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THE PATH TO AGREEMENT

Columbia Water's unparalleled metering project benefits both utility and customers

PAGE 12

Frank Eskridge
Deputy Director of Utilities
for Columbia Water
Columbia, South Carolina

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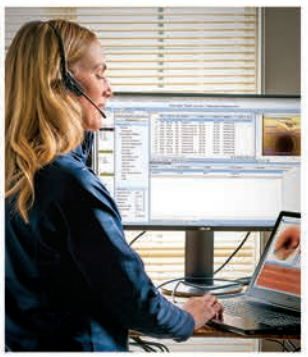

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PIPELINE AND INFRASTRUCTURE, HYDRANTS

ON THE COVER: Frank Eskridge, deputy director of utilities for Columbia (South Carolina) Water, has helped guide the utility through a massive water system metering infrastructure upgrade. (Photography by Charlie Mather)

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Luke Laggis

Luke Laggis

MODELS OF EFFICIENCY

Utilities from across the globe share stories of improving their communities

If you could be more efficient at any one thing, what would it be?

For me, it would be scheduling. I'm often not as organized and efficient as I'd like to be when it comes to planning, assigning and scheduling stories. It could make the process of putting this magazine together much less stressful. And without that stress, I'd probably be able to spend more time on story development and other aspects of my job that would make the product stronger. It would also make other people's jobs easier — fewer deadline issues, more lead time, less scrambling. It's a goal of mine, and one I'm earnestly working toward.

What if your water distribution system was 10% more efficient? You'd treat less water, chase fewer leaks and probably prevent an emergency or two. Those cost-savings would allow you to reinvest and make your system even more efficient, to boost your capital projects spending or upgrade tools and equipment. Each of those things gives you potential for even greater improvements.

There's a story about Tier 3 jetting nozzles in this issue. Marty Tew and his crew at Fayetteville PWC Water Resources doubled their efficiency when they moved to Tier 3 nozzles after seeing a demonstration. Imagine what doubling your cleaning efficiency would give you time to do. That could be the difference between staying in reactive mode and chasing emergencies to a proactive approach that builds even more efficiencies throughout your operations.

I doubt there's a municipal utility anywhere that wouldn't benefit from that budget boost.

What if your revenue jumped 4% without a corresponding rise in expenses? That's exactly what happened in Columbia, South Carolina, where a large-scale automated metering infrastructure project updated a system that was underrecording water usage by 4%. I doubt there's a municipal utility anywhere that wouldn't benefit from that budget boost.

What if you could buy a piece of equipment that would eliminate the need for two other pieces of equipment and save your crews time on a task they do daily? That's exactly what happened in Anamosa, Iowa, where the city Water Department invested in a trailer-mounted hydroexcavating unit with an attached valve exerciser. The new unit has allowed the utility to exercise all its valves annually, when it was previously only able to get to about half of them each year. That's a lot of extra time freed up for those crew members to focus on other tasks.

In Udaipur, India, opencut replacement of sewer lines in ancient and densely populated neighborhoods proved inefficient, so the city turned to trenchless technology. Pipe bursting proved to be exactly the solution the city had been looking for. The project increased system capacity with minimal disruption and improved the community as a whole. And that's really what your jobs are all about.

All of these stories are good examples of ways to improve your operations and serve your customers better. They might not all fit your specific circumstances, but they all demonstrate that you don't need unlimited resources if you use your resources efficiently.

Enjoy this month's issue. ✦

Comments on this column or about any article in this publication may be directed to editor Luke Laggis, 800-257-7222; editor@mswmag.com.

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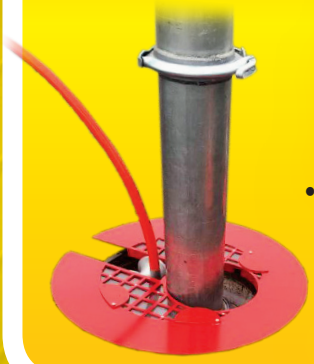

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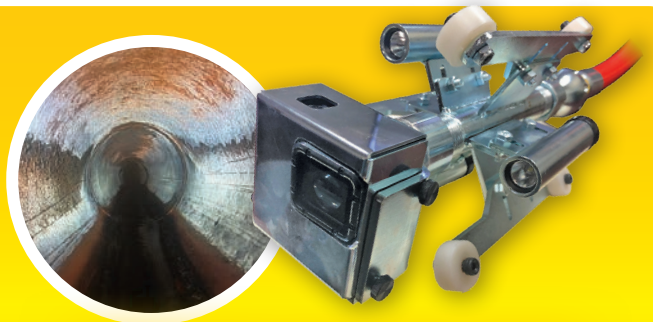

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GETTING THE PICTURE

Troubleshooting Inspection Cameras

Inspection cameras are a critical tool on sewer cleaning and pipe rehab projects. So when a camera breaks down on a job, productivity, profitability and customer relations suffer. But it doesn't have to be that way. Equipped with some basic know-how, savvy contractors can save the day by troubleshooting camera issues. **mswmag.com/featured**

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Storm Drains and Catch Basins

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A Used Equipment Checklist

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THE PATH TO AGREEMENT

Columbia Water's unparalleled metering project benefits both utility and customers

By Giles Lambertson

Columbia Water distribution system foreman Douglas Brooks prepares to install a smart meter from Badger Meter in Columbia, South Carolina. (Photography by Charlie Mather)

Everything seems to be flowing together in Columbia, South Carolina, where two rivers merge into a third and a transition to a smarter water metering system is moving forward with equal persistence.

"This is the direction the city is moving," says Frank Eskridge, deputy director of utilities for Columbia Water. "City council leadership, the mayor, the city manager, they all want to leverage technology to improve our service."

In this case, improvement means better utilization of utility employees, better monitoring of water usage and waste, and better management of water use by utility customers themselves. The trifecta of progress was a long time coming.

> **"The aging meters were giving an estimated 4% underrecording of water usage."**
>
> **Jason Shaw**

Pilot and press

Columbia's meter story dates back to the 1990s when city officials realized that not doing preventive maintenance on the water meter system had consequences. Many of the manually read meters themselves were failing and accurate usage of water was not being recorded. The city limped along for more than a decade, paying more attention to its meters but not upgrading them to an efficient data collection system.

Finally, in 2012, technology was in the offing for an upgrade. Columbia Water engineer Jason Shaw, who has worked at the utility for almost 15 years, was part of a team that undertook a pilot program to test two modern meter-reading systems.

One was AMR (automated meter reading), in which an endpoint on a meter collects water usage data and a reader collects the data with a handheld receiver while walking or driving by — no having to stop, open a box and read a dial. The other tested system was AMI (advanced metering infrastructure), in which data is collected at the meter and transmitted to central computers through a radio or cellular network. In this system, a meter reader need not visit a meter location at all.

For the pilot program, some 800 meters in adjoining neighborhoods were taken out of service and fitted with the new technology, the AMR in a residential neighborhood and the AMI in the Manning Correctional Institution — a complex of buildings operated by the South Carolina Department of Corrections. Employing AMI in the prison seemed like a good idea because meter readers wouldn't have to set foot on the grounds.

In the end, the fruit of the 2012 pilot program was nil. "We went through a process of evaluating the proposals, without a consultant to help us," Shaw says. "We spent some $400,000 at that time and liked the technology. It was a learning experience, but there were so many other things going on that we didn't see a path forward at that time to fund a meter upgrade project."

Foreman Douglas Brooks (right) and operator Torin Martin connect a new Badger smart meter on a residential water service.

Eskridge, who has been with the utility for two years, says the state of technology in 2012 was a factor in the city's decision to defer the change. Eskridge served in a leadership position in the Greenville, South Carolina, utility department and worked on bringing an AMR drive-by system to that city beginning in 2008. He says the reason Greenville chose AMR over AMI was an upfront investment issue.

"Utilities that wanted to use cellular had to build their own cellular transmission network," he says. "That's one reason we went with the drive-by system. But after 2015, the proliferation of cell-phone towers began. Cellular now is robust and resilient and redundant."

After the city spiked the idea of automated meter reading, the growth of the Columbia water system continued — some 2,000-3,000 meters a year — and meters continued to age. Finally, in 2017, Columbia hired international consulting firm Jacobs Engineering to help the city convert to a different system.

"By that time, our average meter age was 14 years. The aging meters were giving an estimated 4% underrecording of water usage," Shaw says. "In other words, the average customer got a bill that was 4% less than it should have been. Those losses, combined with the age of our meters and the fact we'd never converted to an interim drive-by system, gave us a very strong business case. We decided then was the time to move."

PROFILE: Columbia Water (Columbia, South Carolina)

SERVICE AREA:
320 square miles

CONNECTIONS:
150,000 metered accounts, 415,000 customers

WASTEWATER PLANT CAPACITY:
60 mgd

WASTEWATER SYSTEM INFRASTRUCTURE:
1,137 miles of pipe, 51 pumping stations

WATER TREATMENT PLANT CAPACITY:
84.5 mgd (Columbia Canal), 75 mgd (Lake Murray)

DAILY WATER DEMAND:
60 mgd on average, 100 mgd on peak days

WATER SYSTEM INFRASTRUCTURE:
2,500 miles of pipe, 23 storage facilities, 30 million gallons of storage capacity

STORMWATER INFRASTRUCTURE:
120 miles of pipe up to 7 feet in diameter, plus flow channels, restored wetlands, box culverts and tunnels

NUMBER OF EMPLOYEES:
Currently 481, when fully staffed 608

WEBSITE:
www.columbiascwater.net

As of mid-November, Columbia Water had installed 80,000 new smart meters, with installation of another 70,000 meters slated to wrap up early in 2022.

City leaders were also motivated to do something by bad press. A relative handful of utility customers shared with *The State,* Columbia's newspaper, their complaints about errant water billing. The water hit the fan.

"There were some billing customers who made it into the paper," Eskridge acknowledges. "The problem never was as big as it looked in the paper. It was amplified there and, of course, the city council is very sensitive to the desires of the community. For many reasons, leadership decided it was time to move in the direction of AMI."

