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April 2014

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THE LONG VIEW

Sound planning and
management help
Tacoma get the
most out of its
infrastructure

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CORROSION COSTS


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Seth Doull,
Engineer
Tacoma, Wash.

underground
understood

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new

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INSIDE:

MANHOLE EQUIPMENT AND REHABILITATION



ON THE COVER:

Seth Doull, an engineer at Tacoma Water in Tacoma, Wash., focuses on the utility's asset management efforts. The utility has been able to minimize the lifecycle costs of owning, operating and maintaining assets at an acceptable level of risk, while continuously delivering established levels of service. (Photography by Mark Mulligan)



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A GLIMPSE INTO THE FUTURE

From the classrooms to the show floor, the Expo provided plenty of ways to improve your utility



FROM THE EDITOR

Luke Laggis

The 2014 Pumper & Cleaner Environmental Expo is in the books. It was another great week in Indy, and it was great to get to talk to so many people from across the industry. And it's always nice to get a close-up look at the newest equipment and technology.

There were so many new products, many launched right at the Expo, from cutting-edge inspection camera systems to redesigned pumps and even a new jetter truck designed specifically around the

input and needs of a municipal wastewater utility in Georgia. It was truly a glimpse into the future of this industry and the potential of your utility, and it was all there on display.

Beyond the technology, the greatest part of the Expo for me

is always meeting and talking to you. I speak with many of you from my desk in Northern Wisconsin, but the opportunity to meet face to face, to speak with you directly and hear your stories in person really brings everything together. It's great to hear

passed what many could have ever imagined way back in 1979, when *Pumper* was first delivered to mailboxes across a few Midwestern states.

The new name better reflects the industry and this show. It's a more accurate snapshot of what we have become and where we are heading. It's a show for an entire industry of hard-working people who maintain the flow in our sewer and water infrastructure, properly treat and dispose of wastewater, and keep drinking water safe and our environment healthy.

COLE Publishing has always used the annual Expo to show our appreciation for the work you do, day in and day out. That won't change. Though often overlooked by others, we understand that what you do is vital to the individuals and communities you serve.

If you couldn't make it to Indy, start planning now so you can be there next year. It's one of the best things you can do to gain the insight and knowledge necessary to keep improving your utility.

Enjoy this month's issue. ♦

I speak with many of you from my desk in Northern Wisconsin, but the opportunity to meet face to face, to speak with you directly and hear your stories in person really brings everything together.

how the work we're doing at *MSW* is making an impact on your work. That's the goal, and it's also the greatest reward.

There are so many stories to be told, and it's an honor to convey them to you. From the municipalities picking up new trucks on the show floor, to the operators learning in the classrooms and seeking out new tools and technology to improve their operations, everyone has a story. You can look forward to seeing some of them in the pages of *MSW* as we move forward.

And while we're looking ahead, take note that next year the Pumper & Cleaner Environmental Expo International will become WWETT – the Water and Wastewater Equipment, Treatment & Transport show. We understand that like the industry, this show has evolved to encompass far more than septic pumping and drain cleaning. The industry and profession has sur-

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CAUGHT IN THE ACT

“No One” is Looking

Are your workers slacking on the job? If so, how would you know? Water utility workers in Louisiana were suspended this past fall after a video surfaced showing poor behavior that resulted in public outcry. Today’s tech-savvy population keeps you in the know when your workers are unsupervised, but how would they look in the public eye if their video was posted on the Web?

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OVERHEARD ONLINE

“ Sometimes utilities don’t feel the need to change because they don’t have competition. Leadership is much more than just managing day to day.”

Top Traits of a Great Leader
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WAGE WAR

How Much Are You Worth?

A \$20,000 raise? Yes, please. An Indiana water utility supervisor received a whopping 28 percent salary increase. Why? He is the only state-certified employee at the water plant with knowledge of the entire water system. Being rewarded for hard work and dedication is vital to employee morale. If your utility cannot afford huge salary bumps, would more vacation, year-end bonuses or paid state certification suffice?

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FROST GONE WILD

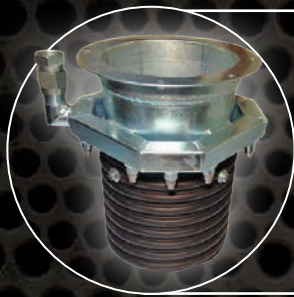
Biting Temps Wreak Havoc

Baby, it’s cold outside. That’s an understatement. Frost depths and freeze-ups have reached unprecedented levels, and record-breaking temps overwhelmed utilities nationwide, making the winter of 2014 one of the coldest in history. More than 50 below-zero days and penetrating frost levels have taken a toll on laterals and water mains at utilities in Wisconsin’s frozen tundra. If you faced similar issues, take a look at what these agencies did to thaw out.

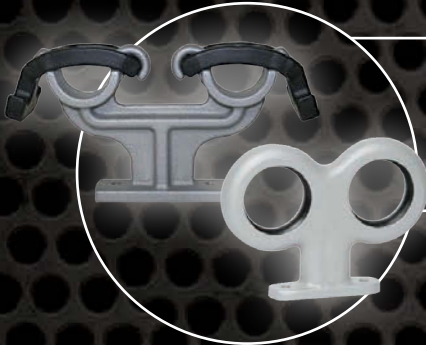
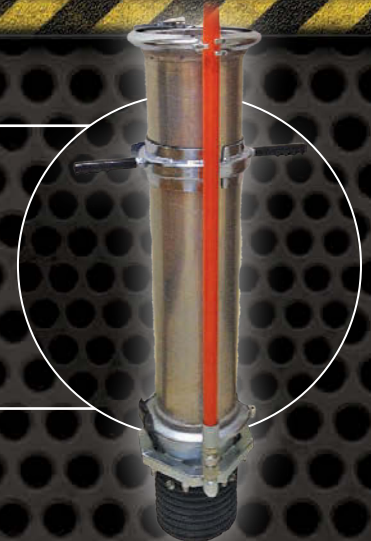
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Building Innovative Tools for Municipalities

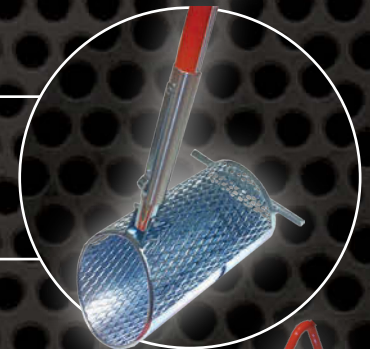


(DIG-IT) Hydro-Excavator HY-EX-8V10, features top flange for your style machine. Available in 6" and 8" tube size with 4, 6 or 10 jets according to your requirements. Each stainless steel jet is zero degrees pointing straight down but can be switched out for different angles. Bottom 8" rubber hose protects what is down below. Comes with a female swivel for your hose and is only 23 lbs. Pictured at right on a 3' extension tube with our Hydro Vac handle in the middle. Tube hose clamps (THC-8) employs articulating jaws to steady your high pressure hose at each tube connection.

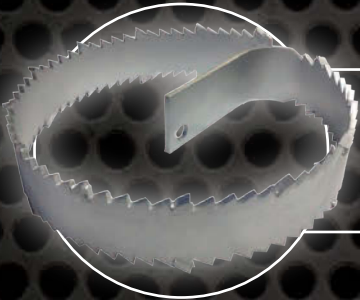


Quick-Mount Fiberglass Pole Carriers. These carriers are a great way to store fiberglass poles on your truck. Can be used with poles, hooks and similar round handled tools. Made of cast aluminum and powder coated. The rubber uv protected flex-draw latches firmly holds the pole in place.

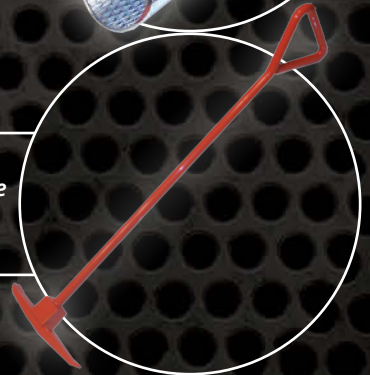
Debris Grit Catcher Baskets. These are almost a must on every jetter. Don't let the debris flow down the line to cause a problem elsewhere. These Grit Catchers not only catch debris but also the fine sand and grit since they have covered bottom and half-moon back. Here is seen using our fiberglass pole system in any length you need.



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Pook. This patented design is the toughest on the market. One side is a pick to chip away asphalt and one side is a hook to flip open the manhole cover. Hence the name "POOK" a pick and a hook. Strong 3/4" handle. The whole unit is heat treated and powder coated safety orange.



Debris Basket with Rope. The baskets are lowered into place with a 25' rope. Eliminated the need for the poles and is easily retrieved at a 45° angle to avoid any spillage when lifted out of the invert.



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THE LONG VIEW

Tacoma Water uses strategic planning and asset management principles to get the most out of its infrastructure

By Erik Gunn



A crew from Tacoma Water installs cathodic protection equipment on a water main in a residential area. (Photography by Mark Mulligan)

Spend some time around Tacoma Water, and you might not hear the word “maintenance” very much.

It’s not that the utility serving the city of Tacoma and surrounding communities in Washington state doesn’t care about keeping up its infrastructure. Just the opposite. At Tacoma Water, they’re a lot more likely to talk

about “asset management.”

That’s not just a fancy term meaning the same thing. Asset management means thinking a lot bigger. Tacoma Water defines it this way: “An integrated set of processes to minimize the life cycle costs of owning, operating and maintaining assets at an acceptable level of risk, while continuously delivering estab-

lished levels of service.”

“It’s looking at, what does it cost to take care of your existing infrastructure and maintain it,” explains Seth Doull, a Tacoma Water engineer. The utility, which replaces about 10 miles of main a year on average, focuses on getting the most value for its dollar.

“It’s not the cheapest material

you put in the ground, it’s the most cost-effective, when looked at over the entire life cycle of the asset,” Doull continues. Deciding on a prospective repair doesn’t just require evaluating the chances of system failure – it also demands considering what the consequences of failure would be.

Through it all, the ultimate goal
(continued)

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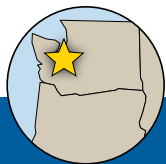
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Data collection is one of the most critical aspects of Tacoma Water's asset management system. Service trucks are equipped with laptops like this one used by lead water service worker Troy Newman at a job site.



PROFILE:

**Tacoma (Wash.)
Water**

POPULATION SERVED:
90,089 residential and
5,692 commercial/industrial
connections

SERVICE AREA:
117 square miles surrounding
Tacoma, Wash.

WATER VOLUME:
Up to 168 mgd from Green
River, 12-72 mgd from North
Fork wells, 55 mgd from local
wells

EMPLOYEES:
248

INFRASTRUCTURE:
1,343 miles of water mains

BIENNIAL BUDGET:
\$153.7 million

WEBSITE:
www.mytpu.org/tacomawater

“It’s not the cheapest material you put in the ground, it’s the most cost-effective, when looked at over the entire life cycle of the asset.”

– Seth Doull

is to give top-notch service to the water system’s customers.

It’s a delicate balance, says Shannon Rauch, Tacoma Water’s asset management supervisor. “There’s the cost of operating the system, the risk you take on if you’re minimizing those costs, and the level of service your customers expect to receive from you.” The end goal, she continues, is “making sure you’re minimizing the cost, but not taking on too much risk, and making sure customers are getting the service they’re expecting.”

Century-old system

Located on Puget Sound, halfway between Seattle and the Washington state capital of Olympia, Tacoma is a city of just under 200,000 people. Tacoma Water is

supplied by the Green River, and its resources are plentiful.

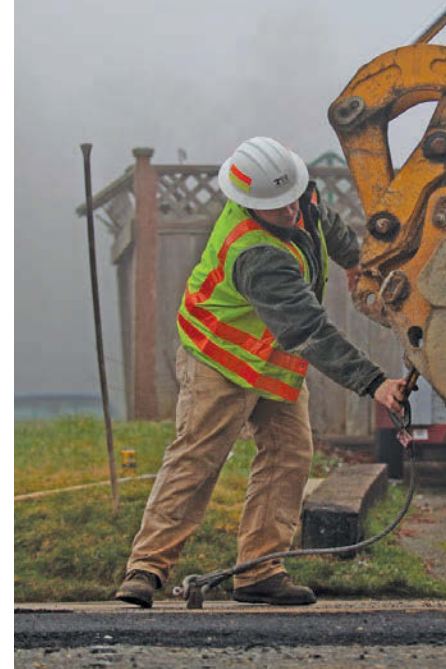
“We’re long on water,” says Tony Lindgren, distribution engineering manager for the utility. “We have an average daily demand of 55 million gallons, and a supply of upwards of 100 mgd to serve that.”

