

Kansas Water Environment Association

The KWEA has these courses:

- April 1-2 – Wastewater Certification Preparation, Dodge City
- April 6 – Ethics, Ulysses
- April 7-8 – Wastewater Stabilization, Chanute
- April 8-9 – Wastewater Certification Preparation, Phillipsburg
- April 13 – Safety, Kinsley
- April 16 – Small Wastewater Systems, Syracuse
- April 21-22 – Utilities Management, Fort Scott
- April 22-23 – Wastewater Stabilization, Medicine Lodge
- April 27 – Wastewater Stabilization, Manhattan
- May 6-7 – Wastewater Reclamation and Reuse, Dodge City
- May 11 – Safety, Syracuse
- May 12 – Small Systems Wastewater Operations, Dodge City
- May 12-13 – Wastewater District School, Emporia
- May 14 – Small Wastewater Systems, Liberal
- May 20-21 – Natural Systems for Wastewater Treatment, Ulysses

Visit www.kwea.net.

University of Wisconsin

The University of Wisconsin Department of Engineering-Professional Development is offering a course on Designing Wastewater Pumping Systems and Lift Stations in Madison April 21-23. Visit http://epdweb.engr.wisc.edu.

Wisconsin Department of Natural Resources

The Wisconsin DNR has these courses:

- April 5-6 – Activated Sludge-Intro (Wastewater), Green Bay
- April 7-8 – Activated Sludge-Intro (Wastewater), Green Bay
- April 13-14 – Anaerobic Digestion-Intro (Wastewater), Chippewa Falls
- April 15 – Anaerobic Digestion-Advanced (Wastewater), Chippewa Falls
- April 19-20 – Mechanical Sludge Handling-Intro and Advanced (Wastewater), Madison
- April 20-21 – Lab-Advanced (Wastewater), Oconomowoc
- April 27-29 – Phosphorus Removal-Intro and Advanced (Wastewater), Stevens Point

Visit www.dnr.state.wi.us/org/es/science/opcert/training.htm. **tpo**

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

CALENDAR OF EVENTS

April 11-14
Kentucky Water and Wastewater Operators' Association Annual Conference, Galt House Hotel and Suites, Louisville. Visit www.kwwoa.org.

April 13-14
Georgia Association of Water Professionals Spring Conference & Expo, Columbus Convention & Trade Center, Columbus. Visit www.gawp.org.

April 13-15
Nevada Water Environment Association Conference, J.A. Nugget Hotel & Casino, Sparks. Visit http://nvwea.org.

April 18-20
North Carolina AWWA-WEA Spring Conference, New Bern Riverfront Convention Center, New Bern. Call 919/784-9030 or visit www.ncsafewater.org.

April 18-20
Water Environment Association of Ontario Annual Conference, London Convention Centre, London. Call 416/410-6933 or visit www.weao.org.

April 18-21
Alabama Water Environment Association, Perdido Beach Resort, Orange Beach. Call 205/349-0067 or visit www.awea-al.com.

April 20-23
California Water Environment Association Annual Conference, Sacramento Convention Center, Sacramento. Call 510/382-7800 or visit www.cwea.org.

April 25-28
Maritime Provinces Water and Wastewater Association Annual Seminar, Delta Brunswick, Saint John. Call 888/890-3222 or visit www.mpwwa.ca.

May 1-5
British Columbia Water & Waste Association Annual Conference, Whistler. Call 501/835-3811 or visit www.awwwea.org.

May 2-5
Arkansas Water Works & Water Environment Association Annual Conference, Hot Springs Convention Center. Call 501/835-3811 or visit www.awwwea.org.

May 3-5
Alaska Water Wastewater Management Association Annual Conference, Westmark Hotel, Sitka. Call 907/561-9777 or visit www.awwma.org.

May 5-7
Montana Water Environment Association, Hilton Garden Inn, Kalispell. Visit www.montana-awwa.org.

May 11-14
Central States Water Environment Association Annual Conference, Monona Terrace, Madison. Visit www.cswea.org.

May 23-26
West Virginia Water Environment Association Annual Conference, Davis. Visit www.wv-wea.org.

Advances in Monitoring and Instrumentation

By Scottie Dayton

ORTHO-PHOSPHOROUS ANALYZER

The single-sample-line, single-parameter ChemScan mini OP analyzer from ASA Analytics analyzes ortho-phosphorous. Large orifices in the sample flow paths seldom plug, and the analyzer operates for three months between reagent service. Wear items replace in less than five minutes. Sample blank analysis on every cycle simplifies set-up, reduces error, and eliminates calibration standards. **800/665-7133; www.asaanalytics.com.**

ChemScan mini OP analyzer from ASA Analytics

Duragauge pressure gauge from Ashcroft Inc.