Everybody believes

The utility's assistant city manager, Clint Shealy, pulled together a team to lead the project, with Shaw being project manager. "It has been a collaborative effort," Shaw says. He works with representatives of the IT, customer service and meter departments. "There are five core people on the city team. Jacobs has four people and Badger Meter has three or four and the meter installers, United Meter Solutions (UMS), has team members. We formed a cohesive team that has managed the project from inception to where we are today."

A proposal by Badger Meter, out of Milwaukee, was selected over five other bids because it was the only one to offer a cellular system. "We didn't want to have to maintain a fixed-base radio network, which can be cumbersome," Shaw says.

In the new system, a meter connected to the network takes readings every 15 minutes. Four times a day, it transmits the collected information through an AT&T cellular network to an Amazon cloud computer in Columbia Water's data center. There, operators monitor the data and, eventually, monthly bills are produced.

"We get notices when we don't get a transmission from a meter," Shaw notes, which can happen when a car has parked over a meter and blocked the flow of data. If someone tries to avoid billing by disconnecting a meter, that sends up an alarm, too.

Deployment of the new Badger meters began in earnest in July 2019 with a 30-person UMS crew installing residential and small-business meters and another couple other technicians installing intermediate and large meters at commercial and institutional locations. As of the middle of November, nearly 80,000 of the 150,000 meters have been fitted in place. The project is on schedule to wrap up in March 2022.

"I can't tell you how pleased I have been with the type of work that UMS has done in the field," Eskridge says. "You can have all the right attitudes in the conference room, but if it doesn't happen

(continued)

SAVINGS AND SATISFACTION

Columbia Water isn't spending millions of dollars on a cellular meter system from Badger Meter on whim. The Columbia, South Carolina, utility is in it for real gains, both the quantifiable kind and the kind that show up in customer satisfaction surveys.

The utility and city say it is a more efficient system of data collection that will produce savings in the cost of service. "We haven't seen a large cost savings yet, but we should start seeing it pretty soon," says water engineer Jason Shaw, point man for the project.

Echoes deputy director of utilities Frank Eskridge: "We haven't scoped that out yet. We're so focused on accomplishing the project that we haven't spent much time looking at ongoing savings that may accrue." That the savings are coming seems assured, however. Payback on the $49 million undertaking is expected to occur in just seven years.

The other savings component is at the customer end where better-informed water users can regulate their usage once they are empowered by new information. This new font of knowledge will come through a free app that is available by simply signing up for it. "To have that app out there is really valuable," Shaw says.

Using it, customers not only can check throughout a month to see how much water they're using and where, they also can set it up to alert them when unusual water usage occurs. Forewarned is forearmed and goes a long way to customers self-regulating water use and avoiding shock at the end of the month from a large water bill.

But for the app to have widespread impact on water usage, it will need to be widely downloaded. That may not happen. Shaw estimates no more than 20% of customers will take advantage of the app information. "Some of our customers are very excited, but some don't know how water gets to them or where wastewater goes. We need to do a better job educating our customers about what we do to provide water and wastewater services."

Utilities communication manager Robert Yanity is trying to get the word out. "Robert is helping us immensely, contacting people through social media, encouraging them to sign up for the app," Shaw says. "I hope people take advantage of it. We're hoping that 20% of water users will begin to check their app, but we would love to exceed that number."

Distribution system operator Torin Martin, deputy director of utilities Frank Eskridge and water distribution system foreman Douglas Brooks (from left) of Columbia Water.

> **"Customers don't want rust particles in their water."**
>
> **Frank Eskridge**

outside on the pavement, it doesn't work. We have an incredibly effective construction team changing out these meters and gathering customer information necessary to convert from manual reading to AMI. Everybody believes in this project and is trying to make it successful."

The goal was to install a thousand meters a week. As of November, the average installations per month was on target at 4,200. That figure partly reflects early months of the project when installers were working in downtown Columbia where concrete and asphalt slowed placement of new meters. As the crew moved out into residential areas, the pace quickened. In August, for instance, almost 7,400 meters were connected.

Constant growth

Columbia Water deals with more than water metering issues. The capital city it serves dates to colonial times and was established as the state capital in 1786. Its waterlines aren't quite that old, but the first water mains were constructed in the early 1800s with periodic updates. Shaw estimates that half of the system today is less than 40 years old and the other half is 60 to 70 years old with a few sections going back perhaps a century.

Ductile iron pipe constitutes 80% of the waterlines, with a little cast iron, reinforced concrete and PVC mixed in. Columbia Water has also expanded service outside the city proper — 60% of its waterlines are in surrounding parts of Richland County. In moving into neighboring communities, the utility has acquired some old and nonconforming lines.

Two water plants serve the community, one in Columbia's older downtown area and the other at Lake Murray. The original downtown plant was constructed in 1906. Two clearwell storage tanks were built and additional pumps installed to serve the plant. All in all, it was a $45 million project. The Lake Murray plant was built in 1983 so it, too, has required regular updates.

The utility also operates the largest wastewater treatment plant in South Carolina, a consequence of the city being built on terrain that allows routing of wastewater to one location. The plant is subject to ever-more stringent requirements and is regularly upgraded. A current capital improvement project will enhance aeration. Columbia Water has 63,000 wastewater customers.

The third component of the utility's services is stormwater control. That system, too, dates back to the early years of Columbia. Some flood-prone areas — such as Martin Luther King Park in the Five Points business district — are a regular flooding concern.

Massive floods hit the city in 2015 when some 20 inches of rain inundated the central part of the state. Two rivers — the Saluda and Broad — merge in Columbia to form the Congaree River. Consequently, besides local rainfall stressing stormwater infrastructure, the trio of overflowing rivers overwhelmed their banks to produce what was termed a thousand-year flood. "The extreme flooding added credence to the need for an effective stormwater system," Eskridge says.

So, there is no shortage of places for Columbia to spend money on its water systems. Waterlines are just one focus, but an important one. "Mr. Shaw is very busy developing and administering projects to replace old cast iron water mains that are corroding on the inside," Eskridge says. "Customers don't want rust particles in their water. There also are long-range plans for new water distribution lines across the north end of the system for an area of high growth."

The city is constantly growing, partly because it is fairly immune from economic downturns. Besides state government and the state prison, the city also is home to the University of South Carolina and to Fort Jackson, the largest U.S. Army training facility on the East Coast. Though the fort has its own water distribution system, it buys its water from Columbia. It also sends its wastewater into the city's collections system.

Demand for water also was boosted by a November announcement that Mark Anthony Brewing will build a $400 million facility in Columbia. The 1 million-square-foot brewery will produce hard seltzer and lemonade products and begin operations in mid-2021. Needless to say, it will be another big water customer for the utility.

Quite a leap

When Columbia Water's $49 million metering system is completed, it will be a significant milestone. It's not the first cellular metering system in South Carolina — the Beaufort-Jasper Sewer and Water Authority, which is about a third of Columbia Water's size, has operated one for years. But Columbia's will be the largest all-cellular water utility AMI installation in the world, quite a leap for a community whose metering routines were stuck in the 20th century.

The new system isn't a panacea for an old water system. The aging infrastructure still remains problematic. Leaks of one kind or another contribute to a water-loss rate of about 15%. Shaw places the number of suspected leaks in the system at 6,900, per the AMI system utility portal. It is "suspected" leakage because at those points water is moving 24 hours a day, which is unlikely in most controlled situations.

The constant cellular tracking of water usage is helping some customers understand the consequences of a running toilet and other overlooked usage. "We've had customers complain about large water bill increases and we've checked our data and found they were unwittingly watering their lawns from, say, 10 p.m. to 4 a.m." Shaw says. "We tell them, you may want to check the timer on your sprinkler. Once they understand it, they say, 'Oh.'"

He believes the additional information will help both customers and the utility. "I think it's going to make all of our jobs so much easier. Being able to explain water usage to a user is just so powerful."

Eskridge concurs. "I can't overemphasize the benefit of talking to customers who believe they haven't used the water we believe they have, then getting them on our app and showing them exactly how water was used two Saturday nights ago. When we are sharing the same facts, the path to agreement is much shorter." ✦

MULTITASKING MACHINE

Combo hydroexcavator-valve exerciser makes a tough job easier for Iowa utility

By Ken Wysocky

BETTER MOUSETRAPS

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valve-exercising

BENEFITS:
Safer and faster excavation and valve exercising/ data collection

USER:
Water Department,
city of Anamosa, Iowa

There was a time when excavating buried valve boxes and exercising main and water hydrant valves in the city of Anamosa, Iowa, was a laborious, time-consuming chore.

But that all ended about six years ago when the city's Water Department invested roughly $50,000 in a trailer-mounted Vac 250 hydroexcavating unit with an attached Spin Doctor 800 valve exerciser, manufactured by Hurco Technologies.

The unit enables the department's three employees to exercise all 672 valves in the city's water system every year. That includes 263 fire hydrants, says Jim Henson, superintendent of the department.

Before the city bought the Hurco unit, employees could exercise about half of the valves annually. Now they can do the entire city in just one season, he says.

"It basically doubled our productivity because the guys don't get as tired. It's incredible that we can do all the valves in just one season. And that allows us to do more projects in a year."

"We had to make it easier and more comfortable to do this strenuous job."

Jim Henson

Department employees used to exercise valves the old-fashioned way: By hand with a valve wrench, says Henson, whose department is responsible for operating and maintaining roughly 32 miles of water mains.

"And if we needed to clean out the valve boxes, we'd take along a shop vac and a portable generator.

"When you're turning valves all day, you get tired. By the time you're done tinkering around with cleaning out valve boxes and turning valves, you're pretty whipped. I've been in this business for more than 40 years and I've turned a lot of valves — it's a job."

In fact, it's such a strenuous task that employees would sometimes admit defeat when they'd come across a really tough frozen valve, he says.