The supply is mainly gravity-fed, bolstered by a system of backup wells, says Ray West, the distribution operations manager. The lion’s share of customers are residential, accounting for just over 90,000 of the utility’s 97,500 connections; the rest are industrial and commercial customers. One in particular, the paper producer Simpson Tacoma Kraft Co., accounts for about one-third of the utility’s daily water demand.

Tacoma Water also has a new \$185 million filtration facility under construction. “That’s a very significant project for us,” says Rauch. “Up to this point we were unfiltered” – one of only a very few unfiltered water utilities in the country.

Tacoma’s water main system is more than 100 years old and includes pipe composed of a wide range of materials. Among those are asbestos cement and cast iron, but there’s a growing amount of ductile iron. “That is our material of choice to install now,” Lindgren says. Durability is one major reason: “We’re trying to design for 100-plus years,” says West.

Over the years the utility has grown appreciably by acquiring



smaller systems in surrounding communities, some up to 30 miles away. The added systems have often used materials below Tacoma’s standards, requiring replacement.

“We’re pretty conservative on the type of materials we use,” West says. “Once it’s in the ground, we want it to last a long time.”

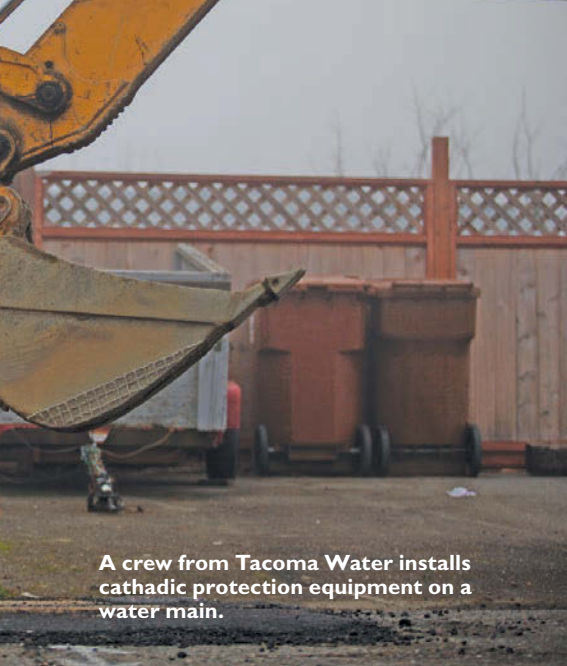
Strategic planning

Guided by earlier strategic planning, Tacoma launched a major program in 2005 of systematically replacing deteriorated water mains. The program included consistently budgeting for the work from year to year.

The initial focus was on water mains with a history of frequent

Cathodic protection equipment is wired onto a water main 8 feet underground in a residential neighborhood in Tacoma, Wash. The system prevents corrosion of the pipe by pulling current toward a zinc anode buried on the same level as the pipe. The entire system is also wired into a larger system that can be monitored by Tacoma Water.





A crew from Tacoma Water installs cathodic protection equipment on a water main.

breaks and those that were among the older lines in the system, as well as the type of main involved.

“We knew certain types of cast iron were performing poorly,” says Doull. “We went out for some of the oldest ones.” Galvanized pipe, which suffered from internal corrosion, was also targeted, he adds. “We replaced almost all of that.”

But Tacoma Water quickly raised its sights. In 2008 the utility took part in an international study benchmarking 15 municipal water supply operations on their asset-management processes. The study was conducted by the International Water Association and the Water Services Association of Australia. Each participating utility, including Tacoma, got a report summarizing strengths, recommending improvements, and ranking all the participants in various asset-management elements.

“We were told we had a good system, a good plan, but it wasn’t formalized in any way,” says West. Still, Tacoma was off to a good start, with something to build on. So, in 2010, the utility took the next step, creating a formal asset-management program.

Risk-based approach

“We’ve really tried to take a more risk-based approach to planning for replacement,” says Rauch, who joined the utility in 2010. Having gotten “the low hanging fruit” in the preceding years, she continues, “now we have the luxury of stepping back and figuring out where we’re going to get the best return for our money for main replacement.”

With the new approach, Tacoma Water is moving away from focusing so much on how old the pipe is. “Age isn’t a reliable predictor of condition,” Doull points out. Downtown Tacoma boasts some of the system’s oldest pipe, most of it cast iron, yet it remains sound despite its age, he explains. “We’ve decided to leave those alone.”

Asset management requires a more comprehensive and analytical approach to the data about the system, Rauch explains. And “risk-based”

means looking at more than just the conditions of the pipe being considered for repair or replacement. It entails understanding what could happen if it fails.

Teams of employees called Strategic Asset Management Plan work groups – or SAMP teams for short – evaluate each of the utility’s assets using a series of consistent criteria to identify both the likelihood and consequence of failure.

Wealth of data

Previous leaders at the utility had the foresight to collect a wealth of data over the decades. “We have data going back 30 years,” says Doull.

Using that data, Tacoma Water was able to develop an economic model based on those three decades of break history and “about 10 years of pretty good cost data” for repairs.

For instance, for a small-diameter main breaking in a residential area, the consequence of failure could be fairly small and repair is easy and relatively inexpensive – perhaps \$5,000 or \$10,000, Doull says.

But for a larger transmission main buried under a main street or major highway, the cost of a repair or replacement could skyrocket. So does the inconvenience posed to the general public when a road has to be shut down and torn up for days or weeks to complete the repair.

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Patrick Sablan, with Tacoma Water, grabs equipment from a service truck while installing.

KEEPING IT SIMPLE

As Tacoma Water has undertaken a long-range, big-picture approach to keeping its infrastructure in shape using principles of asset management, there's one thing the utility hasn't done: gone out and bought some expensive new software package for the task.

Tacoma Water uses its existing Magguide electronic mapping system (although it does plan a change). But it's also keeping its asset management information in SAP, a citywide CMMS data management system. In-house analytics are accomplished using Microsoft Access database and Excel spreadsheet platforms.

"We've tried to use the tools that we already have," says engineer

Repairs where soil has been contaminated from industrial sources are sure to be a lot more expensive because of the extra care required. And a main failure that could affect major institutions, such as a school or a hospital, likewise carries far greater consequences.

"We are now beginning to better understand what our highest-risk assets are," says Rauch. Managing them effectively requires asking whether there is sufficient backup

"We're pretty conservative on the type of materials we use. Once it's in the ground, we want it to last a long time."

— Ray West

infrastructure that can be brought online if the primary infrastructure fails, and whether there is an appropriate replacement project protocol for a certain piece of equipment or a certain process.

Thinking ahead also allows for more choices in solutions. "Maybe it's as simple as adding a valve or another feed into a hospital or school, and not necessarily having to replace the main," says Rauch.

Getting a more complete picture of the condition of every asset is also part of the approach. Tacoma Water began a condition assessment project a few years ago, and it's still underway. Already crews have found

that some proposed replacement projects weren't necessary.

"They did their investigation and the main was in good shape," says Doull. The money that would have been spent on those unneeded replacements can now be directed elsewhere.

Analytical tools

Asset management is a kind of toolkit, says Rauch, and the "tools" are particular analytical frames and techniques that can be applied to answer questions and understand situations.

One such tool is making a business case in order to evaluate a prospective action. At Tacoma Water, says West, major capital improvement projects now must undergo a business-case evaluation. Rauch says that illustrates how the utility is working to teach everyone in the operation how to "apply asset-management principles in the job they do."

Asset management is about more than just money and cost. "Asset management provides us with the information in order to make informed decisions," Lindgren says.

It's not rigid, either. Every budget biennium, using the asset-management criteria, Tacoma Water develops "a list of projects that make the most sense for us," Lindgren says. "But that may change, depending on what comes up."

For instance, if the city has put rebuilding a certain street on the fast track, and that location is earmarked for a future water main project, Tacoma Water could decide to move that project up so that it can be completed while the street is torn up, avoiding repeated disruption to traffic.

It's not enough just to consider the economics of a project. "There

are a lot of social impacts that we need to look at," Lindgren says.

Team approach

The focus on asset management has also helped encourage much more collaboration between various departments and divisions of the utility, Doull notes. It also has promoted two-way communication between management and the front-line employees.

"When I first started with asset management, what I saw was the top-down and bottom-up approach," he says. It isn't enough for management just to communicate information down to the rest of the staff. "We also learned how important it was to get information from the staff people who have their hands on the equipment."

The SAMP teams illustrate that approach. Made up of six or seven employees each from across the staff, representing a range of trades and professions, each of the 15 teams is assigned to one of Tacoma Water's 15 asset classes: Water meters and distribution mains, services and transmission mains, pump stations, and so on.

"It's a very focused effort to look at a particular asset class," says Doull. After six months to a year of biweekly or monthly meetings, collecting all the information that the utility has about the assets to which a team is assigned, the teams then reconvene as needed when confronted with relevant decisions, such as whether to begin using a new kind of meter.

"It's vital to have the input from our operational staff and mechanics," Doull says. "They're the ones that touch these materials. Without that perspective, we wouldn't be as successful as we are."



Seth Doull, an engineer at Tacoma Water in Tacoma, Wash., helps the utility improve efficiency by focusing on asset management.

Seth Doull. “We’ve tried very hard not to go jump at what a vendor is offering.”

Up to now, the mapping system has not been a GIS system, but the utility is migrating to an ESRI-based GIS mapping system, Doull adds.

Tacoma Water has taken a conservative approach to technology, though. Field employees have had laptops for 10 years, says Tony Lindgren, distribution engineering manager. But there’s no rush to migrate to tablets just because they’re hot and popular. Functionality is much more important.

That doesn’t mean Lindgren or his colleagues look down their noses at useful new technology. To further refine the process used to forecast a

water main’s remaining useful life, the utility is piloting a noninvasive acoustic pipe assessment technology.

Another project involves developing an application that field mechanics inspecting lines can use to record equipment failures and their causes while still out on site and instantly enter the information in the asset management database.

“They’d be able to see the maintenance history, they’d be able to dispatch work, and supervisors would get notification of the problem and be able to send someone out to take care of it,” says asset management supervisor Shannon Rauch. The system is expected to be rolled out over the next year.

A history of vision

Tacoma Water employs strategic planning in every facet of its operation, not just its approach to asset management. Besides its retail water business, the utility also is a wholesale provider of water to neighboring utilities. The growth of that segment of its revenues has been a direct product of strategic planning, Doull says.

“It’s vital to have the input from our operational staff and mechanics. They’re the ones that touch these materials. Without that perspective, we wouldn’t be as successful as we are.”

– Seth Doull

As a relative newcomer to Tacoma Water, Rauch finds the operation’s commitment to strategic planning to be in keeping with a long tradition of forward thinking at the utility going back to its founding.

The foresight to start detailed data collection three decades ago and the decision in the early 2000s to become more intentional and systematic about keeping the system upgraded continued that spirit. The current use of tools such as strategic planning and asset-management represent its latest expression.

Building the system a century ago “took some vision and forethought,” says Rauch. “I still believe that’s ongoing in our long-range planning. We have a strong team here.” ♦

A web of wires for the cathodic protection equipment emerges from the ground where it is connected to a water main.



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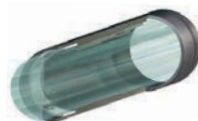
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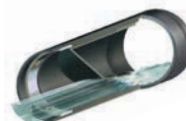
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CONTROLLING CORROSION COSTS

Composite manhole covers offer a variety of advantages to their traditional counterparts in corrosive environments

By Jo Stott

Ageing infrastructure is one of the primary problems facing the United States today. Across the water lines, sewer systems and other infrastructure are deteriorating at a rapid pace, and corrosion is one of the principal factors.

According to a study by the National Association of Corrosion Engineers (NACE), the direct cost of infrastructure corrosion was over \$22 billion in 2002 in the United States alone. Adjusted for inflation, the direct cost of corrosion in 2013 is estimated to be over \$42 billion on an annual basis. It has been estimated that at least 25 to 30 percent of annual corrosion costs could be saved if optimal corrosion management practices were employed.

Underground infrastructure

The underground infrastructure of the United States is particularly exposed to corrosion because its core components are often installed in contact with soil, often convey water or more corrosive liquids, and many components such as manhole covers, frames and grates are installed at grade and are completely exposed to the elements. The scale of the affected systems that are sub-

ject to corrosion and decay is immense. According to the American Waterworks Association, there are approximately 876,000 miles of municipal water piping in the U.S. The country's sewer system network is estimated to exceed 800,000 miles of underground piping.