BOURDON TUBE GAUGE

The Model 1279 bourdon tube Duragauge pressure gauge from Ashcroft Inc. has Model 100 or 200 diaphragm seals for long life and reliability. The instruments have a stainless steel movement and as-welded 4.5-inch solid-front phenolic case. They are available in dry, liquid-filled, hermetically sealed, weatherproof, or PLUS! (steadies the pointer and protects the movement from vibration and pulsation without a liquid fill). Numerous process connections, wetted materials, and optional flush port enable the gauge-seal combination to work in most caustic media up to 5,000 psi. **800/328-8258; www.ashcroft.com.**

V-2000 colorimeter from CHEMetrics Inc.

PHOTOMETER

The lightweight and field portable V-2000 microprocessor-based LED colorimeter from CHEMetrics Inc. is preprogrammed to measure 13-mm, 16-mm, or 1-inch cells in concentration, percent transmittance, or absorbance modes. Its interface/output logs 100 data points with date/time tags, then downloads them to a printer or computer. Self-filling Vacu-vial reagent ampoules provide accurate water-quality tests for more than 30 analytes including ammonia, chlorine, sulfide, and COD. **800/356-3072; www.chemetrics.com.**

BI-2000 respirometer from Bioscience Inc.

MICROBIAL RESPIROMETER

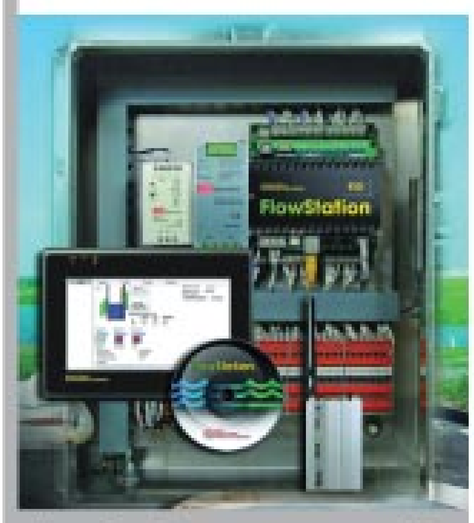
The automatic BI-2000 aerobic/anaerobic respirometer from Bioscience Inc. does BOD and bioremediation testing, biodegradability assessments, and toxicity screening studies of water, soils, sludges, and compost. Windows-based operating software adds flexibility with more reactor sizes and testing configurations.

The device continuously and precisely resupplies oxygen needed to sustain bioreactions in liquids or semi-solids even over extended periods in sealed reactors. It measures aerobic carbon dioxide evolution and anaerobic gas evolution, and does long-term OECD biodegradability testing from 50 to 104 degrees F. The unit sets up easily and has individual reactor control including stirring rate. **800/627-3069; www.bioscienceinc.com.**

RADAR WATER-LEVEL SENSOR

The CS475 sensor from Campbell Scientific mounts above the water, then uses radar (short microwave pulses) to measure the distance from the sensor to the surface. Changes in water levels from 2 inches to 65 feet calculate depth, flow rate, or volume. The sensor never contacts the liquid, has no moving parts, operates at -40 to 176 degrees F, and it is compatible with all SDI-12 output protocols. **435/753-2342; www.campbellsci.com.**

CS475 sensor from Campbell Scientific



FlowStation pump controller from Control Microsystems Inc.

PUMP CONTROL PACKAGE

The FlowStation out-of-the-box pump controller from Control Microsystems Inc. has a built-in Web server and user-friendly configuration interface for stand-alone installations or SCADA networks. It has event and alarm logging, remote notification of alarms via e-mail or system management server messaging, BlackBerry interface, wireless communication, and touchscreen options. Optional TelePACE ladder logic and C++ programming extend flexibility. **888/267-2232; www.controlmicrosystems.com.**

SMART FLOAT

The mercury-free Opti-Float level detector from Cox Research and Technology uses fiber optic cable to transmit a beam of light from an LED in a remote transceiver down to the float. The presence or absence of light activates a relay, which operates other devices. The dual DIN (top hat) rail-mounted transceivers connect to two floats and are safe in explosive areas such as wastewater pump station wet wells. The float, cable and UL/CSA-listed transceiver are tested to more than one million operations. **225/756-3271; www.coxresearch.com.**

Opti-Float level detector from Cox Research

A-21ZX digital ozone sensor from EcoSensors Inc.

OZONE DETECTION

The A-21ZX, a digital ozone sensor from EcoSensors Inc., provides portable ozone detection from zero to 10 ppm. The unit has a rechargeable eight-hour operation cycle, meets CE requirements, and can be equipped with a Model OG-3 ozone calibration source in 0.1- or 1.0-ppm output. **800/472-6626; www.ecosensors.com.**

LevelMaster monitoring system from EPG Companies Inc.