"They'd say, 'OK, this one is good — let's move onto the next one.' I've heard this happens at other towns around here, too. Some towns don't even exercise their valves because it's so difficult.

"We had to make it easier and more comfortable to do this strenuous job."

Power for productivity

The Vac 250 features a tiltable 250-gallon debris tank, either a CAT 36 hp diesel engine or a Kohler 34 hp gasoline engine, a Gardner Denver vacuum pump, a 250-gallon water tank and a Giant water pump (3,000 psi at 4.7 gpm).

The Spin Doctor, which can apply up to 400 foot-pounds of torque, features an articulating boom that can extend up to 9 feet; with an extended-reach option, it can extend up to 13 feet and provide 270 degrees of side-to-side coverage. Self-leveling and swivel action allows operators to tackle valves that aren't perfectly straight vertically.

"It also offers variable-torque control, which is really useful," Henson says. "You can break the nut off the top of a valve if you don't watch the torque.

"And it's not built cheaply, either. The trailer is very well made. Our unit also has directional caution arrow lights on the back, which is very useful from a safety perspective."

The Anamosa Water Department's three employees exercise all 672 valves in the city's water system every year, a task that took twice as long before the department got its Hurco Spin Doctor 800 valve exerciser.

Henson also says the articulating boom, which can reach about 4 feet below surface level to 7 feet above surface level, allows access to valves in hard-to-reach places. "It's a very handy feature," he says.

Versatile machine

The hydroexcavating capability makes the unit even more flexible and versatile. It saves time compared to hand-excavating or using a shop vac to suck up dirt.

"If dirt is pretty compacted, we just take the wand and spray it really good, then suck up the slurry into the debris tank," Henson says.

The department also uses the nozzle to wash down dirty vehicles and wash dirt and mildew off the exterior of the department's 144,000-gallon, aboveground concrete detention tank, which holds well water prior to treatment.

"We use it many times for other jobs around town, too. It's a very versatile machine."

Furthermore, the unit provides detailed information about each valve's condition as well as its exact GPS coordinates. For example, if a valve stem wobbles, which indicates a potentially faulty stem, a computer records it.

"It graphs everything we do," Henson says. "It provides many details, right down to whether a valve was hard to turn in the middle of exercising it."

When a job is finished, the operator hooks a computer to the unit, which then downloads data.

"We use it many times for other jobs around town, too. It's a very versatile machine."

Jim Henson

"When I walk in my office, it then automatically downloads the data to our geographic information system map," Henson says.

Overall, the unit is durable and easy to operate. Hurco initially provided on-site training, but now the department handles it internally. "It's pretty easy to figure out how to use it," he says. "We're so happy we bought it — we can finally keep up with all the valve turning." ✦

SMALL TOOLS STILL PRESENT DANGER

Failure to use small tools and PPE the proper way is just as dangerous as more obvious work hazards

By Giles Lambertson

Discussions of safety in confined spaces and other dangerous environments often center on protecting employees from toxic gases, falls or other big health hazards in the workplace. Sometimes overlooked are the small things — small tools like the hammer or drill that are handled pretty much without thinking about it — or the seemingly small risks taken when an employee fails to utilize fundamental PPE.

"When an employee has done something a million times, there is a complacency risk."

Chris Ravenscroft

Here's the thing: Small is relative. Losing a finger or sight in one eye is not as horrific as losing a limb or one's life, but it is disabling nonetheless and oftentimes is avoidable. Word to the wise: Think small — like good company safety managers do.

One starting place to explore the subject of working safely with small tools is the U.S. Department of Labor's succinct guidelines. In short, always use a correct tool that is in good working condition, and operate it as recommended by the manufacturer while wearing correct PPE.

In more detail, those rules include:

• Use the right tool for the job.

A screwdriver is not a chisel, nor a Crescent wrench a hammer. One hand tool can be utilized to mimic another, but they usually are poor substitutes. The screwdriver lacks a chisel's tempered and sharpened edge. The adjustable wrench is without a hardened, flat surface designed for striking. Misusing a tool, therefore, is not only ineffective but in most cases, unsafe. The unhardened edge can shatter, sending shards toward your eyes; the rounded surface of the wrench can slip off and strike your hand instead.

"I've been there and done that. Everyone has," says John Flanagan, safety manager of North American Pipeline Services. "Usually it is using a wrench instead of a hammer or a hammer as a pry bar — the right idea, the wrong tool. When we see something like that, we ought to say, 'Billy, are you really going to do that? Why don't you take a minute and go get the right tool.'"

• Examine each tool for damage before use and do not use a damaged tool.

If the handle of a tool, whether plastic, wood or metal, is cracked or burred, tag it as damaged and ask your supervisor for a replacement because a cracked handle is in danger of fracturing and potentially injuring the user. The temptation is to attempt to repair a handle in that condition by, perhaps, wrapping it in duct tape. Unfortunately, that not only doesn't restore the complete strength of the handle, it imparts false confidence in the tool's integrity. Both conditions are potentially unsafe.

Small everyday tools, if used inappropriately or dropped, can present very real risks to workers.

• Provide the correct PPE and use it properly.

Let's face it, until a fleck of steel tossed up by a drill bit enters an eye or a protruding piece of steel strikes the head when a person stands up, the safety glasses or hard hat you're supposed to be wearing seem like a lot of trouble. But the fact is, some of your work environments contain hazards that only wearing of glasses and a hat can mitigate.

Failure to don PPE when using hand tools mostly is a consequence of complacency. "When an employee has done something a million times, there is a complacency risk," says Chris Ravenscroft, owner of Koberlein Environmental. He says the risk is increased by the fact that jobs in the field, versus in a factory, present a variety of unique situations and conditions. However, the hand tools remain the same in every case and protective gear is designed to work in all those situations and conditions.

(continued)

Protective equipment, from hard hats to boots, gloves and glasses, need to fit properly and be worn whenever the situation calls for them. Complacency with common tasks is no excuse for not wearing the proper PPE.

• Operate a tool according to a manufacturer's instructions.

Example: If a drill job has the potential to penetrate a live electric circuit, safety rules require that an insulated drill be utilized to protect the user against a shock. Wrapping the handle of an uninsulated drill in electrical tape does not insulate it. Some time-pressed workers do it anyway for psychological comfort. These often are the same employees who can be seen passing a drill from one level to another by dangling it from its cord, a mishandling that can lead to damage to the tool or injury of another worker.

While the Labor Department guidelines are helpful, they hardly cover every contingency. How about falling hand tools, for instance? If a falling wrench doesn't strike and injure someone working below, the tool's fall at the very least requires a worker to descend to a lower level and retrieve it.

"A lot of times a worker doesn't attach a tool to a tether, uses the tool and then goes on working and the tool falls out of his pocket or hands and there you go," says Kyle Irwin, founder of Irwin's Safety, a Canadian safety management firm. "In most cases, if they are tied off, the tools do not become a hazard. The problem is, you don't see that tying-off happening enough."

Injuries from small tools may vary in particulars from one situation to another. And while bad habits generally are universal in nature, local conditions can produce one error of judgment over another. For example, working in a northern climate might mean bulkier clothing is worn for warmth, increasing the chance of clothes being snagged by a rotating machine or catching fire if unknowingly pressed against a hot drill bit.

Ravenscroft mentions two small tools that in his experience have proven the most problematic for workers. One is a device that spins wire cable to scour clogged pipes. "It requires hands-on operation and that requires a level of awareness. It calls for the right kind of gloves that don't catch the material and cause it to twist," he says.

"The other tool is an arctic blaster, which uses hot water and steam to thaw pipes through a hose. It's very efficient, but it's a personal burn hazard and a fire hazard. Techs know when they take these tools off the truck, they represent real danger." To offset the intrinsic danger of the thawing tool, its use is addressed in annual training and the process of working with the tool is reviewed regularly.

"There definitely is ill-fitting equipment. But there are so many pieces of equipment manufactured, just find one that will work."

Kyle Irwin

A sometimes-unspoken issue in respect to wearing PPE is comfort. Is discomfort a reasonable excuse for not donning a hard hat or bulky gloves?

"Yes and no," Irwin says. "There definitely is ill-fitting equipment. But there are so many pieces of equipment manufactured, just find one that will work. The larger problem is avoiding manufacturers' recommendations. When using a respirator or dust mask, it should be a good fit, but a lot of people just grab a mask. That can give you false security that you're being protected.

"Do what the manufacturers say you should do. It is the responsibility of an employer to see that employees follow the recommendations. It all boils down to everyone in a program taking some responsibility for themselves."

Flanagan, of North American Pipeline Services, acknowledges that equipment can be uncomfortable. "They are hard hats. I was in the service and had to wear a helmet. It wasn't the most comfortable thing." On the other hand, as safety manager, he says he tries to provide PPE that will be used. "I go out and order a couple dozen pair of gloves and say, 'Here, try them out. Let me know how you like them. If you say it doesn't work for you, OK, we'll try something else.' I try to accommodate each crew."

Ravenscroft acknowledges that comfort "sometimes is an issue. So, making sure that PPE is available and comfortable is as important as the expectation that employees will use it. We try to be understanding. Safety committee members are close to operations and they know that safety glasses fog up and what can be done in that environment. We try to find the best glasses we can. The best might cost twice as much, but we're not going to save a couple dollars and provide PPE that doesn't work for our employees. It's a balancing act."

Seemingly small decisions like these by safety committees and managers are vital. They have a large impact on the lives of employees working in potentially dangerous situations. ✦

We invite readers to offer ideas for this regular column, designed to help municipal and utility managers deal with day-to-day people issues like motivation, team building, recognition and interpersonal relationships. Feel free to share your secrets for building and maintaining a cohesive, productive team. Or ask a question about a specific issue on which you would like advice. Call editor Luke Laggis at 800-257-7222, or email editor@mswmag.com.

ESTABLISH YOUR CORE VALUES

Creating a shared vision requires communication followed by action

By Ken Wysocky

After nearly two decades of working in the municipal water and wastewater industry, Joone Lopez knows full well that job seekers generally don't view utilities as great and exciting places to work, especially compared to private-sector companies that typically pay more and enjoy more dynamic and progressive reputations.