Sewer, water and stormwater utilities all utilize extensive networks of

In many cases, they are the only materials that will handle a given service environment; and in other cases their corrosion resistance is combined with their lower unit cost to make them the most economical acceptable solution.

underground piping. Typically, manhole covers are installed every 100 feet or so to allow for accessing the underground pipeline or conduit. It is estimated that there are at least 100 million manhole covers and grates installed in the United States alone. The principal materials used in these underground systems are steel, cast iron and concrete. All of these materials, including, to a lesser extent, concrete, are subject to corrosion.

FRP products now widely used
Fiberglass-reinforced plastic



Composite manhole covers are more resistant to all forms of corrosion than their traditional counterparts (lower left), and most are equipped with watertight silicone gaskets.

in the laminate. There are various resin systems available today, all of which provide long-term resistance to almost every chemical and temperature environment.

Composite manhole covers are highly resistant to all forms of corrosion. For this reason, they have been specified for use in highly corrosive environments such as steam manhole vaults. In many major cities, district energy networks operate large underground piping systems used to transmit steam from a central plant to nearby office buildings, hotels, hospitals and apartments. The steam or superheated steam that is transmitted in such systems can often reach temperatures as high as 400 degrees F. Due to the high heat of the steam, many utilities require the use of a thermally nonconductive composite manhole cover to prevent the accidental burning of pedestrians that may come in

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contact with the cover.

Most composite covers are equipped with watertight silicone gaskets that seal against the manhole frame. These gaskets can significantly reduce the amount of surface water infiltration into the steam vault. Surface water is often contaminated with road salts that can cause corrosion in the piping and valves located in the vault. In addition, by keeping surface water from entering the manhole, spilling directly onto the hot steam valves and piping and thereby turning into steam, the internal temperature of the vault is kept at lower temperatures.

Composite covers are also extremely resistant to corrosion caused by road salts. This is extremely important for municipalities and utilities in colder climates where road salt is routinely applied during the winter months.

Corrosion resistance is also critical for industries that are transmitting or storing corrosive liquids. In applications involving highly corro-

sive or environmentally damaging liquids, engineers often design concrete trenches to contain the piping. Fibrelite's extensive line of composite trench covers are now being used across an array of industries as a strong, lightweight and corrosion resistant alternative to metal or concrete panels.

Making an impact

Today, composite materials are used in a wide variety of industries and applications. Composites offer several advantages over traditional materials: higher tensile strength, lighter weight, greater corrosion resistance, no resale value (detering theft), better surface finish and easier processing.

By helping to reduce the costs of corrosion, composite covers can allow municipalities, utilities and other operators of underground infrastructure to improve the financial strength of their enterprises. ♦

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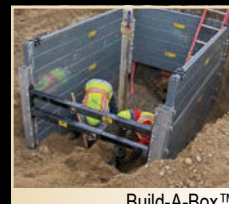
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FOCUS: SEWER

GETTING WITH THE PROGRAM

Bell Buckle takes a programmed approach to environmental compliance and nets significant I&L reductions on a tight budget

Randy Johnson, Town of Bell Buckle wastewater manager, looks into the EQ Basin at the town's wastewater treatment plant. (Photography by Sanford Myers)

By *Peter Kenter*

Nobody knows for sure how the city of Bell Buckle, Tenn., got its name. What's certain is that the Bell Buckle Water and Sewer Department is successfully employing a programmed approach to attack the deficiencies of its wastewater system while protecting the wallets of ratepayers.

The city of fewer than 500 people is located about 50 miles southeast of Nashville. Much of the sewer infrastructure was built in the late 1950s and is reaching the limits of its service life. The 6-mile gravity-fed sewer system consists to a large extent of clay pipe and brick-lined manholes now subject to inflow and infiltration. A 1-mile force main provides service solely to the Webb School, a private boarding facility.

With a small municipal tax base, public funds are at a premium. The entire department is operated by three people: wastewater manager

Randy Johnson, water manager Ronnie Lokey (who doubles as fire chief) and assistant Jason Lewis who works primarily on water, but spells Johnson on wastewater. Armed with a New Holland backhoe and a Chevy dump truck, the team performs a wide range of tasks, from meter reading to infrastructure repairs and supervising outside contractors.

Sewer system moratorium

In March 2005, the city became the subject of an Administrative Order by the Tennessee Department of Environment and Conservation (TDEC) over untreated wastewater flowing into Bell Buckle Creek. Under a moratorium applied by the state, no additional connections could be made to the system until the state approved a Corrective Action Plan (CAP) and Capacity, Management, Operations and Main-

PROFILE:

Bell Buckle Water and Sewer Department, Bell Buckle, Tennessee

FOUNDED: 1856

CUSTOMERS SERVED: 790 water customers, 270 sewer customers

AREA SERVED: 1 square mile

DEPARTMENT STAFF: 3

INFRASTRUCTURE: 6 miles of sanitary sewer lines, 7,100 feet of force main, 39 miles of water mains

ANNUAL DEPARTMENT BUDGET: \$705,000 (anticipated 2013-14)

ASSOCIATIONS: Tennessee Association of Utility Districts, Municipal Technical Advisory Service

WEBSITE: www.townofbellbuckle.com/waterandsewerdepartment/index.htm



tenance (CMOM) program, which was due three months from the announcement to avoid further enforcement action.

At the time, Johnson had been hired as a backhoe operator and was working to achieve his Grade III Wastewater Treatment Plant Operator certification.

“At that point it seemed that the expanding rules and regulations about wastewater and accumulating problems had finally caught up with the system,” says Johnson.

The city hired an engineering

city’s five basins and a sewer system evaluation survey (SSES). When the equalization basin was put into service in the summer of 2006, TDEC lifted the moratorium.

“Unfortunately, the equalization basin was undersized,” says Johnson. “The wastewater plant was designed to process about 150,000 gallons of sewage per day, depending on how well the sludge settles and allows water to pass through four tertiary sand filters. By fall, the tank filled up. Soon we were sitting on a million gallons of rainwater. The tank

“In some cases, the smoke testing showed us where a homeowner broke open a clay service lateral years earlier to rod it out, then covered the broken pipe with a piece of tin.”

– Randy Johnson

firm to quickly devise a CAP, which was approved by the council in June of that year.

The centerpiece of the plan was the construction of a million-gallon equalization basin at a cost of \$500,000. The quick-fix plan was designed to both provide relief to the wastewater treatment plant and end the moratorium as soon as possible. The decision was backed by a flowmeter study, which mapped the

stayed full through the winter and we ended up with more untreated wastewater entering the creek. By March of the following year we got the tank down 3 or 4 feet and then it filled right back up.”

Multiple sanitary sewer overflows were logged in 2007 and 2008.

City devises a new CAP

Johnson took on the job of wastewater manager in 2009 as the

Town of Bell Buckle Wastewater Manager Randy Johnson, right, watches as a Compliance Enviro Systems worker retrieves a camera out of a manhole.



Town of Bell Buckle Wastewater Manager Randy Johnson, left, and Water Superintendent Ronnie Lockey look at a SpectraShield treated manhole.

city struggled to do what it could to improve and maintain the system on a limited budget. Faced with more sanitary sewer overflows, the city agreed to a new CAP in 2011 and a renewal of its CMOM program. Among the priorities: inspection and rehabilitation of Basins 3, 4 and 5.

“Under the new CAP, we began to concentrate more on rehabilitating the system by seeking out the worst cases of I&I,” says Johnson.

In February 2012, the city retained the Nashville office of Littlejohn Engineering Associates to provide it with a programmed approach to dealing with the wastewater system. The company leveraged data from the 2006 SSES, and existing AutoCAD files to create a

all assets electronically and integrating the information into a simple web-based geographic information system using ESRI ArcGIS software and made available to staff via ArcGIS Online.

Working on priorities

“We helped the city rank which basins were the highest priority,” says Travis Wilson, a project manager with Littlejohn. “Each client is different and has its own budgetary constraints. We worked with the department to see what they could do and what we needed to get contractors to do based on their unique knowledge of the system. We deter-

“It looked like the work had never been inspected after it was finished. There were a lot of seam issues and the inverts weren’t tied into the mainline correctly.”

– Randy Johnson

more thorough map of the city’s sewer and water assets. The consultant then assisted the department in using GPS technology to capture

mined that continued attention to Basin 5 was the best place to start, so we could knock out all of the big home run leaks we identified.”



A FULL TEAM EFFORT

In a city of under 500 people, a team effort is required to ensure that ratepayers get value for money. At the Bell Buckle Water and Sewer Department, employees have each other's backs.

"Water manager Ronnie Lokey always makes himself available," says wastewater manager Randy Johnson. "During recent manhole camera inspections, he assisted whenever we ran into something that required immediate attention."

Lokey, on the other hand, counts on Johnson to assist whenever the city experiences a water main break.

"Randy is one of the better backhoe operators I've met," he says. "He can really work around those lines until we get to the leak, without making the problem worse."

The department also counts on alderman and Vice-Mayor Jenny Hunt to advise on budgets and provide liaison between the Tennessee Department of Environment and Conservation (TDEC) and the city.

She also has a knack for writing successful grant applications. At one point, she studied the city's wastewater treatment facility for two months to develop a thorough understanding of how it worked before submitting a grant application.

Hunt most recently helped the city land a \$200,000 Community Development Block Grant from the state for sewer system rehabilitation.

"The people reviewing these applications get a lot of paper arriving on their desks," she says. "You want to give them something unique that indicates that you know what you're talking about."

She says she isn't shy about seeking meetings with TDEC staff to ask for advice or to work on compromises regarding the city's Corrective Action Plan.

"I was recently asked just how I had managed to get a meeting with the commissioner of the TDEC," she says. "My secret? I called him to request a meeting. Regulators are people like anyone else, and effective networking and communications go a long way to help the city to work well with them."



Gerard Cruz, of Compliance Enviro Systems, LLC, out of Baton Rouge, guides a camera through through a pipe inspection from the control room.

Basin 5 represents about a third of the sewer system. Bell Buckle staff teamed up with outside contractors to conduct smoke testing and manhole inspections, adding any pre-

Connection Seal + Lateral, while the department repaired any damaged clean-outs, replacing clay components to the property line with PVC.

"We fixed a bunch of laterals and replaced some clean-outs that were in bad shape with new ones. With the money we saved on that section of pipe, we were able to spend more on manhole lining."

– Randy Johnson

viously overlooked infrastructure to the GIS database. A camera team was also contracted to televise the sewer lines and integrate its findings with the GIS system. While the work concentrated on Basin 5, any areas outside the basin that had previously been identified as significant contributors to I&I were also included.

"From the information we gathered, we listed the manholes that appeared to have the worst leaks and had a contractor line them with SpectraShield Liners," says Johnson. "The smoke testing showed us that a lot of the I&I was caused by poor connections to service laterals over the years. In some cases, the smoke testing showed us where a homeowner broke open a clay service lateral years earlier to rod it out, then covered the broken pipe with a piece of tin."

Camerawork also revealed that a decades-old sliplining job had been poorly implemented.

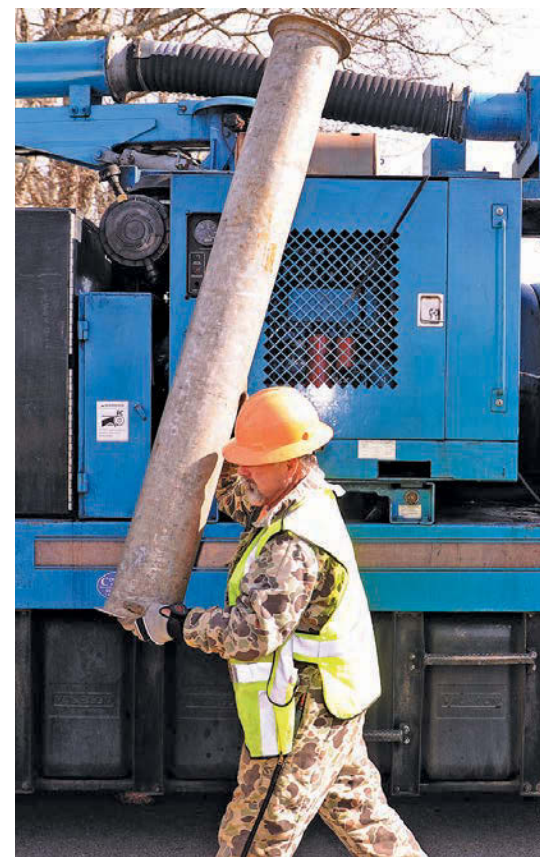
"It looked like the work had never been inspected after it was finished," says Johnson. "There were a lot of seam issues and the inverts weren't tied into the mainline correctly."