PUMP STATION MONITOR

The LevelMaster stand-alone liquid-level monitoring system from EPG Companies Inc. monitors and displays liquid levels in side slope risers, wells, tanks, sumps, reservoirs, and settling ponds. The system has the CH1000 liquid-level meter and sensor, and built-in thermostatically controlled panel heaters to maintain minimum temperature, eliminating condensation and optimizing accuracy. Options include intrinsic safe circuitry, level sensors with additional surge suppression, Tefzel sensor cables, and a portable 12-volt version. **800/443-7426; www.epgco.com.**

GF90 mass flowmeter from Fluid Components International LLC

GAS FLOWMETER

The automated GF90 mass flowmeter from Fluid Components International LLC continuously measures and controls chlorine dispensing for optimum water purity. Operators insert the meter in the chlorine gas process piping and wire its 4-20 mA output to the input/output modules in the automation system. The solid-state precision flow sensor reduces plugging and measures extremely low flow.

The unit measures air/gas flows from 0.25 to 1600 SFPS with a turndown ratio up to 1000:1. Measurements for fluid temperature are -100 to 850 degrees F and 1,000 psig. Its microprocessor-based programmable transmitter stores three gas calibration groups, each manually or automatically switched for a specific gas calibration. The instrument also measures mass flow and temperature. **760/736-6180; www.fluidcomponents.com.**

MONITOR SODIUM HYPOCHLORITE

The Hypo Trak sodium hypochlorite monitoring system from Force Flow allows tracking of usage, amount remaining, current strength, and hypo age from PLCs or SCADA systems. The unit also sends alarms indicating vapor-locked metering pumps and excessive chlorate formations. All functions are menu-driven, and configuration changes are done through the keypad. The monitor is housed in a NEMA 4X enclosure. **800/893-6723; www.forceflow.com.**

Hypo Trak monitoring system from Force Flow

FX-1000P analyzer from Foxcroft Equipment and Service Co. Inc.

CONTROL CHLORINE FEED

The Foxcroft FX-1000P amperometric chlorine residual analyzer from Foxcroft Equipment and Service Co. Inc. measures free or total chlorine residuals instantly, and continuously with an isolated 4-20 mA output that allows operators to control chlorine feed. A distilled white vinegar buffer prevents deposits of oil, grease, hydrogen sulfide, iron-manganese, and other materials.

The analyzer has field-adjustable operating ranges from parts per billion to 0-100 ppm undiluted, and high and low alarms. High-grade gold and copper electrodes, fixed sample and buffer feed rates, and continuous cell mixing and cleaning assure accurate readings. Solid-state analog electronics provide drift-free residual readings and output signal. **800/874-0590; www.foxcroft.com.**

WIRELESS AUTOMATION

The scalable IO expansion module from FreeWave Technologies has 12 input-output points per module and 192 IO points per 16-module stack for wireless automation requirements. The unit integrates with the FreeWave Modbus network. Operators can stack 16 modules on the radio or base, or use the unit as an expandable remote module through a serial connection. The unit is Class 1, Division 2 approved. **866/399-4930; www.freewave.com.**

IO expansion module from FreeWave Technologies

PCA 330 series chlorine analyzers from Hanna Instruments Inc.

EFFLUENT DISCHARGE MONITOR

Inline PCA 330 series free and total residual chlorine analyzers from Hanna Instruments Inc. monitor pH, ORP, and temperature. The units have two, 4-20 mA outputs for integration with most SCADA systems, and continuously monitor and control the chlorine content in wastewater up to 5 mg/l with an accuracy of ± 4 percent or ± 0.035 mg/l, whichever is greater. The analyzers have a user-programmable sampling rate from 2.5 to 99 minutes per sample and are based on the U.S. EPA-recommended DPD 330.5 method. **800/426-6287; www.hannainst.com/usa.**

NO3D sc nitrate immersion sensor from Hach Co.

NITRATE SENSOR

The NO3D sc nitrate immersion sensor from Hach Co. uses ion-selective electrode technology to measure nitrate ions in wastewater. Operators can monitor nitrogen removal online to control the nutrient removal process in treatment plants with less than 30 percent industrial waste. **800/227-4224; www.hach.com.**

TS4000H gas detector from General Monitors

HART PROTOCOL

The TS4000H toxic gas detector from General Monitors is compatible with HART communication protocol, which provides uniform and consistent communication without disturbing the 4-20 mA analog signal. This permits access to device configuration, diagnostics, and maintenance and alarm records.

Besides identifying hazardous gases, the detector safeguards against oxygen deficiency. It displays concentrations to 500 ppm, displays fault codes, prompts when calibration is needed, and provides complete status to the control room. Features include event logs, visible LED, and an indicator for remaining sensor life. The unit, in an explosion-proof housing, also is available in Modbus configuration with three 8-amp relays. **800/330-9161; www.generalmonitors.com.**

Rugged Dissolved Oxygen optical DO sensor from In-Situ Inc.