But as the general manager of the Moulton Niguel Water District, based in Laguna Hills, California, Lopez is debunking those industry stereotypes in a big way.

"Our culture is about each other and is based on kindness coupled with accountability."

Joone Lopez

As evidence, consider that the *Orange County Register* has named the utility, located about 50 miles southeast of Los Angeles, among the best medium-sized places to work in Orange County. For four years in a row (2016-19) including a No. 1 ranking in 2018. And while competing against dozens of private-sector companies in the newspaper's annual Top Workplaces survey, now in its 14th year.

"We were the first public-sector organization to receive a No. 1 ranking (in the Top Workplaces survey) and we're very proud about that designation," Lopez says.

In addition, in 2020, the U.S. Environmental Protection Agency said MNWD was among the top eight wastewater utilities nationwide in terms of employee development. And it's also been the recipient of many other awards for innovation and operational efficiency.

Kindness and accountability

The secret sauce here is a workplace culture that's based on the so-called HERO model of values: honesty, effort, respect and one team, says Lopez, a former police officer.

"Our culture is about each other and is based on kindness coupled with accountability," she explains. "We are supportive of one another. Our core values drive how we think and work.

"We also believe we're not just in the utility business — we're in the people business.

"We understand that what we do impacts people's lives, so with great honor, pride and dedication, we work together to see how we can better help people."

Lopez agrees that it's more critical than ever for utilities to create great workplace cultures. "Going forward, it's imperative that we compete better with other sectors," she says. "A great workplace culture is not only needed to attract the best and brightest minds, but also to develop the kinds of innovations that help us better serve the public.

"Some national statistics in our industry indicate our pipeline of talent is declining," she continues. "But you get peoples' attention if you create a workplace environment that's healthy and safe as well as exciting and dynamic. We just need to do a better job of telling our story."

Room for improvement

The workplace culture wasn't always so great at the utility, which serves more than 170,000 customers in a 37-square-mile area that includes the cities of Laguna Niguel, Aliso Viejo, Laguna Hills, Mission Viejo, Dana Point and San Juan Capistrano. The district also is responsible for 540 miles of wastewater pipelines and 19 lift stations.

"Morale was low and it was an unhealthy place to work. We weren't out there as a part of the community," says Lopez, who left law enforcement in 2002 to pursue a career in the water industry, then became MNWD's general manager in 2012. "So when I arrived, I worked with the staff and the board of directors to create a different environment, a place where people can come to work and know they're respected and don't have to walk on eggshells, look over their shoulders or worry about bad behavior and harassment."

Her blueprint for building a great culture came from evaluating her own bad experiences at previous jobs and developing a plan to avoid those pitfalls.

"It deflates you as an employee when you feel you aren't treated as well as other people or you don't trust leadership or you don't feel motivated," she says. "I don't want anyone to ever feel like I did."

Setting expectations

One of Lopez's first moves was establishing a monthly all-hands meeting where she set out, in very specific and certain terms, her expectations of employees in regard to honesty, effort and respect.

"You have to set the tone at the top," she emphasizes.

Then she incentivized employees to adopt those values by only promoting those who follow them.

Furthermore, Lopez consistently and repeatedly encouraged employees to try new ideas and innovations without fear of retribution for failures. "We allow people to try new ideas that can help us get better," she says. "If the ideas don't work, it's on me. If they succeed, the employees get the credit.

"This helps them be more creative and imaginative," she adds. "I always tell new employees to imagine the organization of their dreams, then come and help me build it."

Collaboration and innovation

As an example of how a great culture fosters innovation, Lopez cites how a casual conversation with an employee eventually spurred MNWD to establish a nonprofit group called the California Data Collaborative in 2015. That, in turn, led to a partnership with Netflix, whose data scientists worked with the district to create a custom data-analytics software program that saved the district $20 million.

At the time, California was in the midst of a record drought that prompted the district to look at how to better conserve water. But it was hard to determine what actions would be the most impactful because the district's 73 million or so customer-related data points weren't standardized or centralized.

"That made it difficult to develop policies that would achieve the end result we wanted," she says.

But the VDV data experts helped the district organize and standardize all that data in computer coding. That then enabled academic institutions and analysts at Netflix to examine water-usage patterns and other data, using predictive modeling tools the district could never afford to develop, Lopez explains.

At that point, the district was planning to build a $20 million recycled-water storage facility in order to ensure it could meet peak customer demands for water.

"But their predictive modeling tools showed how we could manage when that water was used by working closely with our recycled-water customers," she explains. "So we didn't have to build that additional infrastructure."

Enforcement matters

Of course, there's a counterpoint to all this: Employees who don't respect the core values must suffer consequences. "In short, they're not here very long," Lopez says. "Sometimes you have to discipline people all the way to termination, which usually doesn't feel very good. But you absolutely have to hold people accountable or you erode your standards.

"After people saw that I was serious about enforcing our core values, they became believers," she adds. "You make a big statement and then continue to talk about it and communicate it and follow it up with action."

Part of that communication component is spending time with employees. She says she periodically puts on work boots and goes out in the field to work.

> **"We just need to do a better job of telling our story."**
>
> **Joone Lopez**

"I want to know what employees feel, smell and touch," she explains. "I also want them to know I value the work they do, which develops a personal connection. And that turns into trust, which is the most important thing for someone in my position.

"If people trust you, they'll go above and beyond," she concludes. "When you allow people to dream and build friendships and networks, both internally and externally, amazing things can happen." ✦

SMART CITY SOLUTIONS

Pipe bursting technology an ideal fix for an ancient neighborhood's aging infrastructure issues

By Suzan Chin-Taylor

Udaipur, one of India's oldest and most densely built urban areas, was suffering the aftermath of annual monsoon seasons. Sanitary sewer overflows were commonplace.

Like in many of the country's centuries-old metropolises, streets are excessively narrow, sanitary infrastructure is way past its life expectancy and population has grown so that capacity of existing systems is insufficient. These factors led to the selection of one of Udaipur's oldest neighborhoods — the Silawatwari district — as an ideal candidate for pipe bursting of its sanitary sewer lines to increase capacity and mitigate SSOs that were commonplace during annual monsoon rain events.

John Rafferty, director of marketing and technical support for TRIC Tools, directs a pipe bursting project in a narrow alleyway of Udaipur, India's ancient Silawatwari district. (Photography Courtesy of John Rafferty)

In 2015, India declared the Smart Cities Initiative, a series of projects that would take 100 older cities and upgrade their infrastructure to be more citizen-friendly and sustainable. Sanitation infrastructure would receive high priority under the initiative, and its goals would be achieved through the location and implementation of technologies that could rehabilitate and/or extend the capacity of existing sanitary collections systems.

Unifying all the various municipal and state bodies for the undertaking of the Smart City projects across 100 cities was no small undertaking. Because of this, all the projects are tendered by a central body agency. The ancient city of Udaipur was one of the first cities selected for the initiative.

Only a few large infrastructure engineering and consulting firms in India would be able to meet the requirements for the scope of work on the Udaipur project. Larson & Toubro (L&T) was selected, and it was quick to subcontract critical elements to small vertically specialized contractors.

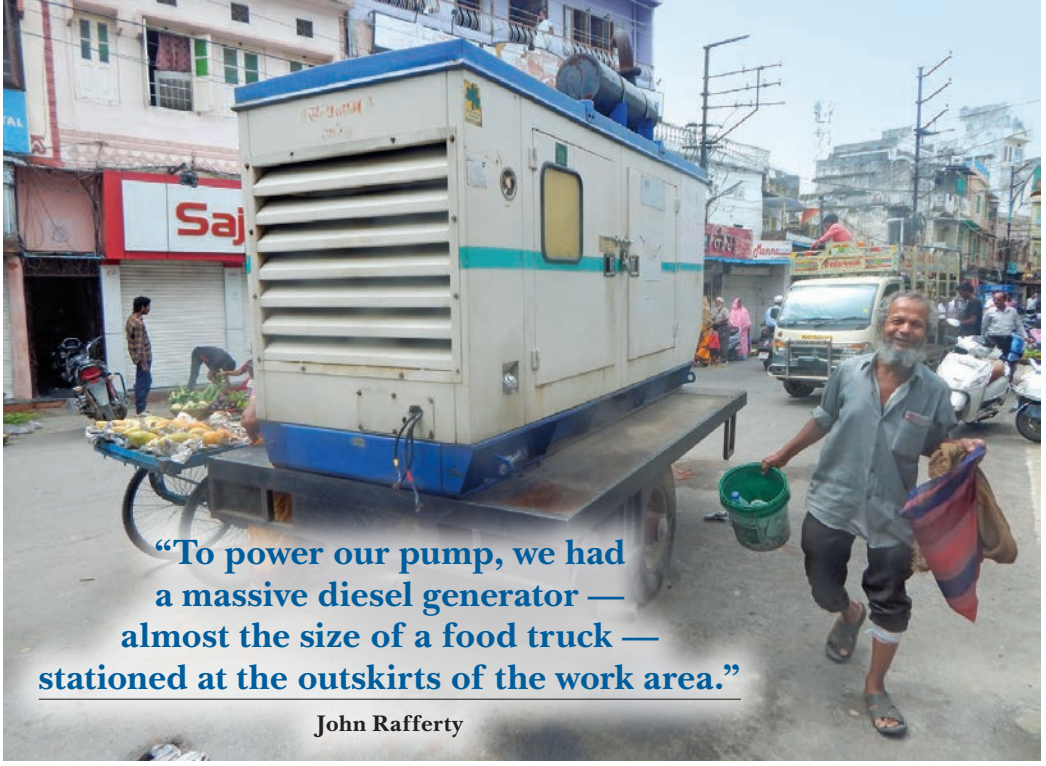
During the course of the project assessment, L&T had determined that trenchless technology would be the most effective solution for the Udaipur sanitary system rehabilitation and capacity upgrades. History had already proven that traditional dig-and-replace methods, which had been tried by the municipality 15 years prior in this neighborhood, had provided little positive impact for the community. The scope of the project would impact approximately 80 to 100 dwellings that housed over 1,000 residents, with the goal being to upsize the existing system capacity and eliminate SSOs that were common for the area. Due to this, pipe bursting presented itself as the best fit.