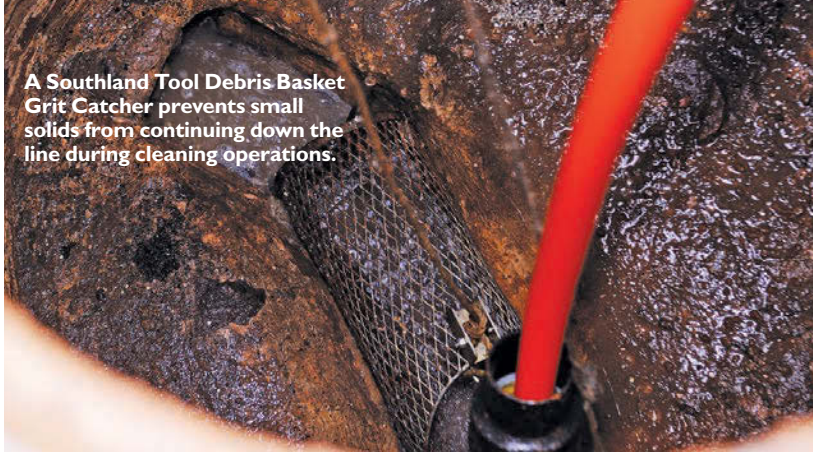
The city employed a contractor to properly connect the laterals using BLD Service

Steve Stewart, of Compliance Enviro Systems, LLC, carries an extension tube to the hose on his vacuum truck. (Vac-Con)

Claiming an opportunity

A recent road construction project along Highway 82 undertaken by the Tennessee Department of Transportation required the replacement of about 2,000 feet of sewer and





A Southland Tool Debris Basket Grit Catcher prevents small solids from continuing down the line during cleaning operations.

water line with the state picking up the tab.

"We jumped on that opportunity," says Johnson. "It was the section connecting the Webb School to the town. We fixed a bunch of laterals and replaced some clean-outs that were in bad shape with new ones. With the money we saved on that section of pipe, we were able to spend more on manhole lining."

The recent programmed effort has been so successful that the city is petitioning TDEC to allow it to alter both its CMOM program and CAP.

In November, the city voted to approve a \$25,000 systemwide flow monitoring study to demonstrate that the rehabilitation work completed on Basin 3 has substantially achieved the goals of the CAP in eliminating overflows. If approved by TDEC, the city would be excused from performing an additional \$500,000 worth of rehab work on Basin 4 by 2015. That would also make a \$48,000 program to televise the remaining two thirds of the sewer system more palatable to ratepayers.

"I can already see at the plant end that the work we've done so far has made a significant dent in I&I," says Johnson. "We intend to complete the work on Basin 4, but making all this headway in a little over a year may buy us some time so that we can do the work when we can more easily afford it." ♦



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EDUCATING THE MASSES

NASSCO is sharing knowledge in creative ways to set industry standards

By *Ted DeBoda, P.E.*

Throughout the year NASSCO finds creative means to extend industry knowledge to as many trenchless professionals as possible. We do this to support our mission to set industry standards for the assessment and rehabilitation of underground infrastructure, and to assure the continued acceptance and growth of trenchless technologies.

Two of the many ways we disseminate critical industry knowledge are through conferences and webinars. At the recent Water Environment Federation (WEF) Collection Systems 2014 Conference in Baltimore, Md., NASSCO provided a two-part workshop focused on the successful installation of cured-in-place pipe (CIPP). The sessions covered tech-

nology selection, design and preparation of bid documents, and the importance of good construction inspection and quality control.

The first part was a presentation and technical explanation of a new CIPP design approach that includes more accurate calculations capable of accounting for non-round pipe shapes and specific design loadings effects. These calculations, which are based on calculations currently being used in other countries, are particularly applicable to pressure pipelines. We continued with guidelines for developing practical and effective performance-based specifications that include specific criteria and quality controls leading to fair and complete bidding documents, and facilitating appropriate construction inspection.

Part two provided information about the skill sets required by CIPP construction inspectors to verify compliance with the specifications, to include specific responsibilities for ensuring product quality, reviewing submittals and documenting contractor performance. Participants learned about quality assurance and testing requirements during installation that lead to a successful, verifiable installation and product life expectancy.

This technical workshop was also geared toward field application, and targeted at engineers and inspectors with design and/or field experience with CIPP installation, along with those wishing to better understand the technology. Both the morning and afternoon sessions ended with an open forum and discussion of frequently asked questions.

NASSCO is also educating and informing through a series of webinars. On Wednesday, April 2, NASSCO's Manhole Rehabilitation Committee partnered with WEF to broadcast its third in a series of ongoing webinars designed to share specific industry knowledge. This webcast provided a comprehensive outline of the various aspects of manhole rehabilitation from initial assessment to verification of a successful installation. We explored the initial inspection phase, which detailed condition grading codes derived from NASSCO's Manhole Rehabilitation Committee, based on Pipeline Assessment Certification Program (PACP) and Manhole Assessment Certification Program (MACP). Next, the four primary categories of manhole rehabilitation technologies were explained, includ-

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Specifications are an integral part of any manhole rehabilitation project. NASSCO's Rehabilitation Committee recently revised the standard specifications, and highlights of the revisions were discussed, including the requirement for registered engineers, representing product manufacturers, to seal designs for projects in certain cases when they require structural build back and infiltration abatement. Finally,

the webinar wrapped up with an overview of the post-rehabilitation inspection and testing that should be required for various technologies.

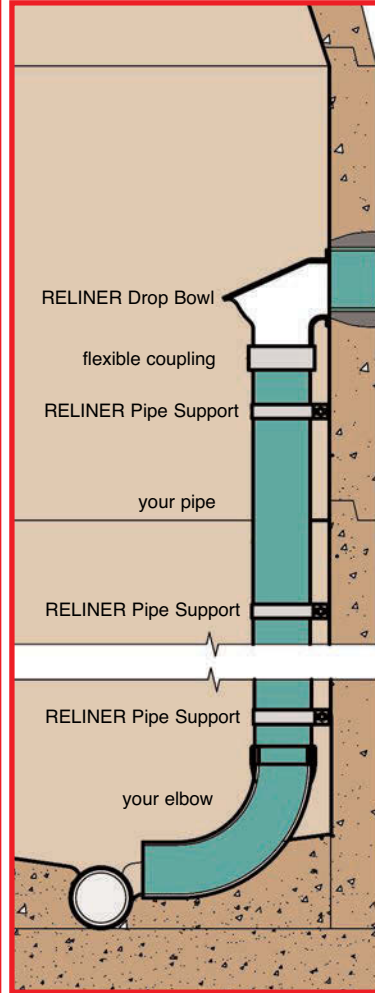
To register to see a recording of this and earlier webinars, please visit www.nassco.org and follow the link on the home page. ♦

Ted DeBoda is executive director of NASSCO. He can be reached at director@nassco.org.

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TIGHTENING UP THE SYSTEM

Shepherdsville invests in quality people and takes the fast track to SSO reduction

By Dan Heim

Shepherdsville, Ky., is about 20 miles south of Louisville, just west of I-65. The Salt River, a tributary of the Ohio River, flows right through the area. The city had been plagued by SSOs, and was under a consent decree to reduce them. The Shepherdsville Sewer Department, headed by Wastewater Treatment Department Superintendent Chuck Keith and Public Utility Director Scott Fleming, did just that.

"We had this decree to reduce our SSOs, and we knew we had a problem," says Fleming. "Fortunately, City Hall was backing us, and the mayor and council gave us the budget we needed to fix the problem."

QK4, an engineering and consulting firm serving the Louisville area for over 40 years, was retained early on in the process. They partnered with Shepherdsville in 1999, when initial negotiations with the

EPA were underway.

The problem was I&I, according to QK4. Fleming recounts how the solution required installation of interceptor lines, upgrades to their treatment plant and lift stations, and manhole rehab. A large area with septic systems also had to be eliminated.

Fleming is also quick to point out that, of the three SSOs in the last 14 months, two of them were triggered by I&I from pipes left open and exposed by developers.

New interceptors

A large part of the solution was the construction of two new 36-inch interceptor lines. The most recent, in 2012, eliminated eight lift stations. "Five of those stations were very problematic and were essentially bottlenecks in the system," explains Rob Campbell, consulting engineer and

assistant VP of QK4. "They contributed to the SSO problem we were hired to solve.

"That interceptor is gravity-flow all the way to the influent pump station at the treatment plant. So we had to build that influent pump

station (with a 36-inch diameter depth, water table) meshed, and the pipe functioned as needed.

"The first 36-inch interceptor was built in 2010 to increase the capacity to the south of Shepherdsville," Campbell says. "It was also designed to take on the effluent from the Jim

"You have to surround yourself with educated and capable people, like our treatment plant Superintendent Chuck Keith and others. I've been able to do that with the support and budget from the mayor and city council."

— Scott Fleming

station to handle the capacity of the interceptor."

Eliminating eight lift stations with a gravity-flow line involved a lot of digging in tough clay and shale soil, with a fair amount of bedrock. QK4 handled the engineering, ensuring all the details (slope, capacity, trench

station) so they could eliminate their onsite treatment plant."

The distillery is the "home plant" for Jim Beam, and it was putting out close to 180,000 gpd of organic sludge byproducts. "Just like you smell chocolate in the air around Hershey, Pa., in Shepherdsville you smell sour

(continued)



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mash in the air,” Fleming says.

Prior to the 2008 economic downturn, the area south of Shepherdsville was growing at a rate much higher than the rest of the state. The 2010 interceptor was being planned and funded at that time. Despite subsidizing growth, the project carried through under its own momentum. “So we’re ready for new growth whenever the economy picks back up,” Fleming says. “In fact, we’re already starting to see some of that as permits come in. But it’s more commercial than residential at this point.”

Fighting I&I

Whatever the origin of I&I, there was the additional problem of system capacity. “Those lift stations were throttling back the flow,” Fleming says. “Combine that with I&I from bad manholes and other sources, and you’ve got a real problem.”



PROFILE: Shepherdsville (Ky.) Sewer Department

SERVICE AREA: 7 square miles

CUSTOMERS: 11,000

CONNECTIONS: 4,600 total;
3,200 residential, 1,400 commercial

POPULATION DENSITY:
1,600 PER SQUARE MILE

EQUIPMENT: Ford E-450 High-Q camera van, Sterling Vector vac and jet, Cat 308C track hoe, Cat 236B skid-steer, Cat D46 dozer, Case 580M backhoe, Towmaster T40 trailer, Ford F-450 crane truck, Ford F-350 dually truck, GMC C7500 dump truck, Ford Escape general purpose SUV

INFRASTRUCTURE: 75 miles of pipe (PVC, ductile iron, clay) from 6- to 36-inch diameter, 2,100 manholes, 30 lift stations, 9 miles of new 36-inch interceptor line, recently upgraded treatment plant

ANNUAL BUDGET: \$3 million operational, \$1.5 million capital

EMPLOYEES: 10 full-time staff, 7 PACP and MACP certified

AVERAGE RAINFALL: 48 inches per year

SOIL TYPE: Clay, shale, bedrock, 8-foot average water table, flood plain

WEBSITE: www.shepherdsville.net/city-departments/sewer-department

Campbell says the city would like to eliminate all those lift stations. They’re dealing with 30 of them at present, and eyeballing a couple more they know they can eliminate. They intend to get that work into the next capital plan.

“As this town built out, we assembled a real patchwork of lift stations and pipes,” Fleming adds. “But when you get big enough, you can start eliminating some of those weak links. And those lift stations are definitely weak links.”

Shepherdsville is just now starting the CIPP process, with UV curing, on some of their older pipe. Those pipes are a mix of PVC, ductile iron and clay, with diameters from 6 to 36 inches. Some date back to 1960, and that includes their oldest manholes.

Manholes, as usual, were part of the I&I problem. With 2,100 manholes in their system, many as old as 53 years, they all had to be inspected for leaks and obstructions. Different methods, from cleaning to spray-on epoxy to total replacement, were required. To get the job done in a timely manner, much of that work was farmed out. Proximity to Louisville provides access to a lot of contractors, and promotes competitive bidding.

Shepherdsville is also building a GIS using the ESRI package. Again, to move the work along, data acquisition was farmed out to Brad Armstrong Land Surveying, a firm in nearby Lebanon Junction, Ky. That work is proceeding well, with about 20 percent of data entry completed.

Finally, Shepherdsville is seeking more control over developer practices. “In the past, the process of having someone sign off before new pipe was buried was not as well-enforced as it could have been,” Fleming says.

What worked for Shepherdsville

The capital improvements went a long way toward solving the SSO problem, and there’s still a lot of work in progress, but things are proceeding nicely. “We’re happy to be where we are at this point,” Fleming says. “But we’re not done yet.