OPTICAL DO SENSOR

The U.S. EPA-approved Rugged Dissolved Oxygen (RDO) optical DO sensor from In-Situ Inc. withstands fouling, high-sediment loads, and rapid flow rates. Using optical- or luminescence-based DO methods, the abrasion-resistant sensor responds rapidly to changing levels, maintains a stable response even in hypoxic conditions, and operates with very low drift for long periods. Calibration and maintenance requirements are minimal. **800/446-7488; www.in-situ.com.**

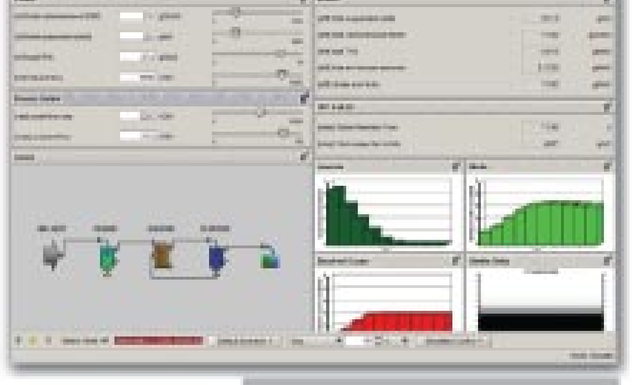
EXTERNAL FLOW METER

The PDFM 5.0 portable Doppler flowmeter from Greyline Instruments Inc. shows flow rate instantly when mounted on the outside of metal or plastic pipes. Operators enter the pipe diameter with the five-button keypad and the sensor displays, totalizes, and datalogs in gallons, liters, or other units. The handheld flowmeter includes 4-20 mA output and 320,000-point datalogger with USB output and Windows software. The rechargeable NiMH battery powers the unit for at least 24 hours. A pushbutton sleep mode extends battery life. **888/473-9546; www.greyline.com.**

PDFM 5.0 flowmeter from Greyline Instruments Inc.

OPTIMIZE OPERATIONS

GPS-X software from Hydromantis Inc. enables operators to improve the design and operation of most wastewater treatment plants. Users drag and drop unit processes to configure the facility, then calibrate the model using plant data and wastewater characteristics. The program carries out numerous what-if scenarios, such as taking tanks out of service, evaluating the effect of rainstorms, upgrading the facility with membrane bioreactors, adding fine-bubble diffusion, and changing RAS, WAS, or SRT. **905/522-0012; www.hydromantis.com.**



GPS-X software from Hydromantis Inc.

MX4 iQuad gas monitor from Industrial Scientific Corp.

GAS DETECTION

The water-resistant MX4 iQuad personal gas monitor from Industrial Scientific Corp. monitors four nontoxic gases and two toxic gases. The unit uses ultra-bright LEDs, a 95-dB audible alarm, and a vibrating alarm to warn users of hazardous environments. Its high-impact polycarbonate housing and protective rubber overmold are certified IP66 and IP67 to withstand dirty environments. **800/338-3287; www.indsci.com.**

LABELShop 2011XLB-PC thermal transfer printer from K-Sun Corp.

SAMPLE LABELING

The LABELShop 2011XLB-PC thermal transfer printer from K-Sun Corp. works with a computer or as a standalone for lab sample labeling, testing, and monitoring. MaxiLabel Pro software has more than 1,100 special characters, 150 preset wizards, date/time stamp, eight bar codes, and hundreds of special symbols for safety, electrical, and environment. Users can import logos, graphics, and symbols into custom designs. **800/622-6312; www.ksun.com.**

LEVEL TRANSMITTER

The LevelRat lift station level transmitter from Keller America Inc. has a durable and abrasion-resistant flush Kynar diaphragm that won't clog or foul when taking measurements in sewage or greasy/slurry conditions. The transmitter has standard lightning protection against damage from voltage surges and direct strikes. **877/253-5537; www.kelleramerica.com.**

LevelRat level transmitter from Keller America Inc.

THREE-IN-ONE

The Pocket H2S from KWJ Engineering is a hydrogen sulfide detector, alarm, and dosimeter in a 1-ounce package. The clip-on key-sized instrument has alarms in LED, audio, and vibration. The first alarm triggers at 10 ppm and the second at 20 ppm; 50 ppm is the highest level. It also has an eight-hour total weighted average warning alarm at 10 ppm. The instrument self-checks on startup. It has datalogging with renewable battery and sensor and electrochemical sensor response. **877/794-4296; www.kwjengineering.com.**

Pocket H2S from KWJ Engineering

Vibnode vibration-monitoring system from Ludeca Inc.

REMOTE MONITORING

The Vibnode 6- or 12-channel vibration-monitoring system from Ludeca Inc. lets operators access customized spectrums at remote pumping stations with pumps 100 to 130 feet deep. Submersible accelerometers at the drive end of the pump collect, evaluate, and report operating conditions to the plant SCADA. OmniTrend software stores and analyses spectrums that users can monitor and reference to narrow band alarms for text or e-mail notification. **305/591-8935; www.ludeca.com.**

MONITORS TOC/TC

In less than three minutes, QuickTOC and QuickTOC Loop Online analyzers from Liquid Analytical Resource LLC monitor total organic carbon up to 50,000 mg/l and total carbon without dilution. They also monitor memory effects, catalyst, or loss of volatile organic compounds (VOC). Operating at 2,192 degrees F, the units oxidize difficult substances even in high-salt applications. **978/425-0300; www.larllc.com.**

QuickTOC analyzers from Liquid Analytical Resource LLC

Model R82 radar transmitter from Magnetrol Environmental Inc.