Gearing up

KMV, the local contractor selected by L&T to work with it on the project, had extensive experience with trenchless technology, and pipe bursting in particular. KMV had already begun bursting sewer mains in Udaipur, but the large and heavy equipment it was using on open roadways and plazas simply would not fit in the labyrinth of narrow alleys of Silawatwari and the other ancient parts of town. KMV reached out to Rajeev Oberai of RAUK Consultants and Engineers in Delhi. RAUK had established a distributor relationship with TRIC Tools almost a decade earlier at the 2010 No-Dig Delhi trade show.

While the three basic TRIC pipe bursting units — the X30, the M50 and the M100 — all operate in the same way, each has a different size and capacity. It was determined that the best configuration would be to combine the TRIC M100 puller and its large 1 1/8-inch cable with the smaller M50 plate and wheelbase.

Once the configuration was built and shipped, arrangements were made for a member of TRIC Tools to be present at the project site to train the installation teams. John Rafferty, director of marketing and technical support, was sent to Udaipur to train and familiarize KMV personnel and the engineers with the TRIC method.



"To power our pump, we had a massive diesel generator — almost the size of a food truck — stationed at the outskirts of the work area."

John Rafferty

Configuring equipment to do the work required careful planning. To power the pump, the crew brought in a massive diesel generator (top) and stationed it outside the work area.

Local contractor KMV had extensive experience with pipe bursting, fusing 5-foot sections of 200mm HDPE pipe in the narrow alleys of Silawatwari and the other ancient parts of town.

A different approach for the hydraulic power pack was needed because of the environment and electrical current (power voltages) used in India, but these special needs brought some surprising advantages.

"Our hydraulic power pack was sourced locally, in Delhi," Rafferty relates. "Hydmark Applicon, the firm that made it for us, powers its pumps exclusively with electric motors, rather than using gas or diesel engines. Electric motors are strong, reliable and far simpler than fuel-powered engines. To power our pump, we had a massive diesel generator — almost the size of a food truck — stationed at the outskirts of the work area. However, India's 240V current meant we didn't need a heavy cord to carry the current long distances which made logistics of power supply through this job site much simpler."

> **"The simplicity of some of the hand tools and methods used was interesting and amazingly efficient."**
>
> **John Rafferty**

The simplicity of some of the methods and tools used on the project ended up being extremely efficient. Top: KMV crew members use a digging bar to lift and position the M100 puller.

Left: Local subcontractors cut a newly installed HDPE pipe with an abrasive wire hand saw.

Getting up to speed

Day One of the project brought some unexpected challenges, but Rafferty and the crews got inventive. TRIC rep Rajeev Oberai was scheduled to be liaison for Rafferty and act as interpreter for the initial training, but his arrival from Delhi was delayed. As a result the work was conducted in a way that was a bit unconventional, culturally speaking.

Infrastructure contracting firms in India have a definitive hierarchy and crew members do not, as a rule, cross-train or perform tasks other than what has been assigned. In this case, the crew members assigned did not speak English and Rafferty had no knowledge of Hindi. Smartphones and Google Translate helped slightly but effectively training those responsible for the project's success required Rafferty to get down in the dirt and train by hands-on demonstration, knowing that working side-by-side with the team was the only solution.

Sanitary collections systems in India — at least those in old Udaipur — are designed very differently from those in North America and Europe. The major differences being that only toilet water is discharged to the sewer lateral, and these laterals

Additionally, the project site was comprised of numerous narrow alleyways, some barely 2 meters wide, that did not have a standard pattern or configuration, nor the space needed for deploying the typical equipment required. Because of this, the power pack was set up with a 100-gallon reservoir and hose extensions. The unit was approximately the size of two portable restrooms side by side, and it was wheel-mounted so crews could move it to each bursting site.

"I was intrigued by the idea of using an electric power pack for the hydraulics. In a challenging environment such as this, it made sense from a reliability standpoint. For example, in an emergency, replacing a hydraulic power pack specifically suited to your equipment might be difficult, but finding a replacement generator would be relatively easy, so downtime risks could be almost entirely eliminated," Rafferty says.

connect to the system at the manhole like spokes on a wheel, with the gravity mainline running manhole to manhole with no connections in between. Graywater from each residence is released to shallow trough-like gutters that run along the curb at the front of the buildings.

Manholes in the Udaipur project zone were shallow, built on the spot using hand-mixed concrete and troweled by hand with very thin walls and bases. This meant bursting could be performed on the sewer lines in a straight shot, from the entry point through all the manholes in between with relative ease. Repairing or even rebuilding the manholes could be done immediately and thus not impede quick return-to-service of the mainline segment.

Rafferty was on hand to train the crews and perform the first five pipe bursting pulls on the project. Two of the bursts were short with the remaining three being in the range of 114 feet each. Much of the support work was done by hand, such as fabricating new manholes and trimming the HDPE sewer main to make those new connections. Crews used a highly abrasive steel wire to trim the pipe, pulling it back and forth like old-fashioned lumberjacks. The result was a quick, exceptionally smooth cut and much cleaner than what could be achieved with a motorized saw.

"The simplicity of some of the hand tools and methods used was interesting and amazingly efficient," Rafferty says. "Some of what I observed were things that I'd like to introduce to our U.S. clients to consider implementing. What we might consider 'low-tech' was often more efficient than our fancy electric or computerized tools."

A crew member reconnects a 25mm residential service line that was cut while excavating a pulling pit for the M100.

Great appreciation

Throughout the project, the cooperation and interest of the neighborhood's residents was outstanding. The work site created disruption to normal foot traffic and mobility, but the community just worked around it and dealt with what would have been considered unsafe by Western standards. Locals would often linger at the project sites observing the work with great interest, and although there was mess and inconvenience, the residents didn't complain. Instead they expressed great appreciation for the efforts being made to improve the area.

The little neighborhood was returned to its routine within 60 days, with the capacity and condition of its sanitary system greatly improved. This project and the individuals involved are a great example of how Eastern and Western ingenuity and cooperation can create long-term, sustainable solutions for India's most challenging aging infrastructure issues and help it attain the Smart City Initiative's goals. ✦

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OPTIMIZING CLEANING EFFICIENCY

Water-conserving Tier 3 nozzles clean better and faster, enabling crews to do more before going for a refill

By Del Williams

In municipal sewer, storm and sanitary line cleaning, hose nozzles are essential tools that direct pressurized water to clear obstructions and clean lines as part of regular maintenance or to prepare pipes for relining. In this way, the nozzle is like a gun and water like bullets that must be precisely directed with force to the target.

While there are many nozzle options available in a variety of configurations, the standard Tier 2 nozzles that are typically supplied with the purchase of a sewer truck are only rated 50-60% efficient. Although these nozzles can handle some blockages, opting for higher-efficiency nozzles can make short work of even the most challenging jobs.

Utilizing high-performance nozzles has benefits that go far beyond conserving water to protect the environment. Reducing water use also minimizes trips to refill the sewer truck water tank and keeps crews effectively cleaning to expedite work completion. By decreasing unnecessary travel, the approach also reduces the cost of vehicle fuel and maintenance, which further stretches municipal budgets.

Getting efficient

As is known throughout the industry, there are tiers of nozzles, rated for water efficiency from Tier 1 (about 30% efficient), Tier 2 (50-60% efficient), to Tier 3 (75-98% efficient). Although they cost less, low-efficiency Tier 1 nozzles tend to utilize only 30% of the available energy, wasting 70% due to excessive turbulence and often lacking the necessary precision to clear obstructions. Tier 2 nozzles are more efficient, but are still not adequate to tackle tougher jobs or perform with anywhere near the efficiency offered by more sophisticated units.

In contrast, the most effective Tier 3 nozzles have tight water patterns that efficiently clean the pipe wall and create a powerful water stream to move debris long distances and propel the nozzle. Crucially, these nozzles provide efficient fluid mechanics to prevent the wasteful use of water and operating pressure.

However, even within the Tier 3 category there are significant differences in levels of efficiency. Opting for the lower-end Tier 3 nozzle with 75%

(continued)

The Fayetteville PWC Water Resources department's eyes were first opened to the effectiveness of high-efficiency Tier 3 nozzles during a hands-on sewer cleaning demonstration at a training session.

efficiency could still lead to additional trips to refill. Additionally, such units may take longer to remove restrictive sewer buildups or blockages.

To proactively improve operations, municipal supervisors responsible for sewer, storm and sanitary line cleaning are turning to the most efficient Tier 3 nozzles. This is enabling sewer maintenance crews to clean better and faster while conserving water and accomplish dramatically more between each water tank refill. This approach also substantially reduces labor and machine hours to clean lines, along with equipment wear and tear, and can save up to 17% in vehicle fuel costs, including travel to refill water tanks and run equipment.

> **"On tough cleaning jobs like restaurant rows with heavy grease buildup, the Tier 3 nozzles are particularly helpful."**
>
> **Marty Tew**

Race car engineering

Fayetteville, North Carolina's Public Works Commission maintains over 1,300 miles of sewer mains, 79 miles of forced sewer mains and 85 lift stations. As a regional utility provider, PWC also maintains and operates several sanitary sewer systems in the area.

According to Marty Tew, a Fayetteville PWC Water Resources construction field supervisor, the municipality's management and technicians' eyes were first opened to the effectiveness of high-efficiency Tier 3 nozzles during a hands-on sewer cleaning demonstration at an on-site training session.

"In the demo, when our trainer walked down one of our 60-year-old sewers, cleaning with a KEG Tier 3 nozzle, the waste stream went black. When he returned cleaning, the waste stream was clear and the pipe looked brand-new inside. That was the proof in the pudding for me and our operators," Tew says.