“Much of it will be preventive maintenance. You’ve got to get out there and video those pipes, inspect your manholes, make sure your restaurants are on a good FOG program – it’s just preventive maintenance in

(continued)



Matt Noe and Jeremy Keith check the blanket depth at the treatment plant.

A BETTER METHOD OF TREATMENT

Shepherdsville runs a single treatment plant. Fortunately, they were already planning for an expansion of its capacity before the 2008 economic downturn, so the project carried through under its own momentum. New builds are not yet back to pre-downturn levels, but growth continues. The city of Shepherdsville is essentially a suburb of Louisville, with many residents commuting to the big city.

Treatment Plant Superintendent Chuck Keith, for a two-year stretch, was on the job basically 24/7. He was understaffed and underfunded. In addition to running the plant, he often had to go out to fix lift stations. It was an inefficient allocation of resources and manpower. That changed when the 2005 consent decree was served.

The original plant was sized for 2.2 mgd. That capacity was increased to 5.0 mgd, with a wet-weather maximum of 10 mgd. “That new plant won an ACEC design award,” notes Scott Fleming, Shepherdsville Sewer Department director. “This is an IFAS process plant, which is pretty much state-of-the-art.”

The acronym IFAS stands for “integrated fixed-film activated sludge.” As a plant upgrade, it can increase treatment capacity by up to 200 percent with no increase in the plant’s footprint. The system uses increased surface area bioreactors to promote the growth of biofilm layers, essential to the breakdown of BODs.

“So rather than going with a conventional expansion using more oxidation ditches and clarifiers, along with a surcharge basin, QK4 worked with the city to do this IFAS system expansion, along with additional clarifiers, but no surcharge basin,” Fleming says. “That was what our engineers recommended, and it has worked well.”

The upgrade also includes a new solids processing building, with new BDP presses that have cut process time and costs by two-thirds. Efficient pressing is essential since, in Kentucky as well as other states, landfill space is increasingly limited.



Johny Clan monitors the treatment plant and all 30 lift stations on Shepherdsville’s SCADA system.

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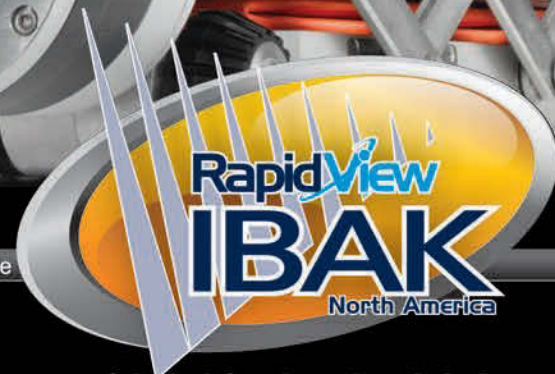


The push-propelled FlexiGATOR[®] provides increased cutting power at the head through its unique rear motor design. Unlike other "mini" cutter systems the FlexiGATOR[®] delivers the power where you need it without sacrificing maneuverability. Perfect for pipelines 4" to 8" (200mm-800mm) in diameter, the system can be pushed around 6" (150mm) 90° bends. Pneumatic outriggers hold the unit in place for control during cutting operations and the color panning camera in front of the cutting head ensures that you can see your work area. Reinstatement laterals, remove protruding laterals, and prepare pipelines for lining quickly and easily from a remote location with this portable unit.



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Tom Lafollette, left, and Matt Noe clean a sewer line with the Vector jet/vac combo unit.

“You’ve got to get out there and video those pipes, inspect your manholes, make sure your restaurants are on a good FOG program – it’s just preventive maintenance in a nutshell.”

– Scott Fleming

a nutshell.”

In discussing the keys to their success, Fleming and Campbell offer a

litany of best practices.

“You have to surround yourself with educated and capable people, like our treatment plant Superintendent Chuck Keith and others,” Fleming says. “I’ve been able to do that with the support and budget from the mayor and city council. That’s how we could hire firms like QK4 and Brad Armstrong and benefit from their expertise. And that’s also why we can draw on our base of local contractors. We’ve got a great network of talent available.”

Campbell adds, “We were able to leverage some positive financial circumstances including good growth in bad times; commerce from Louisville, which is a hub for UPS; state level and ARRA funding; and a bonus in the form of a base realignment for Fort Knox, which along with Shepherdsville is in Bullitt County. That alone could add \$300 million in payroll to the local economy with new Army personnel arriving.

“The city also made the tough decision to set rates at a point where the sewer department could function. Rates are always controversial, but enough people had the fortitude to make that happen, and it definitely paid dividends.”

Ongoing efforts

Shepherdsville is now launching



Pat Welch, left, and Rocky Price lower a CUES camera down the manhole for a sewer line inspection. RIGHT: A look at the control room in the CUES CCTV van.



a website to educate the community about what is being done to ensure continued, safe and reliable system operation. With their reduced SSOs, the public is already aware of improvements. With education, the public should be more tolerant of rate increases. It’s the best of all worlds when you have both City Hall and your customers backing your efforts.

With a full-time staff of only 10, and doing most of their work

in-house, they’ve managed to accomplish what few municipalities can claim. They’ve beat their consent decree timeline by several years. And their staff was no small part of that success.

“Six of our people are both PACP and MACP certified, and these are relatively new hires,” Fleming says. “So continuing education is something we’re pushing with them right now.”

This is the first year in the business for three of their personnel, but the other seven share a combined total of 85 man-years of experience.



The Shepherdsville team includes, from left, Matt Noe, vac operator; Johny Clan, collections maintenance tech; Chuck Keith, wastewater superintendent; Rocky Price, collections maintenance tech; Scott Fleming, public utilities director; Pat Welch, treatment plant maintenance tech; Jeremy Keith, collections maintenance tech; and Tom Lafollette, FOG program coordinator.



Turnover is always an issue, but the team has remained a coherent unit producing quality results.

Meeting requirements

The decree is still on the books, and Shepherdsville still has the same timeline and requirements, but they no longer need to file quarterly reports. Proper documentation of operational planning and activities was also part of that agreement, and that is ongoing. There will, of course, be periodic visits to confirm compliance.

The EPA agreement specifically addressed Shepherdsville's SSO problem. A hundred SSOs per year was unacceptable, and everyone knew that. "I never expected we'd meet that agreement as quickly as we did when I first took this job," Fleming says. "But it all came together for us." ♦



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MANHOLE EQUIPMENT AND REHABILITATION

By Craig Mandli

Taking measures to rehabilitate faulty manholes rather than installing new structures can lead to substantial savings for municipalities. Here are several lining systems, sealants and epoxies, manhole components and installation safety equipment designed to aid in rehabilitation.

Manhole Liners

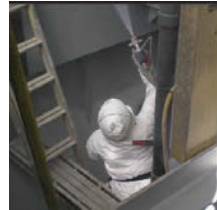
Concrete pipe lining system

The **CentriPipe** structural concrete pipe lining system from **AP/M PERMAFORM** provides a no-dig solution for underground infrastructure rehabilitation. It uses a bidirectional spincaster to centrifugally compact a precision liner at the proper design thickness for the size, shape and conditions of deteriorated pipe. It inhibits rust, waterproofs and seals, is resistant to abrasion, and structurally reinforces and protects round, arched and elliptical pipe. It is professionally applied through a global network of certified applicators. **800/662-6465; www.centripipe.com.**



Polyurea-based lining system

The **PolySpray** polyurea-based lining system from **HydraTech Engineered Products** resembles spray-applied plastic. It provides abrasion and corrosion resistance and is utilized in applications that require a tough, high-build lining. The rugged, but flexible, properties provide a coating ideally suited to withstand mechanical shock, and the snap cure allows for immediate return to service. The environmentally friendly lining can be spray-applied to various thicknesses and cures in minutes. The application can be used as a structural repair to partially deteriorated culverts or manholes, or as a protective barrier to degraded inverts. It resists fracture to impact or load, exposure to most chemicals, reduces wear and extends life of the system, enables an immediate return to service, complies with ASTM F-1216 and ASTM A849, and has a 50-year design life. **513/827-9169; www.hydratechllc.com.**



Spray-applied structural lining system

The **EcoCast** centrifugally cast, spray-applied structural lining system from **Inland Pipe Rehabilitation** combines application equipment with a custom-formulated geopolymer for consistent application and long-term performance. It can restore concrete, brick or corrugated metal storm and sewer pipes and manholes, and noncircular infrastructure. It is an effective solution for infrastructure with limited access, and large-diameter applications starting at 36 inches and up. **855/832-6477; www.teamipr.com.**



Stretchable manhole system

The stretchable **CIPMH** manhole lining system from **LMK Technologies** produces a cured-in-place seal that resists freeze/thaw conditions. It fits all manholes including barrel sections, eccentric and concentric cones constructed of brick and mortar, precast or block. Since it utilizes a stretchable liner, site preparation and installation can occur in the same day, eliminating lead time for ordering. It can be installed as a chimney seal or full-depth manhole lining. Once the liner has been vacuum impregnated and manually inverted into the manhole, it will cure ambiently under pressure in one to two hours depending on depth. **815/433-1275; www.lmktechnologies.com.**



Two-component lining system

The two-component lining system from **Madewell Products Corp.** consists of a high-build restoration mortar and a 100 percent solids epoxy corrosion barrier coating. First the mortar is shot onto a damp substrate, using the water on the surface to achieve a strong bond. Then an epoxy topcoat is applied while the mortar is still soft, and the two materials cure together. The final result is a strong and corrosion-resistant monolithic lining that provides a continuous surface. The mortar and topcoat are tightly bonded to the substrate and each other. This system eliminates the need to dry the structure prior to mortar application. The need for a second mobilization to apply the epoxy after the mortar has cured is also eliminated because the two materials cure simultaneously. **800/741-8199; www.madewell.net.**



Manhole rehabilitation liner

Manhole rehabilitation liner from **Perma-Liner Industries** is universally sized and engineered to create a structural cured-in-place seal to fit all manholes, including barrel sections, eccentric and concentric cones constructed of brick and mortar, precast or block. The vacuum-powered, resin-impregnated liner is inverted manually into the manhole and uses an inflation device to press it against the existing wall, forming it to the shape of the manhole. Excess resin migrates into imperfections, where the liner is sealed and mechanically held in place. The cured-in-place liner is engineered to resist freeze-thaw cycles and create a watertight, corrosion-resistant structural lining that eliminates infiltration and inflow. Depending on chimney or depth, cure times will occur within 1 to 2 hours ambient. **866/336-2568; www.perma-liner.com.**



Life-extending lining system

The **Raven 405 Series** from **Raven Lining Systems** provides long-term performance in harsh, damp environments. Its 100 percent solids, zero VOC polymers demonstrate adhesion, low porosity and high chemical and abrasion resistance. It stops recurring inflow and infiltration, with ultra-high build properties that make it ideal for overhead and vertical application. It is used on new concrete to protect against corrosion and extend the life of the structure, and can be used on deteriorated structures such as brick, concrete or steel. **800/324-2810; www.ravenlining.com.**



Epoxy-modified cement mortar

RestoKrete No. 208 epoxy-modified cement mortar from **Sauereisen** is a substrate repair material and water-resistant barrier for the prevention of inflow and infiltration in concrete or brick substrates. It can be used when structural integrity needs to be restored, and is designed to fill voids, irregularities and air pockets in concrete. It is pumpable and sprayable, easily applied by spin-cast or straight-shot method, trowelable up to 1/2-inch thickness, moisture tolerant, and compatible with all SewerGard and ConoFlex systems. **412/963-0303; www.sauereisen.com.**



Rehabilitation material

Strong-Seal MS-2 C manhole rehabilitation material from **The Strong Company** is formulated for moderately corrosive applications with a pH of 2.0 or higher. It is a calcium aluminate mix with alkaline-resistant fiberglass reinforcement used to form a structural monolithic liner covering all interior substrate surfaces, stopping inflow, infiltration and exfiltration while restoring structural integrity. It meets or exceeds ASTM testing standards. **800/982-8009; www.strongseal.com.**



Sealants

Manhole chimney sealant

EasySeal SG two-component spray-applied urethane sealant from **Cretex Specialty Products** provides a flexible seal in the grade ring area of manholes to reduce or eliminate frame-chimney inflow. It's formulated for use in sanitary sewer manholes and allows for quick, easy application with minimal surface preparation. It has elongation, peel strength and tensile strength in excess of 3,000 psi, and is a thixotropic material that gels within seconds of application, allowing for easy material buildup. It is dry to the touch in minutes. It is an alternative to the company's "Classic" or "LSS" internal manhole chimney seal when the conditions may limit or prevent the use of mechanical seals. **800/345-3764; www.cretexseals.com.**