PULSE BURST RADAR

The loop-powered non-contact Model R82 radar transmitter from Magnetrol Environmental Inc. is based on pulse burst radar technology with equivalent time sampling circuitry. It measures a 40-foot range by emitting short bursts of 26-GHz microwave energy that is reflected from the liquid-level surface. The unit configures with the menu-driven, four-push-button, two-line, 16-character display, HART digital communications, or PACTware. The options allow operators to configure the transmitter through the local user interface or remotely with the capability of capturing echo waveforms and viewing trend data and diagnostic conditions. **630/969-4000; www.magnetrolenvironmental.com.**

RACK-MOUNT SYSTEM

The TA-2048MB gas detection digital Modbus rack-mount controller from Mil-Ram Technology Inc. identifies hundreds of gases and vapors using 48 channels with three separate 16-channel Modbus networks. The multi-drop transmitter network eliminates separate wiring to each detector, while the auto-configuration wizard makes channel configuration automatic using the front-panel, pushbutton setup.

TA-2048MB gas detection controller from Mil-Ram Technology Inc.

The RS-485 digital Modbus RTU provides half- or full-duplex configuration. A backlit 16-character by 2-line LCD display auto-scrolls channel data and fault conditions, and continuous diagnostics. The controller uses local or remote power. **888/464-5726; www.mil-ram.com.**

Markland Model 502 meter from Markland Specialty Engineering

DENSITY METER

The Markland Model 502 suspended solids meter from Markland Specialty Engineering lets users easily measure the concentration of sludges or slurries without the reading being affected by color. In wastewater treatment plants, it is used to measure primary, secondary and return activated sludges and it can also monitor industrial sludges and process slurries. In drinking water plants, it can measure the concentration of backwash sludge from sand or membrane filters before it is sent for further processing.

The device uses the attenuation of ultrasound to read the concentration. It measures slurries that are too thick for optical methods. The meter can be mounted in open-top tanks or pipelines. Ultrasound is inherently safe and requires no permits or regulatory approvals to operate. **905/873-7791; www.sludgecontrols.com.**

CONTINUOUS GAS ANALYZER

The Sentinel S4 continuous online gas monitor from Vapex Products Inc. delivers a 50 percent reduction in scrubber chemicals. The unit operates as a scrubber control to measure internal gas and regulate chemical pump additions, or as a monitor that sends 4-20 mA signals indicating scrubber performance to existing control devices. It accommodates two to four hydrogen sulfide and chlorine sample points. The monitors have long-life sampling pumps, touchscreen interface, onscreen help functions, and data storage for scrubber analysis. **888/907-0004; www.vapex.com.**

Sentinel S4 continuous online gas monitor from Vapex Products Inc.

CORROSION MONITOR

The OnGuard 3000 atmospheric corrosion monitor from Purafil Inc. gauges the real-time effects of corrosion on electronics in control rooms, SCADA rooms, or motor control centers, and monitors corrosion in variable frequency drives or control panels.

OnGuard 3000 monitor from Purafil Inc.

It uses copper- and silver-plated quartz crystal microbalance sensors to measure the accumulation of corrosive film on sensitive metals.

The monitor generates minute-by-minute corrosion level readings that predict and prevent computer failure; increase instruments' reliability; identify air-quality trends; gauge temperature, relative humidity and differential room pressure; and project the environment's ISA severity level. The unit stands alone as a datalogger or connects to a distributed control system that uploads data to personal computers. **800/222-6367: www.purafil.com.**

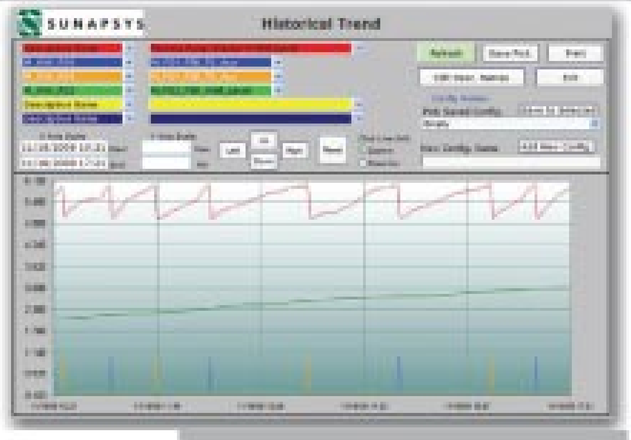
WEATHER STATION

The compact System 6A industrial weather station from Rain Wise Inc. has sensors for wind speed and direction, rainfall, temperature, relative humidity, and barometric pressure. Individual sensors are connected into a single support assembly that outputs in analog 4-20 mA or 0-10-volt DC current, Serial RS-232 or RS-485, and Modbus RTU. Solar radiation, soil temperature, and soil moisture sensors are optional. **800/762-5723; www.rainwise.com.**

System 6A industrial weather station from Rain Wise Inc.