Not long after the training and demonstration, the municipality updated its sewer truck nozzles with mostly Tier 3 nozzles from KEG.

According to Tew, refilling the sewer truck tank with water can take 30 minutes to an hour, depending on the hydrant location, so the municipality also values the efficiency gained with Tier 3 nozzles.

"When virtually up to double the amount of sewer pipe can be cleaned with a 98% water-efficient Tier 3 nozzle, compared to a 50% water-efficient Tier 2 nozzle, that minimizes crew cleaning downtime that results from making frequent trips to refill the vehicle's water tank," Tew says.

He adds that having to make fewer water tank refills is an even greater boost to productivity when crews in multiple vehicles are involved with sewer cleaning and may be dependent on having a steady water supply to continue their work.

Tew notes that more efficient water use also reduces vehicle fuel use as well as wear and tear by requiring fewer trips to the hydrant.

By conserving water and reducing the necessity of refilling water tanks at hydrants, the nozzles also minimize the need for municipal vehicles to travel through environmentally sensitive areas like wetlands, and difficult to traverse areas such as back roads.

What sets the most efficient Tier 3 nozzles apart from others in the category is fluid mechanics engineering on par with the aerodynamics of race cars or fighter jets.

An essential tool

In the case of KEG's Tier 3 nozzles, the high-performance fluid mechanics design leaves little room for power loss or excessive turbulence. After exiting the jetter hose, water travels into the body of the nozzle before moving through smooth, curved channels. This design enables the water to maintain its power and speed before entering the nozzle's replaceable titanium ceramic inserts. Next, the water is funneled from a short conical shape to a larger, longer cylindrical shape, allowing a tight water pattern to emerge.

The internal workings of the nozzle, including the way the water gets turned, redirects the energy of the high-pressure water entering the nozzle as efficiently as possible. This results in what is needed for the task: more thrust and power using less water.

"On tough cleaning jobs like restaurant rows with heavy grease buildup, the Tier 3 nozzles are particularly helpful. Where a Tier 2 nozzle might take multiple passes to provide an adequate clean, a top Tier 3 nozzle can do a better job with far fewer passes," Tew says.

He estimates that by switching to ultra-efficient Tier 3 nozzles, Fayetteville's municipal PWC got about a one-year return on its investment in terms of more efficient labor and resource use, including decreased fuel use and avoiding potential vehicle and crew downtime.

While Tew does not insist that such a Tier 3 nozzle is necessary for every job, he does recommend it as an essential tool for the municipal sewer crew's toolbox.

In addition, he points out that the increased efficiency of municipal work crews equipped with Tier 3 nozzles has made meeting North Carolina state mandates for sewer maintenance easier.

"We are mandated by the state to clean 10% of our sewers a year," he says. "While we have always met that target, we are actually above the goal now and our cleaning is far more efficient than it ever has been.

"The Tier 3 nozzles, along with superior cleaning methods, are helping us to better maintain public sewer systems and keep costs down for ratepayers." ✦

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CREATING NEW GUIDELINES

Specifications provide process standards for the sewer service industry

By Sheila Joy

NASSCO (National Association of Sewer Service Companies) is located at 2470 Longstone Lane, Suite M, Marriottsville, MD 21104; 410-442-7473; www.nassco.org

Sheila Joy is executive director of NASSCO. She can be reached at director@nassco.org.

Developing guidelines is an important part of NASSCO's mission: To set standards for the assessment, maintenance, and rehabilitation of underground infrastructure and to ensure the continued acceptance and growth of trenchless technologies.

Over the past year our hardworking committee members have developed new NASSCO Specification Guidelines for styrene-based resins, smoke testing and rehabilitation with fiber-reinforced polymers. The guidelines will benefit the entire industry.

Safe Use and Handling of Styrene-Based Resins in Cured-in-Place Pipe: Published in October 2020, this guideline is a revision of the 2009 edition, which was updated to address recommendations made by the Trenchless Technology Center at Louisiana Tech based on its findings on styrene safety (released in January 2020). The guideline discusses styrene and other volatile organic compounds, as well as using styrene-based resins in an environmentally friendly manner that is safe to workers and residents.

Rehabilitation of Sewers Using Fiber-Reinforced Polymers: Published in August 2020, this Performance Specification Guideline provides guidelines and performance requirements for the rehabilitation of gravity sewers using internally bonded fiber-reinforced polymer composite systems.

Smoke Testing Inspection in Sewer Pipes: Updated from the 2010 version, this document provides guidance on smoke testing inspections to confirm system connectivity, identify gravity sewer system defects that allow inflow and infiltration, assist in locating cross-connections between storm and sanitary sewer, locate sources for odor complaints and provide a permanent record of the defects including type, location and severity.

NASSCO committees are also finalizing many additional Specification Guidelines that will be made available on nassco.org in the coming months:

- Concrete Pipe/Geopolymer Rehabilitation
- Cured-in-Place Pipe (Update to 2017 Edition)
- Grouting for Capital Pipe Rehabilitation
- Grouting for Maintenance and Pre-Rehabilitation of Sewer Lines
- Pressure Pipeline Rehabilitation Using CIPP
- Private Lateral Inspection
- Private Lateral Repair/Rehabilitation Recommendations
- Sags in Different Types of Pipe

All of these Specification Guidelines are (or will be) made available to the industry for free download. Please visit nassco.org/resources/guideline-specs frequently to browse, download and utilize these important resources.

All NASSCO guidelines are prepared by committees comprised of representatives of NASSCO members and peer-reviewed by industry professionals. NASSCO guidelines are not specific to any one product, project or job site, and should be considered guidelines only. Conditions for use may require additions, deletions or amendments to NASSCO guidelines to conform to project-specific site conditions and to comply with applicable laws, regulations and ordinances. NASSCO does not guarantee, certify or ensure any result and assumes no liability as to content, use and application of these guidelines.

If you would like to be involved in the development of NASSCO Specification Guidelines, please visit nassco.org/get-involved/join-a-committee. ✦

PIPELINE AND INFRASTRUCTURE, HYDRANTS

By Craig Mandli

PIPE PARTS/FITTINGS

Cherne I-Series Test-Ball Plugs

I-Series Test-Ball Plugs from **Cherne Industries** are lightweight, short and flexible, delivering solutions for a variety of applications, including blocking and bypassing flow, installing new pipes and junction boxes or repairing old ones, and installing or repairing utility holes. Available in eight expansion ranges from 6 to 24 inches, they meet U.S. and international industrial and municipal needs for engineers and contractors. The plugs feature robotic, mechanical bonding of aluminum end plates to the plugs' premium natural rubber to eliminate chemical bonding failures. They provide improved performance and safety through optimized design and maximum backpressure of 15 psi, with inflation pressure of 45 psi. **952-933-5501; www.oatey.com/brands/cherne.**

Ford Meter Box Mechanical Joint Connected Products

The line of **Mechanical Joint Connected Products** from **Ford Meter Box** can withstand high pressures with simple installation. The difference is the side bar sealing system that eliminates the need for removing, cutting or modifying the side seal gasket during installation. Alignment pins and multiple lifting eyes ease assembly in the trench. Constructed with heavy welded steel and epoxy coating, these products are durable and corrosion resistant. The Mechanical Joint Split Coupling is suitable for repairing 4- to 24-inch IPS, CIOD or pit cast pipes. The Mechanical Joint Tapping Sleeve simplifies tapping out-of-round or fragile 4- to 30-inch pipe with 4- to 12-inch taps. **260-563-3171; www.fordmeterbox.com.**

Krausz USA HYMAX Digital Application Selection Guide

The **HYMAX Digital Application Selection Guide** from **Krausz USA** is a web-based app that enables users to find the right HYMAX product for any water or wastewater pipe repair. Searches can be done according to the field situation of the repair, such as a crack or hole in the pipe; the application, such as if a pipe needs to be connected or restrained; or the HYMAX product name. The HYMAX Digital Application Selection Guide is an effective tool for installers in the field, operations directors and superintendents, purchasing directors and warehouse managers, and engineers. **855-457-2870; www.krauszusa.com.**

RELINER/Duran Stainless Steel Pipe Supports

Stainless Steel Pipe Supports from **RELINER/Duran** are easily installed adjustable clamping pipe brackets available in noncorrosive 11-gauge type 304 or 316 stainless steel. Often used as part of an inside drop in sewer manholes, they are also used to secure pump discharge lines, conduit, pumps, roof leaders and any other pipe to structure walls. In a marine environment they are used around piles to mount equipment. The slotted legs are adjustable to allow for variations in the offset distance between the pipe and the wall, and to accommodate irregular mounting surfaces. Clamps are stocked for 1.5- to 30-inch pipes including SDR35, Sch 40, IPS, HDPE, C900 and DN. **800-508-6001; www.reliner.com.**

PUMPS

Boerger BLUEline

The **BLUEline** rotary lobe pump from **Boerger** is a self-priming, valveless, positive-displacement pump used to convey viscous and abrasive materials. There are 21 pump models in six series with pulsation-free operation, fully reversible rotation, dry-run capabilities and flow rates up to 7,500 gpm. The pumps are stable and wear resistant with a maintenance-in-place design that allows for all wetted parts to be easily replaced through the front cover without removing the pipe or drive systems. **612-435-7300; www.boerger.com.**

Orenco Systems Biotube ProPak

Biotube ProPak pump packages from **Orenco Systems** are complete and ready to install. They are used for filtering and pumping effluent from single- or dual-compartment septic tanks to gravity or pressurized discharge points. Pump vault technology eliminates the need for a separate dosing tank. Packages include a Biotube filter cartridge, which filters up to two-thirds of solids, so only liquid from the tank's clear zone is pumped. Filters are easy to remove and clean without pulling the pump vault. All components are designed to be quickly installed and easily maintained. The PF Series high-head effluent pump is field serviceable and field repairable, and pump controls are designed for specific packages. Multiple models are available. ProPak Select software is designed

to provide fast, error-free hydraulic calculations and generate system curves. **800-348-9843; www.orenco.com.**