Epoxies

Three-part epoxy-modified ceramic enhanced mortar

MortarTec Ceramico three-part epoxy-modified mortar from **Epoxytec** is aggregate and ceramic reinforced for surfacing, patching and filling voids and bug holes in concrete substrates. Proper application results in a smooth, hard surface, with ideal adhesive properties. It is generally topcoated with a variety of high-performance epoxies for use in mild to extremely aggressive exposures. It can be used on green concrete, and early topcoating. **877/463-7699; www.epoxytec.com.**



Epoxy system

The **HydraLiner** single base resin epoxy system from **HammerHead Trenchless Equipment** comes with three choices of curing agent hardeners. Winter Blend is the fastest curing hardener and is ideal for cold weather conditions or for short applications that require a fast return to service. Standard Blend is the customary hardener with an increased working and cure time sufficient for most project applications. Summer Blend is useful in long or large-diameter pipe runs and high temperature applications with a sustained temperature of up to 200 degrees F. The speed of cure for any of the hardeners increases with the addition of heat via hot water, hot air or steam. **800/331-6653; www.hammerheadtrenchless.com.**



Concrete and manhole repair epoxy

Infragard concrete and manhole repair epoxy paste from **Infrastructure Repair Systems** can repair a small area or an entire concrete wall or manhole, stopping both infiltration and exfiltration leaks. It can be simply troweled on, has superior adhesion to either damp or dry surfaces, is corrosion resistant and conforms to any shape. It is a two-part environmentally friendly ambient cure epoxy system that is nonhazardous with zero VOCs. There is no special training needed, and application instructions are included. **877/327-4216; www.irsi.net.**



Modified epoxy

Dura-Plate 301, a solvent-free, surface and humidity tolerant two-pack modified epoxy from **Sherwin-Williams**, can be applied over damp steel without dew point restrictions in treatment facilities with pipe galleries. It protects sweating pipes from corrosion and eliminates odors from coatings that contain high levels of solvent. It is suitable for marginal surface preparation, preventing damage to equipment such as treatment pumps and motors that can be affected by abrasive blasting. **800/524-5979; www.sherwin-williams.com/protective.**



(continued)

Coatings

Structural, spray-applied polyurethane

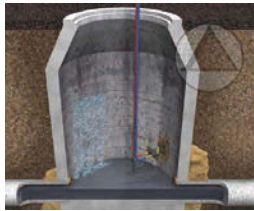
SprayWall structural spray-applied polyurethane from **Sprayroq** is a restorative and protective lining solution for wastewater infrastructure with a fast cure time, corrosion- and abrasion-resistant properties, and ability to be applied in any desired thickness in a single pass. Structures can be returned to service rapidly, in some cases within hours. Environmental and climatic factors such as freeze/thaw cycling and humidity or aridness have a minimal effect. It is 100 percent VOC free and has undergone extensive ASTM third-party testing to assure product performance. **800/634-0504; www.sprayroq.com.**



Chemical Grouts

Hydrophilic urethane gel chemical grout

AV-254 Gelseal hydrophilic urethane gel chemical grout from **Avanti International** quickly permeates various soils and cures to create an effective, long-lasting water barrier while providing soil stabilization. It is designed to stop water infiltration into manholes, sanitary and storm sewer mainlines, pipe joints, service laterals and other underground structures by providing support and strengthening surrounding soils. Typical injection techniques are curtain grouting and by remote packer. It is easy to handle, contains no acetone and is nonflammable. It is typically pumped at an 8:1 water to resin ratio, but in injection areas with high water flow it can be pumped without water. **800/877-2570; www.avantigrout.com.**



Computerized grouting system

The **Easy Grout** computerized grouting system from **CUES** has a graphical user interface that leads the user through the joint testing and grouting processes. The software includes help files, tool tip descriptions, real-time monitoring and recommended settings. The system consolidates all the valves, electrical controls, etc., into a single instrumentation cabinet that can be quickly swapped with a loaner unit if required. Portable, truck- and trailer-mounted grout rehabilitation systems for mainline, manhole and lateral joint sealing feature a full line of CCTV equipment and decision-support software. **800/327-7791; www.cuesinc.com.**



Applicators

Spinning application nozzle

The **Model 360** hand-held, high-speed, air-powered spinning nozzle from **RFI Construction Products** is used to apply fine-grain mortars, grouts and epoxies to circular surfaces. It has the capacity to line 4- to 96-inch-diameter pipe, manholes, storage tanks and pipe fittings. Linings can range from 1/8 to 1 inch. This system allows the installer to efficiently increase production safely. Coatings go on with a controlled wall thickness, and the operator stays above ground to spray. **631/752-8899; www.rficonstructionproducts.com.**



Safety Equipment

Manhole protection ring

The **MPR100** manhole protection ring from **H2 Technical Rescue Equipment** protects lines from the rough edges of manholes by simply dropping it into the manhole prior to any equipment. It is produced in a highly visible safety orange to help identify the site and the open manhole, reducing potential hazard. It provides a full 360-degree area of edge protection. **517/204-2121; www.h2tr.com.**



Rupture-protected domehead plug

Rupture-protected plugs from **Lansas** have a built-in relief valve that will help prevent the plug from being over inflated. Once the valve cracking pressure is reached, the relief valve opens, allowing excess air pressure to escape. It then resets and reseals just below the required inflation pressure. Over-inflation as a factor in plug failure will be greatly reduced, as the relief valve will allow air to escape in excess of 85 cfm. The relief valve is mounted into the end plate to prevent physical damage when the plug is being transported or installed. It can be used multiple times. A protective sleeve can be added for added protection and extended plug life. **800/452-4902; www.lansas.com.**



Manhole rehab pipe plug

Multisize flow-through inflatable pipe plugs from **Logiball** can be used to divert flows without costly bypass setups, keeping work zones dry. They are ideal for use in manhole rehabilitation jobs, where flow control can be an important part of the cost. **800/246-5988; www.logiball.com.**



Manhole cover remover

The **Lifter** from **Rock Mills Enterprises** safely and efficiently removes manhole covers and drainage grates with the push of a button. It mounts into a standard 2-inch trailer hitch receiver and is powered by the vehicle battery. A roadway camera and dash-mounted monitor positions it directly over the cover, which can be removed via remote control. With an optional swing arm, the cover can be swung away from the opening and replaced after work is completed without moving the vehicle. **712/451-6550; www.rockmillsent.com.**



Pole camera system

The **Investigator** pole camera system from **RS Technical Services** provides clear color video for visual assessment of manholes, unsafe areas or structures too small for human entry. It uses two high-intensity LEDs with a 10X optical and 4X digital zoom capability. Mounted on a telescopic fiberglass pole that extends to 21 feet, the head is motorized to provide remote tilt adjustments. All functions are adjustable by the operator from the viewing station. A soft-side bag contains a DVR with integrated display and a 13.2 Ahr lithium-ion battery. It can also be adapted to any RST system to power the unit and send video to the base station for recording and report writing. **800/767-1974; www.rstechserv.com.**



Tube holder

The **Deep-Vac** manhole tube holder from **Southland Tool Mfg.** eliminates the threat of vacuum tubes extending up in the air. Simply clamp the device around a tube in any location, then lower it into the manhole while supported by the device's four steel extension arms. Tubes are added by unclamping the device and moving it up and over the next flange connection. The suction boom hose can be connected to the end tube to support the weight as tubes become heavier. The device weighs 10 pounds, and is designed for manholes from 24 to 36 inches, with extensions available for larger openings. **714/632-8198; www.southlandtool.com.**



Manhole Parts and Components

Pipe-to-manhole connector

The **A-LOK Premium** flexible rubber pipe-to-manhole connector ensures sealing pressure under differential loading or pipe deflection. Inside the connector a blend of fibers, binders, polymers and congealing agents create a dynamic fluid that maintains the watertight connection, preventing infiltration and exfiltration in wastewater and stormwater systems while meeting ASTM C-923 and F-2510. Installation is fast and easy since no grouting is required. Just bevel, lube, install and backfill. **800/822-2565; www.a-lok.com.**



Heavy-duty hole saw attachment

The **HS-57** heavy-duty hole saw skid-steer attachment from **Coneqtec Universal** removes the collar and surrounding area of concrete and asphalt encasing manhole covers. It reduces the hours required to repair manhole covers to typically 10 to 20 minutes in concrete and twice as fast in asphalt. It has up to a 14-inch-depth cut, improved positioning and optional centering arms. It has heavy-duty hydraulic motors, a hydraulic-powered break-out feature (no rocking or loader break-out), 45 carbide-tipped picks to cut through concrete, asphalt and brick, a self-aligning hydraulic clamp that securely attaches to the collar, and a 57-inch-diameter hole cut. It lifts the collar and surrounding layers of concrete/asphalt when the cut is finished. **888/832-3462; www.coneqtec.com.**



Manhole cleaner

Manhole Cleaners from **NozzTeq** are made of rustproof stainless steel and have two protective guard plates at top and bottom. While they are available in several different sizes, the most popular are 3/4- and 1-inch sizes that connect directly to the hose on a truck. The turbo rotary arm is counterbalanced and precisely equilibrated to withstand high revolutions. Rotating parts are also surrounded by safety guards. They are reinforced with self-lubricating, stainless steel ball bearings with a carbide gasket system, and are designed for a high number of revolutions, ensuring long-lasting durability. Just lower the unit into the manhole and it cleans within minutes. **866/620-5915; www.nozzteq.com.**



Annular seals

Multi-Flex annular seals from **Petersen Products Co.** slip over the end of a pipe to seal between a bypass pipe and the sewer main, simplifying manhole bypass. They can be made for almost any size, pressure, chemical and temperature requirements. They are flexible, easy to install and have many inflation connection options. They are ideal for bypassing a pipeline during repairs or any other temporary small to large pipeline connection. **800/926-1926; www.petersenproducts.com.**



Manhole channel system

The **Manhole Channel Repair System** from **RELINER/Duran** has a molded fiberglass flume combined with a PVC pipe section used to rehabilitate inverts without flow interruption. Field-installed modular components bolt together with minimal tools, are adaptable to a wide range of field conditions and manhole sizes, and are compatible with current field manhole-lining systems. The full depth lined channels are high flow and easy to maintain. Standard 8- and 12-inch-depth channel sections fit through 24-inch manhole frames and will accommodate 6- through 12-inch pipes. Larger sizes are available. **800/508-6001; www.reliner.com.**



Cleaning nozzle

The **Alphajet** cleaning nozzle from **USB - Sewer Equipment Corporation** cleans grease, sludge and crusts from lift stations and manholes prior to rehabilitations. It is actuated by water coming from the pressurized hose of the jetter truck. Four driving nozzles enable 360-degree controlled rotation in a horizontal plane, eliminating the need to cover the manhole. The horizontal rotation only allows for observation of the cleaning progress. The body requires no lubrication or replacement of internal mechanical parts within the first 12 months of operation. Driving nozzles can be extended to accommodate various sizes of manholes/lift stations. **866/408-2814; www.usbsec.com.**



Lids

Composite manhole cover

Composite manhole covers from **Fibre-lite Composites** are used for applications where corrosion can destroy underground infrastructure. They are available with company logos and other brand markings. Any style logo or other marking can be permanently molded into the upper surface of the cover, in single or multiple colors. They are ideal for branding and product identification, or to blend in with the color or layout of a building, plaza or sidewalk. They can be molded in nearly any color or combination of colors. **860/501-2479; www.fibre-lite.com.**



(continued)

Locking manhole cover

FiberShield lightweight locking manhole covers from **McGard** are constructed of a durable, fiber-reinforced polymer material with multiple security points. They are lightweight and easy to handle and transport, eliminating the lifting and dropping injuries caused by heavy, cast-iron manhole covers. Weighing 80 percent less than cast iron, they exceed an H20 traffic rating. They are installed in seconds and removed without bending over. They require a key to operate, and have no scrap value, eliminating theft. **888/888-9192; www.manholelocks.com.**



Inserts

Stainless steel inflow shield

InflowShield manhole cover inserts from **Rowland** substantially decrease inflow and infiltration. They are custom sized and manufactured from 18-gauge 304 stainless steel. Their deep-dish design allows for easy removal of the manhole cover without contact to the bottom of the insert. Each insert is equipped with a nylon strap or high-grade stainless steel handle. **855/545-3815; www.rowland-inc.com.**



Leak-proof manhole insert

SSI Manhole Inserts from **Sealing Systems Inc.** stop the inflow of rainwater through manhole covers. Sewer evaluation studies indicate that a typical manhole casting will allow an inflow rate from 0.20 to over 5 gpm during rainfall occurrences. Inserts are custom sized to provide an enhanced fit and seal, and are manufactured from an ultra-high-density polyethylene copolymer material known as Marlex HXM 50100. They can be inexpensively installed utilizing in-house collection system maintenance personnel. **800/478-2054; www.ssisealingsystems.com.**