TRENDING TOOL

The Web-based Trending Tool from Sunapsys Inc. lets operators spot operational issues before they become serious problems. The interface shows time-based data from any database or predefined trends. Users can map database field names to user-friendly names, export trends, and plot levels, flows, and pump status. Holding the mouse pointer over a trend reveals its actual point values. Features include scroll and zoom, drop-down menus, and pop-up calendars. **540/904-6862; www.sunapsys.com.**



Web-based Trending Tool from Sunapsys Inc.

SEL-2411 controller from Schweitzer Engineering Laboratories

AUTOMATION CONTROLLER

The SEL-2411 programmable automation controller from Schweitzer Engineering Laboratories qualifies for UL Class I, Zone 2 approval, operates at -40 to 185 degrees F, withstands 15-kV electrostatic shock, and resists 15-g vibration/shock. Built-in voltage and current connections allow operators to monitor electrical quality and power consumption. Access is through the front-panel display or SCADA networks. **509/332-1890; www.selinc.com.**

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COD REAGENTS

A complete line of chemical oxygen demand (COD) reagents from Orbeco-Hellige test ranges from zero to 15,000 mg/l. Packs of 25 or 150 vials have a measured amount of reagent, so operators just add water. Mercury-free reagents are available. **800/922-5242; www.orbeco.com.**

Steel-Trak Model 640S flowmeters from Sierra Instruments Inc.

THERMAL MASS FLOW METERS

Steel-Trak Model 640S immersible thermal mass flowmeters from Sierra Instruments Inc. are made of heavy-duty 316 stainless steel wetted materials. The high-temperature design withstands 750 degrees F. The 3/4-inch-diameter sensor probe inserts into ducts and pipes up to 72 inches and has numerous process connections including hot tap. For very large ducts, multipoint-flow-averaging arrays have touchscreens for field programming, meter validation, and diagnostics. Probes remove easily for cleaning. **800/866-0200; www.sierrainstruments.com.**

750-644 Bluetooth RF-transceiver module from Wago Corp.

BLUETOOTH RF TRANSCEIVER

The 750-644 Bluetooth RF-transceiver module from Wago Corp. provides fast, bidirectional wireless communication between input/output nodes. Within 10 ms, the unit exchanges data up to 3,281 feet (line-of-sight) or 328 feet (within buildings) for secure data transmission controller-to-controller during the treatment process. One master module communicates with seven slaves on a personal area network via Bluetooth 2.0+EDR radio technology. The module supports Ethernet I/P, Modbus TCP/IP, Profibus, DeviceNet, and CANopen technologies. **800/346-7245; www.wago.us.**

StacoSine active harmonic filter from Staco Energy Products

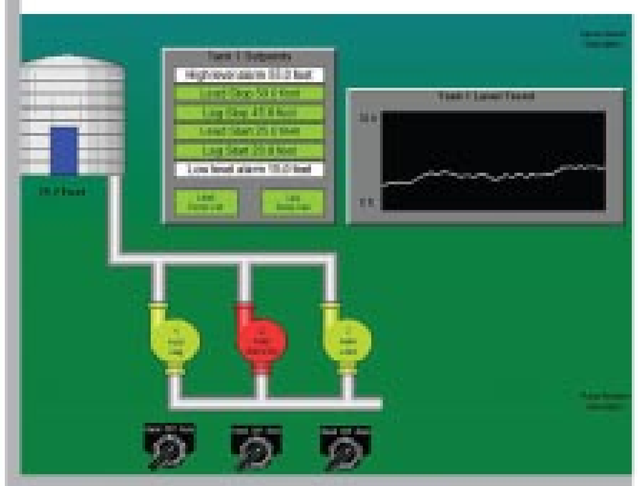
HARMONIC FILTER

The StacoSine active harmonic filter from Staco Energy Products alleviates problematic electrical harmonics in variable-frequency drives and pumps. Available from 25 to 300 amperes as a standalone or motor-control integrated system, it accommodates multiple-drive harmonic mitigation. The filter has a DSP controller with discrete fourier transform algorithm topology and analysis/calculate performance response time of less than 20 ms. Its LED graphic display has multiple operation and maintenance functions with 16-line and 40-character capability. The man-machine interface and analyzer provide operating data status and alarm information. **866/261-1191; www.stacoenergy.com.**

Wireless manhole monitoring system from Weidmuller

WIRELESS MANHOLE MONITORING

The wireless manhole monitoring system from Weidmuller is compact and easy to use and can send analog and discrete signals through the ground and steel manhole covers to receivers often blocks away. The energy-efficient unit also uses standard AA-sized batteries and is housed in an explosion-proof, Class 1, Division 1 enclosure with small external antenna. The portable system monitors water levels and high-low set points. **800/849-9343; www.weidmuller.com.**