Pulsafeeder Blackline Series MD and PRO

Blackline Series MD and PRO mechanical motor driven and solenoid actuated metering pumps from **Pulsafeeder** are used to precisely dose chemicals into wastewater applications including pH correctness, polymer and odor control. They are motor-driven, spring-return mechanical diaphragm pumps for precise and accurate metering control. Oil-lubricated ball bearings in an aluminum housing in conjunction with a PTFE flat-style diaphragm provide long life. They offer a dosage range of 7 to 132 gph, with manual or automatic controls and polypropylene, PVDF or stainless steel liquid-end options. **800-333-6677; www.pulsatron.com.**

Vaughan self-priming chopper pump

Self-priming chopper pumps from **Vaughan** are designed to be easily accessed outside of the wet well while pumping waste solids at heavy consistencies, without plugging or dewatering of the solids. They eliminate the loss in production and mess, along with making it easy to service the pump to get it back in operation. **888-249-2467; www.chopperpumps.com.**

Vertiflo Pump 1600 Series

The **1600 Series** horizontal close-coupled, vortex end suction pump from **Vertiflo Pump** is suitable in a wide range of applications in areas like food processing solids, wastewater treatment, pollution control, slurries and solids. It offers capacities to 1,600 gpm and heads to 170 feet TDH, and it withstands temperature to 250 degrees F. Pumps are designed with back pullout construction that permits easy inspection and access for service or maintenance if needed without disturbing the piping to the pump. Standard construction is cast iron, 316 stainless steel fitted, all 316 stainless steel, alloy 20 or CD4MCu. The impeller has a fully recessed design, which accommodates the passage of solids. All impellers have wiping vanes, which reduce axial loading and prevent dirt from entering the sealing area. The impeller is keyed to the shaft, and an impeller locking screw ensures positive attachment. **513-530-0888; www.vertiflopump.com.**

PUMP PARTS/COMPONENTS

PRIMEX KwikSwitch

The **KwikSwitch** quick-release float switch connection system from **PRIMEX** improves reliability and reduces installation and float switch replacement time. It is designed to be installed directly in a wet well. The four-port manifold easily connects one to four float switches for level control applications, and its color-coded wiring pairs and corresponding colored caps make installation and maintenance easy. It is rated for temporary submersion, and its dual-seal design provides improved protection against water ingress and corrosive gases typically found in sewage lift stations. It includes a single manifold multiconductor direct burial rated cable and stainless steel mounting bracket for the manifold. Sealing plugs for unused ports and mechanically activated float switches are available. It is CSA certified. **844-477-4639; www.primexcontrols.com.**

VALVE BOXES/COMPONENTS

Badger Meter Smart Electric Valve Actuator

The **Smart Electric Valve Actuator** from **Badger Meter** optimizes control valve performance and offers Modbus RTU, Modbus TCP/IP and SoloCUE Flow Device Manager connectivity. It delivers position accuracy (± 1% of full scale), with five available positions when there is a loss of power. The device also features four positions when there is a loss of signal. Both the full closed and full open positions are defined during setup. The actuator has an internally powered feedback signal, which actively communicates stroke position to the control system. Its feedback sensors are crucial in more precise applications. It provides manual override capability to help the operator in loss-of-power situations. It minimizes the number of models needed to work with different electrical demands. Its universal AC input with voltage protection will work with 115 V AC, 230 V AC and 24 V DC power supplies. **800-876-3837; www.badgermeter.com.** ✦

 By Craig Mandli

Pumps enable tunnel dewatering

Problem:

A hydroelectric project in the province of Boca de Toro, Panama, included a power plant with a capacity of more than 223 MW, generating energy via two turbines at the dam. Before repair work on a 2.6-mile tunnel under the power plant could start, it had to be pumped dry.

Solution:

A large number of 6-inch **BA150E D285 BBA** portable pumps were used. They offer a max flow of 2,200 gpm at a max head of 125 feet. A large part of the tunnel was dewatered via two 10-inch HDPE pipes and gravity technology. In order to remove over 12 million gallons of residual water in the last few yards of the tunnel, the Spanish dewatering company Ferrer S.L. shipped miles of HDPE pipes and a number of 6- and 8-inch **BA180E D315** vacuum-assisted diesel pumps to Panama, enabling the tunnel dewatering project to move forward successfully. The 8-inch pumps offer 3,150 gpm at a max head of 135 feet.

RESULT:

The pumps enabled the tunnel to be completely cleared, allowing work to commence on the tunnel. **843-849-3676; www.bbapumps.com.**

Metering pumps continuously feed chemicals for safe use

Problem:

A wastewater facility in northern Illinois was in need of a pumping system that could inject a dosage of chemicals into its water system for clean and safe use. The specific chemicals to be inserted were polyphosphate and flouride, which are common additives to drinking water throughout the U.S.

Solution:

The plant installed a chemical feed system utilizing **FXM** metering pumps from **Flowrox** in a packaged system consisting of two pumps. This package is designed for the continuous operation of pumping viscous material and is equipped with simple site connections to ensure ease of installation and start-up on site. The system will pump ferrous chloride from three clarifying storage tanks into mixed liquor splitter boxes for use.

RESULT:

The plant pumps these chemicals through its water system at a continuous rate of 356.11 gpd at a pressure of 60 psi. It now has the accuracy and turndown of the pumps to fitting perfectly with the swings of flow it will see based on its effluent flowmeter. It ise now able to safely and reliably supply clean water to the surrounding areas. **410-636-2250; www.flowrox.com.**

Pumps combat sanitary sewer overflows

Problem:

The sewage collections system at a 12,000-acre retirement community in the Southeast U.S. experienced massive infiltration and inflow issues, causing sanitary overflows during heavy rain. The community's original infrastructure could support only a fraction of the current population plus recreational amenities. The Department of Environmental Protection stepped in with an ultimatum: Invest in a better solution or face costly fines. Additionally, the solution couldn't include increasing homeowners association dues.

Solution:

The Public Works Administration responsible for the community investigated upgrading the pumping stations. It knew larger pumps would also require larger engines to drive the pumps. To keep costs manageable, the community selected two models of **Pioneer Pump** sound-attenuated diesel skid packages across four pumps: the **SAPP66S12** and the **SAPP64S17L71.** At a savings of approximately $30,000 per package, the cost was almost $100,000 less than the next closest alternative. Controlled by LOFA CP750 panels, the pumps have an auto start/stop function that is triggered by a level transducer. As the level of the wet well rises, the pump speed increases to maintain safe levels during heavy rain. The control panel is wired to the main VFDs so that the main lift station does not run unnecessarily when the diesel package is running. The packages would also serve as back-ups in the event of power outage.

RESULT:

After installation, the pump packages performed as promised. After realizing the cost-effectiveness of this approach, the retirement community continued to add diesel packages each year, upgrading its remaining pumping stations. **503-266-4115; www.pioneerpump.com.**

Grinder pumps solve waste district's clogging issues

Problem:

Clogs caused by fats, rags, oils and grease have been an issue for the sewer system at Steuben Lakes Regional Waste District in Indiana. As this system grew, the time spent dealing with this issue had grown significantly. The district needed an effective grinder pump.

Solution:

The district's wastewater supervisors were introduced to the **Pentair Myers V2 Series Grinder Pump** with cutting edge technology. The pump's Axial cutter technology helps avoid clogs by cutting and slicing solid material and pushing the remaining material away from the pump. This action prevents any large mass from building and blocking the inlet, helping lower maintenance costs. The curved leading edges create a scissor action between it and the stationary cutter, reducing the load on the motor and delivering longer pump life as this method of cutting uses significantly less torque than the shearing action of a radial cutter.

RESULT:

Pilot installations at two locations proved successful at eliminating clogs, and the district replaced 150 old pumps by the end of 2020. **888-416-9513; www.femyers.com.**

Sleeve used to encapsulate leaking joint

Problem:

In late 2017, Olean (New York) Water was alerted to the need to test and accept a new 6-inch-diameter ductile iron water main for immediate service. The line failed to pass the pressure test required for city acceptance due to a leaking push-on joint. Olean had to quickly evaluate two options: perform a cut-in repair and replace the joint or encapsulate it.

Solution:

The decision eliminated the need to open the line with a cut-in replacement section and avoided the need to send in additional crew members to perform a two- to three-hour replacement of the line section. By selecting the **UltraSleeve** from **Total Piping Solutions** to fully encapsulate the leaking bell, the joint was repaired in less than 30 minutes, and the leak was fully contained under pressure. The sleeve can be installed on virtually any joint from 2 to 12 inches in diameter, and can encapsulate any other leaking joint, including old couplings, clamps, flanges or mechanical fittings.

RESULT:

The repair was completed in record time and eliminated the need to disinfect the line prior to placing it back into service, saving time, material and equipment plus other intangibles. A traditional opencut repair would have taken significantly more time and assets and may not have provided the utility with a desirable outcome. **716-372-0160; www.tps.us.**

New pump retrofitted in pressure sewer system

Problem:

A sewer district in Warren County, Missouri, was having maintenance issues with grinders on its pressure sewer system. Units were failing prematurely, often from overloading motors to pumping mechanism failures. These failures required maintenance, which often was after hours. Night and weekend repairs were raising overtime costs.

Solution:

Webtrol Pumps was called to offer an alternative that would reduce the cost on maintaining the system. After discussions, a customized retrofit **MVPS15** was selected. The units were designed to fit the existing basins and modified to eliminate the problems that were occurring using different level sensors. The pumping control system was designed so that it would still be compatible with the existing panels and wiring.

RESULT:

The modified units have been fit into the existing basins. Control switches are now working well, and the pump impellers, made from stainless steel, are not pitting like the previous units. Service call logs have been greatly reduced. **314-631-9200; www.webtrol.com.** ✦

WORTH NOTING

PEOPLE/AWARDS

Cody Gratny was promoted to civil principal and Boulder (Colorado) civil department manager for JVA Inc. Among his duties is devising innovative approaches to stormwater management.