Manhole odor filter insert

The **Wolverine** manhole odor insert from **Simple Solutions Distributing** eliminates hydrogen sulfide-based odors that emanate from wastewater sewer line manhole covers. It is custom made to exact dimensions to ensure a quality installation and trouble-free operation. Each insert is manufactured from a durable high-density polyethylene copolymer material that meets ASTM Specification Designation D-1248 Class A, Category 5, Type III. The carbon canister is manufactured from PVC and corrosion-resistant components. **866/667-8465; www.industrialodorcontrol.com.**



Risers

Riser ring

Manhole riser rings from **LADTECH** can be installed in minutes. The rings nest together, and include a 2 percent slope ring and a 1/4-inch spacer ring for a precision fit. They're made of high-density, lightweight recycled polyethylene, meet AASHTO's HS-25 axle-loading spec, and are impervious to H2S corrosion that destroys concrete. **877/235-7464; www.ladtech.com.** ♦





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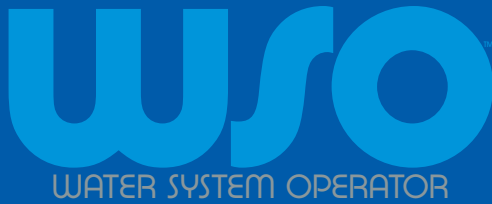
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Durable risers provide solution for sinking manholes

Problem

The City of Corning, N.Y., found that the manholes located on a two-mile stretch of roadway – which accounted for a bulk of the traffic coming into and through the city – provided the second biggest challenge (behind pavement deterioration) in maintaining city streets. Their issues were low spots in the road caused by low manholes. Corning’s storm and sanitary sewer systems averaged over 70 years in age. Over time, the mortar joints supporting the manhole frames and covers deteriorated, and the manhole covers settled into the roadway.



Solution

Previously finding it difficult to prioritize these repairs due to the cost and difficulty of alternative manhole adjustment techniques, they found their answer in **Abart Industries - Top Hat Risers**. Initially, the intention was to use the risers as short-term, temporary solutions that would also serve to remind them that certain manholes needed adjusting. However, they found that units installed on “high traffic” roadways held up with no issues for over three years, even with snowplows. They are reusable, durable rubber manhole risers that offer a cure for castings, and are an ideal solution for afterthought adjustments. Not only do they absorb impact from traffic, they protect the manhole structure and can be customized to fit virtually any manhole design.

RESULT

The risers provided a durable and versatile solution for a large problem, allowing Corning to provide smoother, safer roads. **315/730-2588; www.tophatrisers.com.**

Paving contractor replaces 100 catch basin risers

Problem

For the resurfacing of the I-64/I-255 interchange near East St. Louis, Ill., paving contractors Keeley & Sons Inc. needed to install a total of 100 catch basin risers. The catch basins lined a barrier wall that separated access ramps from main lanes, which meant that crews working on the basins would be exposed to traffic. As part of the contract, lane closures had to be kept to a minimum. “We couldn’t close lanes at all during peak hours, from 6 to 9 a.m. westbound and 3 to 6 p.m. eastbound,” says project engineer Bob Germann.



Solution

Keeley & Sons decided to use catch basin risers from **American Highway Products**. The risers make raising catch basins and manholes to grade a relatively fast and reasonably priced process. The risers are custom-made for particular projects, and can be easily installed with hand tools, as the entire process takes just a few minutes per riser.

RESULT

Crews installed the risers after the binder course was laid, and before the final paving lift. Instead of a couple of weeks, all 100 catch basins were raised to grade in just two days. “I’m really glad we had the risers available,” says Germann. “Without them, we would have been forced to hammer out the existing frames and pour new concrete; it could have taken a couple weeks just on that part of the job.” **888/272-2397; www.ahpl.com.**

City decides to rehab manholes instead of repair

Problem

One particular line of manholes in the City of Conroe, Texas, had to be continuously repaired after various spray liner options failed over a period of a few years. The city decided to find a permanent rehabilitation solution.



Solution

The city selected rehab manholes from **Containment Solutions**. The monolithic rehab manholes are made of noncorrosive fiberglass and install in a fraction of the normal time. The rehab manhole is simply inserted into whatever is left of the corroding existing concrete manhole and does not require confined-space entry or special ventilation equipment.

RESULT

The city not only repaired the manholes in a short amount of time, the new manholes were also warranted for 20 years. **877/274-8265; www.containmentsolutions.com.**

Rubber manhole frame helps township eliminate inflow and infiltration

Problem

The aging infrastructure in the Township of North Glengarry (Ontario) was rocked after a 50-year rain event, causing floods and sewer backups. Inflow and infiltration through leaky manhole covers was a significant factor in the system overcapacity. The township needed to rehabilitate its manholes.



Solution

Hamilton Kent's Lifespan System, a rubber manhole frame with a locking cover system, was piloted in eight locations. The first four units were installed in on-road locations. The others were designated for off-road use near a very active creek, which was decidedly critical for controlling I&I. The creek often overflows and the township didn't want extraneous water adding to the city's overcapacity problems. As a water-tight system, Lifespan prevents sewer surcharge up to 3 psi and rainwater inflow up to 15 psi.

RESULT

The township has reported impressive results and no negative issues. By eliminating I&I at these access points alone, the residents will save money they would otherwise have spent on treating extraneous water at the plant and cleaning up after overflows. The installation team appreciated the ease with which the lightweight Lifespan System was installed. They have since ordered more units. **859/533-0849; www.hamiltonkent.com.**

Precast manholes lead to significant savings for football stadium construction

Problem

Baylor University's McLane Stadium is being built on a 93-acre site at the intersection of Interstate 35 and the Brazos River, the longest

waterway in Texas. Along with its unique, tight location, the project required relocating sewer and electric transmission lines, along with water, sewer and drainage facilities to service the site.

Solution

To accommodate the size and angles of connecting sewer pipes, and to address the requirement of a small construction footprint, the engineer designed five-sided precast reinforced concrete manhole structures manufactured by Hanson Pipe & Precast. The versatility of precast concrete allowed the contractor to connect the large-diameter sewer mains using only one structure at each point of intersection. Working with the design engineer, Walker Partners, Hanson provided preliminary designs of the special manholes, and estimated production times for building the structures. The fast turnaround times were a key factor in the selection of precast concrete for these unique structures.



RESULT

The manholes saved time and offered versatility and significant savings in installed cost over alternative materials. **704/752-4740; www.hansonpipeandprecast.com.**

(continued)

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Monolithic rehabilitation stops I&I and provides full structural rehab

Problem

The City of Medford, Wis., made a commitment to reduce I&I in their collection system. They determined that reducing the clear water intrusions via both leaking and structurally failing manholes in their system would provide beneficial results long term. The city needed a nondisruptive, long-term, cost-effective method for their maintenance plan.



Solution

Infratech Infrastructure Technologies used **Monoform** to structurally rehabilitate failing manholes in the system. Workers cut and demo the street surface, remove the casting, demo the chimney section and place the forming system inside the existing manhole. The new structure is formed around the existing drops and flow is not disrupted. Concrete is poured between the existing structure and forming system, then allowed to cure. Forms are removed, the bench and invert are repaired, the casting is reset and the street surface is poured and finished. A complete monolithic pour provides a stand-alone product without detours, bypassing or disruption to adjacent utilities.

RESULT

The system produced brand new manholes designed to exceed H-20 traffic loading requirements and design life equal to installing new pre-cast. It cost the city approximately half of what it would have spent to dig and replace the manholes. **763/428-6488; www.infratechonline.com.**

Moisture-tolerant lining used to rehabilitate manholes

Problem

In September 2003, the City of Denham Springs, La., determined that they'd need to dig up and replace the city's manholes, a job that was estimated to cost at least \$20,000. Because of the high cost of the project, the city decided to look into rehabilitation options.



Solution

The city decided to rehabilitate their manholes using **Enviroline 222** moisture-tolerant lining from **International Paint – Devco Coatings**. It is a solvent free, two-component polyclamine-cured lining system utilizing novolac epoxy technology to offer chemical resistance, adhesion to concrete, moisture tolerance, fast cure (rapid return to service in 8 hours at 77 degrees F), single-coat application, and abrasion and impact resistance.

RESULT

The city saved more than \$18,000, and the job took only two weeks to complete. The manholes continue to operate flawlessly. **440/234-2900; www.international-pc.com.**

City finds cost-effective manhole replacement system

Problem

Lexington, Ky., is the second largest city in Kentucky. With all of the activities in the area and the resultant traffic, the city realized it needed to make the streets as safe and smooth as possible. A few years ago, the sewer and street departments began to search for a better way to maintain sewer manholes. Manhole lid installations either deteriorated over time or went out of level due to street repaving. The conventional repair methods involving air hammers and saws were too labor intensive and cost prohibitive.



Solution

The search for a new repair method led the city to the **Mr. Manhole** system, which uses a powered cutter that operates on a backhoe or skid-steer loader. The cutter places a round cut outside the manhole perimeter and removes the manhole frame from the road with little manual labor. The system provides a quick and accurate way to rebuild the man-

hole frame and lid to the exact height and slope of the road. An added benefit of the system is its ability to stop groundwater penetration into the manhole chimney section.

RESULT

The Lexington maintenance department purchased the first system in 2008. The crews were trained and immediately set to work repairing the city's manholes. The work went well and the response from the public was positive, so in 2011, the city purchased a second Mr. Manhole system. Jimmy Webb, superintendent of streets and roads for Lexington, estimates that 1,800 repairs have been completed to date. **419/229-3015; www.mrmanhole.com.**

Epoxy resin used to rehabilitate 108 manholes

Problem

The public utility department of Baltimore, Md., was charged with rehabilitating 108 deteriorated brick and concrete manholes.



Solution

For this project, Spiniello Companies chose to use **NeoPoxy International's** high-strength, corrosion-resistant **NPR-5304** epoxy system. First, the manholes were pressure-washed at 2,500 to 3,500 psi. Although NPR-5304 is a totally hydrophobic product and can cure underwater, hot air was then blown on the surface for 15 to 30 minutes in order to get maximum adhesion. Following this preparation, NPR-5304 was sprayed onto the surface as a monolithic 250-300 mils in one pass without preliminary mortar repair. This direct-to-aggregate method gives the best results since aggregates are the most corrosion-resistant part of concrete, and act like additional anchors for the epoxy layer.

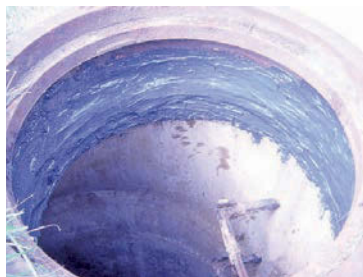
RESULT

The project was completed successfully, and the manholes were back in service within an hour. Through this application of NPR-5304, the life span of the manholes was extended by approximately 50 years. **510/782-1290; www.neopoxy.us.**

Flexible epoxy used to combat inflow and infiltration

Problem

Inflow and infiltration entering the sewer system through manholes was causing severe collection system overflows during wet weather in the Village of New Lenox, Ill. Senior operator Keith McKeen needed a cost-effective and easy way to remove as much I&I as possible.



Solution

The Village started using **Parsonpoxy FP** from **Parson Environmen-**

tal Products, and applied it where the manhole frame meets the riser ring. Since Parsonpoxy FP is highly flexible, it can withstand the freezing and thawing environment.

RESULT

"Parsonpoxy FP is a cheaper cost per manhole than purchasing chimney seals, and can be easily and correctly applied by our summer-time staff," says McKeen. "It has also greatly reduced our I&I problem." **800/356-9023; www.parsonenvironmental.com.**

Base liners saves costs in manhole replacement project

Problem

In 1993 the Town of Oliver, British Columbia, connected a new housing development adjoining Tuc El Nuit Lake to its wastewater collection system. Individual septic systems were abandoned and replaced with new pipe side sewer connections. A new gravity-fed sewer line with 17 manholes was constructed between two lift stations. Intermittent flow created fertile conditions for hydrogen sulfide. The first sign of trouble was the sudden collapse of a



(continued)



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sewer section near the wastewater treatment plant. The Tuc El Nuit Lake section was then examined, and inspectors discovered that the complete disintegration of the concrete manhole barrels was imminent.

Solution

It was also discovered that the concrete bases protected by the **PREDL Systems North America MH base liners** were in original condition. Steve Underwood, P.E. with TRUE Consulting, verified that the concrete bases survived without corroding. Complete structural integrity was preserved. They decided to replace the severely decomposed manhole barrels with new lined barrels and lids installed and supported by the original lined bases.