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The Advantage complete SCADA solution from Total System Resources combines numerous functions. Logging of historical information and report generation provides easy access to data. Plant operators can create and edit graphic displays without stopping communications, and multiple communication protocols provide translation between different hardware vendors. A suite of specialized tools balances structure and flexibility to reduce integration and startup time. Embedded navigation tools simplify database management. **888/583-3001; www.tsr-advantage.com.**

COMPLETE TITRATIONS

The palm-sized, portable magnetic SpeedStir from Taylor Technologies makes speeds drop-count titrations such as the FAS-DPD test for free and combined chlorine. The stirrer thoroughly incorporates each reagent addition in a second. Operators simply place the water sample on the mixing platform, add the stir bar, turn it on, and dispense reagent. Six LEDs below the mixing platform illuminate the test sample, making color changes easy to see. The 600-rpm unit runs on four AA alkaline batteries and shuts off automatically after 60 seconds. **800/837-8548; www.taylortechnologies.com.**

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The Capital Controls Series 1870E chlorine residual analyzer from Severn Trent Services is an amperometric-based instrument that continuously analyzes free or total chlorine, chlorine dioxide, iodine, bromine, or other oxidants. The system has a field-selectable monitoring range from 0-0.1 to 0-20 mg/l. It incorporates a constant, direct-drive electrode cleaning system and provides consistent residual values. **215/997-4000; www.severntrentservices.com.**

Capital Controls Series 1870E analyzer from Severn Trent Services

Ultrameter II water quality monitor from Myron L Co.

WATER QUALITY MONITOR

The handheld Ultrameter II water quality monitor from Myron L Co. measures conductivity, resistivity, TDS, pH, ORP, and temperature using supplied internal sensors. Accuracy is ±1 percent of reading for conductivity/TDS/resistivity and ±0.01 for pH. The instrument, waterproof and submersible to 3 feet, has automatic temperature compensation to 77 degrees F, memory for 100 date/time-stamped readings, and a user-replaceable pH/ORP sensor. Features include one-touch measurement, easy keypad calibration, and IR port for fast data transfers with optional uDock. **760/438-2021; www.myronl.com.**

WIRELESS CONTROLLER

The wireless ConsoliDator from Precision Digital Corp. has four or eight channels and is easy to use. It accepts 4-20 mA, Modbus and flowmeter pulse inputs and displays them on a large backlit LCD screen. Its main screen displays inputs in numeric and bar graph format. Additional screens show detailed information about each input. The unit is suitable for all general-purpose monitoring and controlling applications, and can be installed up to 5 miles from the sensors with the pre-programmed wireless feature. **800/343-1001; www.predig.com. tpo**

ConsoliDator controller from Precision Digital Corp.

A Youthful Perspective

BRANDON JOHNSON TOOK A JOB AS AN OPERATOR AFTER HIGH SCHOOL AND QUICKLY SAW A GREAT CAREER. HE'D LIKE TO SEE THE INDUSTRY REACH OUT TO MORE PEOPLE IN HIS AGE GROUP.

By Ted J. Rulseh

Like most young people, Brandon Johnson never imagined himself in a wastewater treatment career. Now, he's happily employed as a wastewater operator with New Braunfels (Texas) Utilities (NBU).

Established in 1942, NBU provides water, wastewater and electricity services to the City of New Braunfels and employs about 200 people. The water system draws both from groundwater and the Guadalupe River, supplying about 3 billion gallons of water per year to more than 21,600 customers.

The wastewater system contains 331 miles of sewers and serves more than 18,900 customers. The three wastewater treatment plants have a total capacity of 8.4 mgd.

Johnson joined the NBU Wastewater Division about 18 months ago as an operator at the South Kuehler and North Kuehler wastewater treatment plants and soon saw a path to a satisfying career. He would like to see the wastewater treatment profession reach out more effectively to people his age and let them know about the many opportunities available in the field. He talked about his perspectives in an interview with *Treatment Plant Operator.*

"I was strong in science in high school, but I wasn't a big fan of math. Now we have to do the numbers for running our processes, and I just jump into it. The math doesn't bother me now. I really like what I'm doing."

BRANDON JOHNSON

tpo: How did you get started in wastewater treatment?

Johnson: Honestly, coming out of high school, I had no clue about wastewater. It was all behind the scenes to me — I didn't know anything about it. I was just looking for a job. I filled out job applications anywhere I could.

I knew people who worked for this company, and they said it was a good place to work. I was really trying to get into any position with New Braunfels, whether it was on the electrical side, as a meter reader, or anything that was available. The superintendent from the Wastewater Treatment Division called me back and said there was an opening there. I went in for interviews, and I found out it was something I would like to do. So I went ahead and pursued it, and I got the position.

I didn't think I'd be liking it as much as I do now. I thought I would stay for a little while and see what happened, but as it turned out, I really like it a lot.

tpo: How did your schooling and background prepare you to work in the wastewater treatment profession?