Ryan Propp was promoted to the role of general superintendent for Owen-Ames-Kimball Co. (Michigan) and will oversee all superintendents in the company's Florida operations. Propp is a National Pollutant Discharge Elimination System stormwater management inspector.

Eira Corral Sepulveda was elected to the board of commissioners of the Metropolitan Water Reclamation District of Greater Chicago. She is the first Latina elected to the board in its 131 years of existence.

Nicole Gillett was hired by the City of Tucson (Arizona) to lead its Tucson Million Trees initiative. In partnership with Tucson Water, the program also will develop stormwater harvesting infrastructure to capture, retain and filter stormwater.

KC Water (Missouri) was honored by the Greater Kansas City Public Relations Society of America. It received a PRISM Award in the video category for a production titled "Understanding Your Water Bill," which explained the costs associated with water, wastewater and stormwater on residents' monthly bills.

Vanderbilt University (Tennessee) received a Leadership Award from the U.S. Green Building Council for its achievements in green building and its commitment to creating a healthy, sustainable future. Its projects have resulted in improved stormwater management.

Charlotte Storm Water Services (North Carolina) received honors from National Municipal Stormwater and Green Infrastructure — an Overall Performance Award in the Large Municipality category, and Gold Level designation in the Innovation and Project Management categories. ✦

CALENDAR

April 15-16
American Water Resources Association National Capital Region Water Symposium, event will be a virtual conference. Visit awra.org.

June 13-16
American Water Works Association ACE21 Conference, San Diego (site TBA). Visit awwa.org.

July 11-14
American Society of Agricultural and Biological Engineers Annual International Meeting, virtual conference. Visit asabe.org.

July 19-21
American Water Resources Association Summer Conference, virtual conference. Visit awra.org.

Aug. 29-Sept. 1
American Public Works Association Public Works Expo (PWX), America's Center, St. Louis. Visit apwa.net.

Sept. 13-16
StormCon Milwaukee and WaterPro Conference, Wisconsin Center, Milwaukee (parallel events being held on same days and location). Visit stormcon.com or waterproconference.org.

Municipal Sewer & Water *invites your national, state or local association to post notices and news items in this column. Send contributions to editor@mswmag.com.*

CLASSIFIEDS

see photos in color at www.mswmag.com

POSITIONS AVAILABLE

Parker Sewer & Fire Subdistrict is seeking to hire a Construction Supervisor. Must have Verifiable Sewer Main Line/Service Lateral installation repair experience. $19-$25 an hour. Apply in person at 117 Smythe St Greenville, SC 29611 (864-467-4030) or on our website www.parkersewerfiresubdistrict.com/current_job_opportunities. (M02)

GapVax, Inc., a nationally recognized manufacturing business, is seeking a talented, highly motivated individual to fill a full-time Sales Position in the Midwest (Iowa based preferred) region. GapVax is the leading manufacturer of industrial and municipal vacuum units and hydro-excavation units in the United States. We provide the most reliable, comprehensive, and efficient mobile vacuum units in the industrial and municipal markets. Specifications of the position are listed on our website, www.gapvax.com, click on the Now Hiring link in the left hand column. Send resumes to or betty@gapvax.com or 575 Central Avenue, Johnstown, PA 15902 (MBM)

SERVICE/REPAIR

SEWER LEAK DETECTION We locate leaking sewer lines and potential areas of ground seeps in watersheds using airborne thermal cameras. www.SewerLeaks.com. (M02)

Dynamic Repairs - Inspection Camera Repairs: 48-hr. turn-around time. General Wire, Ratech, Ridgid, Electric Eel, Gator Cams, Insight Vision, Vision Intruders. Quality service on all brands. Rental equipment available. For more info. call Jack at 973-478-0893. Lodi, New Jersey. www.dynamicrepairs.biz (MBM)

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Barbco forms Omneity Innovations

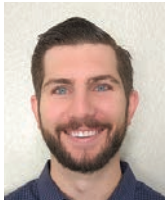
Barbco finalized a split of its engineering and service departments from the company to create Omneity Innovations, a spin-off company. Omneity will utilize the departments' expertise to focus on continued improvement of service to its customers. It will provide a wide array of services including engineering, training, technical support, consultation, repair and rebuild for all underground trenchless technologies.

Aries Industries adds new Alberta dealer

Aries Industries has strengthened its international market reach by adding Alberta-based Superior North America to its network of dealers. Superior North America, headquartered in Calgary, services the prairie provinces and British Columbia. The company brings over 17 years' experience in the refuse, road maintenance, sewer and public works equipment industries.

Mark McNeff joins subeca as IoT manager

Subeca announced the addition of Mark McNeff, EIT, as executive manager of IoT business development. McNeff will head up efforts to introduce subeca's key product line, the subeca AMIoT System of Water Management, to water resource and supply agencies looking to meet state water mandates and increase revenues by upgrading current hardware and software to IoT level Smart City technology.



Mark McNeff

Vacuworx renovates Tulsa machine shop

Vacuworx has a newly-renovated machine shop inside its Tulsa, Oklahoma, headquarters. The equipment manufacturing company is turning excess capacity into a new revenue stream as the company takes on contract work for outside companies. Vacuworx offers comprehensive design, CAM programming and machining services on an array of raw materials. The shop can accommodate short to large production runs and specializes in prototype development and finish treatments to suit individual needs.

Volvo Group and Daimler Truck AG enter new joint venture

The Volvo Group and Daimler Truck AG have a signed binding agreement for a joint venture to develop, produce and commercialize fuel-cell systems for use in heavy-duty trucks as the primary focus, in addition to other applications. The ambition of both partners is to help take a step toward climate-neutral and sustainable transportation by 2050. The Volvo Group will acquire 50% of the partnership interests in Daimler Truck Fuel Cell GmbH & Co. KG for approximately $7 million on a cash and debt-free basis. Closing of the transaction is expected during the first half of 2021, subject to merger control review by relevant authorities, as well as other approvals.

Super Products president announces retirement

After 13 years leading and growing Super Products, Mike Vanden Heuvel announced his retirement effective Dec. 31, 2020. As his successor, Super Products' Vice President of Rentals Randy Buening was promoted to president of Super Products, effective Jan. 1. Vanden Heuvel joined the company in 2007 as the VP of industrial sales and took over as president at the end of 2008. During his tenure he added several rental facilities and maintained steady growth. Under Vanden Heuvel's supervision, Super Products built and moved into its new headquarters in Mukwonago, Wisconsin, in January 2020. The new building allowed the organization to consolidate three separate operating facilities in southeast Wisconsin into one, where it now produces its full product line. ✦

Mike Vanden Heuvel

Randy Buening

Product Spotlight

Couplings are a fit for difficult repairs

By Tim Dobbins

Connecting to existing pipes that have been sheared off isn't an impossible repair, but still one that can pose difficulties and take time to fix properly.

Fernco's ICON couplings are designed for easy installation in not only sheared off pipes in sanitary and storm systems, but for connecting pipes of differing or irregular outside diameters.

"This is an internal push fit coupling," says David Donahue, marketing coordinator for Fernco. "They are ideal for above- and below-ground sewer and DWV pipes in vertical and horizontal applications."

The ICON couplings are made from shear-resistant, rigid ABS plastic and create a watertight seal on any pipe material including plastic, cast iron and copper. "This coupling is a great solution for those tough situations where a standard coupling cannot be used," Donahue says.

By coupling from the inside of the pipe, it can connect pipes that penetrate the ground, a wall, floor or ceiling where it's not possible to connect to the outside of the pipe.

Each coupling features a rubber sleeve with a ribbed design to ensure a watertight connection. An internal lip creates a smooth transition between pipes. The internal ribs use a tapered edge to aid in natural flow and a built-in pipe stop helps users know when the coupling is installed properly and flush to the receiving pipe. Though watertight, the fitting is not permanent and can be removed and reused at any time.

No tools are required for installation, and with the help of some soap and water, Fernco says push-fit couplings can be fitted in under 30 seconds. To install, make sure the inside of the receiving pipe is clean and free of burrs. Spray a soap-and-water solution onto the ICON and press firmly into place making sure the leading fin does not get folded over. Follow the same procedure for the second pipe and the connection is complete.

ICON couplings are tested to 4.3 psi and come in two size options: 4- and 6-inch. The ICON 4-inch will fit inside diameters ranging from 3.90 to 4.06 inches and the ICON 6-inch will fit diameters ranging from 5.83 to 6.02 inches.

"We've received great feedback from customers using these in the field," Donahue says. "It really is a great coupling for those tough connections." **810-503-900; www.fernco.com.**

Infinite Informatics AERINOS ProfiSens wireless IoT system

CAS DataLoggers' new AERINOS ProfiSens wireless IoT system from Infinite Informatics includes a family of wireless sensor nodes and a cellular data gateway that forwards data and sends SMS alarm messages. Features include: low power operation from a lithium battery or external power; wireless range of greater than 3 miles (line of sight) between sensors and data concentrator; up to 32 sensor nodes and 64 measurement channels; support for FTP upload and SMS alarm messaging; and a rugged IP66 enclosure suitable for outdoor use. **800-956-4437; www.dataloggerinc.com.**

NOARK Electric Ex9CA safety contactor

The new Ex9CA safety contactor from NOARK Electric is designed for use in safety function applications. It offers unique features that allow the design of safety control circuits with current ratings up to 38A. Applications for the Ex9CA include E-stops, light curtains, safety gates and safety interlocks. The NOARK Electric Ex9CA is equipped with a permanent transparent cover that prevents manual operation and provides easy identification of the device status. They are available with either AC or DC operating coils. DC coil models are equipped with integrated surge suppression. They install easily on a 35 mm DIN rail or on panels. **626-330-7007; na.noark-electric.com.**

Polygon Composites PolySlide composite tubing

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