Johnson: In high school in New Braunfels, I took four years of automotive technician and three years of metal fabrication. Anytime there's a problem with my truck, I fix it. I'm the man to go to when anybody has a problem with anything mechanical. I figure out how to do it if I don't know how.

Brandon Johnson, wastewater operator at New Braunfels (Texas) Utilities.

I was strong in science in high school, but I wasn't a big fan of math. Now we have to do the numbers for running our processes, and I just jump into it. The math doesn't bother me now. I really like what I'm doing.

tpo: What is it about the career that you find especially satisfying?

Johnson: I like helping the environment and getting the feeling that I'm doing something worthwhile, instead of just collecting a regular paycheck. I'm helping out the fish and wildlife. I hunt for whitetail, antelope, fallow deer and axis. I've been fishing ever since I can remember. I've always loved the outdoors. I like keeping what we have in good health so everybody else is able to share it, too. It gives me a sense of fulfillment.

tpo: What are your responsibilities at the treatment plant?

Johnson: I do a little bit of everything. We rotate tasks every month, from working on the filter press, to working in the lab checking the ammonia, turbidity, DO, and chlorine residuals. I collect the samples from the treatment process. I receive and unload treatment plant chemicals, and adjust chemical doses as needed. I also operate and maintain pumps, motors, blowers and valves and perform maintenance and repairs on our mobile equipment.

tpo: How do you see yourself advancing in the profession?

Johnson: I've just acquired my Class D operator's license. I plan to take all the schooling to get my Class A license, and I also want to get a degree in biology from a local college. I'm still trying to figure out what kind of education program will suit my schedule for working full-time while going to school.

tpo: Who has been helpful to you during your first year on the job?

Johnson: I can't pinpoint a single individual. All my fellow operators have different skills and ways of doing things. I look up to all of them. They have ideas, both old and new, that help me out every day. Orlando Pena, who is the assistant plant superintendent, has been teaching me everything and helping me with my wastewater licensing. Whenever nobody else is there, he's always willing to help. Everybody is really good that way. If I need help, someone will come over and help me.

tpo: In your opinion, what can the industry do to attract more young people to join the ranks of operators?

Johnson: It's pretty basic. Let them know that they'll be helping the environment and will gain satisfaction from knowing that they're doing something positive. Also tell them that there will always be a need for wastewater operators. You'll always have a good job, and you won't have to worry about losing your job in tough economic times. There's good pay, and there's room for advancement. We're going to need more operators as the older professionals are starting to retire.

tpo: What are the best ways to get these messages to young people?

Johnson: Go to job fairs. I went to a couple of those when I was in high school, and I didn't see any wastewater agencies. And maybe there should be an introductory class in environmental services in high school. Students could learn about the professions and pursue those interests into college if they wanted to go further with it. I would also like to see the counselors in the high schools start talking about it.

There could also be advertising on the TV shows that kids watch all the time. Not necessarily an ad for a specific company — just for the industry itself.

tpo: How do people your age respond when you tell them you are a wastewater treatment operator?

Johnson: Sometimes at first they laugh when I tell them. Then I talk about how diverse it is and all the different things we do. You're always out in the field doing something, not just sitting behind a desk at a computer. They like that idea. It changes their perception, and some start seeing it as a profession to look into.

tpo: How do you see your career developing years from now?

Johnson: I would like to be in a position like the one my supervisor, Orlando Pena, has now. He started off with exactly what I was doing, being a plant operator, and he worked his way up to being assistant superintendent. I admire that. I look up to him. **tpo**

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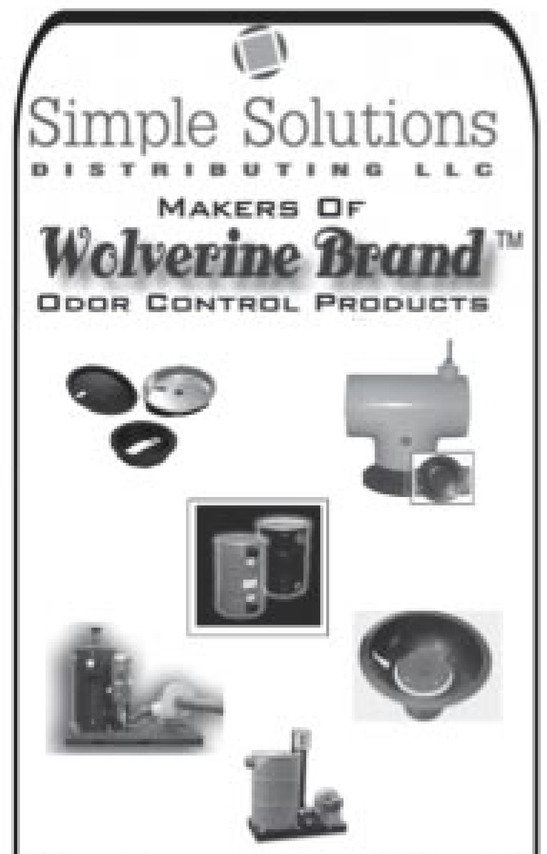

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