RESULT

The base liners embedded during the precast concrete manufacturing process completely protected the manhole base structure in the atypical conditions. The time, labor and material costs for the Town to repair this sewer line were dramatically less because the liners were originally specified. **604/415-9944; www.predlsystems.com.**

Resin used to create core plug to stop sewer infiltration

Problem

A large volume of infiltration entered a sanitary sewer manhole in Brentwood, Tenn. The invert of the manhole had a visible 6-inch-diameter hole, likely created to release groundwater during the construction of the sewer. The hole's plug had disintegrated, allowing groundwater and inflow from an adjacent creek to enter the system. The estimated leak volume was 250,000 to 300,000 gpd.



Solution

CK Masonry installed a bypass system to divert the sewer flow from the manhole in need of repair. They then injected **Prime Flex 920** from **Prime Resins** through probes inserted into the creek bank to slow the flow of water from the creek and stabilize the soils voided by erosion around the manhole. A 1/2-inch injection hole was drilled into the invert of the manhole adjacent to the large hole allowing the infiltration. A Prime Resins Wall Stinger Nozzle was fitted to an 8-foot section of threaded iron pipe with a flow control valve to allow remote injection. The remote injection device was driven into the drilled hole in the invert. To reduce the inflow pressure the manhole outflow pipe was plugged and the manhole was flooded with water until equal with the adjacent creek. **Prime Flex 920** was injected through the remote injection probe while a sand bag was held over the gaping hole in the invert. The manhole was drained and the sand bag was removed to reveal a perfect plug. CK Masonry then excavated some of the foam plug and installed a cementitious repair mortar to finalize the repair to the invert. The project was completed in one and a half days.

RESULT

Flow monitoring between Monday and Wednesday showed a reduction of base flow of 500,000 gpd. The repair was completed on Tuesday that week. That is an estimated savings of \$1,400 per day in treatment cost alone. Additional savings for electricity for pumps were also achieved. **800/321-7212; www.primeresins.com.**

Lining system provides concrete spalling corrosion protection

Problem

The city of Portland, Ore., noticed manhole concrete spalling from hydrogen sulfide corrosion, and cracking from natural ground movement. Over time, the damage progressed and repairs became necessary. The work had to be done during winter, with temperatures dipping as low as 40 degrees F. And because a section of road had to be closed for the repair, completing the job in a timely manner was paramount.



Solution

Iron Horse Group, a **Rhino Linings** applicator, repaired the spalled concrete in half a day. **Primer 101** was applied to the concrete next as a moisture barrier along with a light sand broadcast. Polyurethane **Primer 161** was applied if the Primer 101 was beyond the 24-hour recoat window. A portable heater was used to cure the primers. The following day, **Rhino Extreme** was applied to the manhole's walls, ceiling and benches at thicknesses ranging from 100 to 125 mils, depending on the expected hydrogen sulfide exposure. It will protect against corrosion, impact and abrasion damage. Because of its 450 percent elongation properties, it will also move with the earth instead of cracking. It cures quickly so return to service was fast despite the cold temperature and 50 percent inside humidity.

RESULT

The job was complete in less than two days. The damage was repaired, and a solution was installed to prevent further damage. **800/422-2603; www.rhino linings industrial.com.**

Lining system solves sewer overflow headaches

Problem

Groundwater infiltration into the sanitary sewer manholes in Waverly, Tenn., was causing sewer overflows. Two pump stations with 4-inch pumps were activated during each rain event, and surcharging caused manhole lids to float and a lift station regularly overflowed. Something needed to be done about the leaking manholes.



Solution

The 244 manholes selected for rehab were all below the water table. Approximately half of them were brick and half precast concrete. CTR Coatings, located in Powell, Tenn., remedied the situation by repairing and lining the manholes. Forty percent of the manholes were raised, replaced or reset, and root balls were removed from many of them. They

were pressure washed and active leaks stopped with hydrophilic grout or hydraulic cement. A **SpectraShield Lining System**, a multilayer system comprised of a polyurea barrier coat, a surfacing layer of polyurethane foam, and a corrosion barrier of polyuria, was then applied to a minimum thickness of 500 mils. It dries in about 10 seconds, so the manholes were placed back into service immediately after the lining was installed.

RESULT

The pump stations have not kicked on since the manholes were lined. The lift station has not overflowed and the manhole lids no longer float from surcharging. Reduced flow means lower treatment costs, and the city no longer needs to worry about leaking or corrosion in their manholes. **904/419-4889; www.spectrashield.com.**

Microsilica cement restores structural capability in corrugated metal culverts

Problem

Several deteriorated corrugated metal pipes were causing a dangerous and costly problem for a Port Malabar Florida community. Because the aging pipes and concrete crossing bridges provided both access to residents and a right-of-way to utility conduits, they wanted to use a no-dig, nondestructive rehabilitation method.



Solution

The Tramonett Company decided to use **Reliner MSP** cement from **Standard Cement Materials** to restore the pipe's interior shell in accordance with Florida Department of Transportation specifications (Texas DOT and CALTRANS) for "Polymeric Concrete Repair Materials for Patching Spalls in Concrete Pavements and Joints in Box Culverts." The contractor repaired the single-barrel 84-inch-diameter pipes by pneumatically applying a wet-mix microsilica cement to a 3-inch thickness using a hand-held nozzle and a separate spin-casting method using the Sun Rover III application machine.

RESULT

The cement provided an ideal solution. It is used to protect concrete, steel and fiberglass structures, and to repair chemical-damaged concrete in pipes, sewer manholes and lift stations, and to make vertical and overhead concrete surface repairs. The components are verified by the Environmental Protection Agency for wastewater use (and drinking water approved). **888/278-1337; www.standardcement.com.**

Flex rib chimney seals reduce manhole inflow and infiltration

Problem

During the recent construction of a new subdivision near Louisville, Ky., the specifications stated that all manholes had to be vacuum tested after construction. Upon passing the vacuum test, an internal mechanical chimney seal had to be installed to prevent future inflow and infiltration into the system.

Solution

The project was awarded to Tru Test, and included more than 50 internal manhole seals. Dave Conrad of Tru Test has installed NPC Internal Flex Rib manhole chimney seals from Trelleborg Pipe Seals Milford for several years. The chimney seals were installed before the contractor had finished the final asphalt road surfacing. The solution consists of an EPDM seal with a rib design that allows vertical and lateral movement while still ensuring a watertight seal. The waveband technology creates an effective seal by concentrating the compressive force of the expansion band. The rubber is captured between the band and the concrete.



RESULT

After completion of the road grading, technicians went back to check the installation. The seal was already performing by holding back water that had leaked through the failed mastic and concrete grouting that the contractor had used to help pass the vacuum test. **800/626-2180; www.trelleborg.com/npc.** ♦

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Product Spotlight

High-dump option provides safe, clear view of debris body

By Ed Wodalski



The Vacall AllJetVac high-dump option for combination sewer cleaners from Gradall Industries enables the operator to raise the debris tank 76 inches above ground level and shift the tank horizontally 21 inches beyond the rear bumper for spill-free off-loading into a 5-foot-high roll-off or dewatering container. An optional slanting splash shield extending from the debris tank further reduces the chance of spills. The dump system also eliminates the need for drive-up ramps.

With a straight-line range of approximately 1,500 feet, a 12-button wireless remote lets the operator control the height of the debris body, distance back, tailgate and dumping process.

“The reason we did that was so the operator at all times can be at the back of the truck, out of the way, and dump his truck safely,” says Bill Petrole, vice president of Vacall Products. An emergency stop provides added safety. “Most of your roll-offs are 60 inches, but we go up to 76,” he says. “And as it goes up, it also shifts back. So what we’re able to do is put the dumping point or opening of the debris body well within the container.”

Integrated into the system is a feature that prevents the truck from being moved when the debris body is raised. “The parking brake has to be set and the body has to be all the way down,” he says. “For safety concerns, we didn’t want anyone pulling away with the body up and hitting something overhead. The biggest thing is so the operator can see what’s happening. These things get to be pretty tall structures, so the operator can safely stay away from it and watch what it’s doing. If it should start leaning or the load’s not shifting, he just stops and puts it back down.”

Petrole says the lift system originally was designed for a customer who had a long-term job to remove debris from an island off the California coast. “There was no dumping facility and everything was brought by barge. They wanted a way to dump into roll-off containers so they could leave the truck working and take the containers back and forth with a roll-off truck.”

Designed to lift 45,000 pounds, the high-dump option is available on new model Vacall combination units and hydroexcavators. It is not available as a retrofit. **800/382-8302; www.vacallindustries.com.**

Zoeller Z-Rail pump disconnect system



The Z-Rail pump disconnect system from Zoeller Co. is designed for threaded discharge submersible pumps. Rated to 250 feet TDH, the system is available in 1 1/4-inch vertical or horizontal NPT, 1 1/2-inch and 2-inch vertical. Additional versions and configurations, including nonsparking for use with Class 1 Division 1 pumps in hazardous locations are available. **800/928-7867; www.zoeller.com.**

FLIR E-Series thermal cameras

E-Series thermal cameras (E4, E5, E6, E8) from FLIR Systems feature 3-inch color LCD display, wide-angle autofocus lens, intuitive camera controls, onboard digital camera and MSX (multispectral dynamic) technology that integrates visible details from digital camera photos onto thermal images. The E4 weighs 1.2 pounds and has four-hour battery life. All models have center spot measurement mode.

866/477-3687; www.flir.com.



PRIMEX duplex lift station controller



The Station View duplex pump controller from PRIMEX provides pump amp, pump flow, power loss and pump HOA selector switch monitoring. Features include intuitive setup, real-time clock and graphic backlit display. The controller has an SD card slot for data logging and operates with a 4-20 mA submersible transducer or four float switches. **800/746-6287; www.primexcontrols.com.**

Hypertherm air plasma cutting system



The Powermax125 portable air plasma system from Hypertherm cuts 1 1/2-inch thick metal at speeds up to 18 inches per minute and can sever metal 2 1/4 inches thick. The gouging system can remove 27 pounds of metal an hour. **800/643-0030; www.hypertherm.com.**

Reelcraft hand-crank hose reels

Series CH37000 hand-crank hose reels from Reelcraft Industries are designed for industrial applications requiring longer lengths of 1-inch hose. The static oil lite bearing helps eliminate possible bearing misalignment due to heavy vibration. **800/444-3134; www.reelcraft.com.**



Dialight LED hazardous lighting fixture



The ATEX/IECx certified 21,000 lumen SafeSite LED high bay from Dialight is designed for hazardous rated applications. The light includes an integrated power supply with 10 kV surge protection and is rated for 100,000 hours.

It also is available in general purpose CE and UL versions. **732/919-3119; www.dialight.com.**

Sioux Corp. steam generator



The SF-50 Steam-Flo steam generator from the Sioux Corp. is designed for accelerating the curing process in precast concrete, degassing tanks and thawing frozen pipes. The 50 hp boiler unit (stationary or trailer mounted) produces up to 1,725 pounds per hour of saturated steam vapor. The generator operates at 15 psi and is available with diesel, LP or

natural gas-fired burners. 888/763-8833; www.sioux.com.

Brentwood stormwater shield

The StormTank stormwater shield from Brentwood Industries is designed to improve sumped inlet treatment and reduce pollutant discharge through gross sediment removal and oil/water separation. The shield prevents debris from directly exiting the outlet pipe, increasing flow length and settling time while reducing pollutant discharge. 610/374-5109; www.brentwoodindustries.com.



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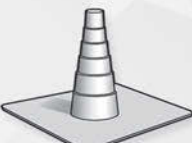
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Aquatherm names distributors

Aquatherm named BWA South Co., Shamrock Sales, Mega Western and Westway Sales Manufacturers Representatives as distributors for its polypropylene pipe. The company now has 28 distributors covering the United States and Canada.

Perma-Liner receives pipeliner patent

Perma-Liner Industries received a patent for its scrim-enforced pipe liner. The liners are made from a lamination that includes a sealing layer, strength layer, support layer and barrier layer.

Trelleborg celebrates factory expansion

Trelleborg celebrated the opening of its expanded manufacturing facility in Skelmersdale, England. The 4,150-square-meter (44,670 square feet) addition houses production of polymer and syntactic foam-based products for the offshore oil and gas industry.

ADS polypropylene pipe receives Ontario approval

The Ontario Ministry of Transportation approved ADS polypropylene pipe for gravity flow sewer and water applications. The new standards and specifications denote dual and triple wall polypropylene (PP) pipe, in addition to previously approved high-density polyethylene (HDPE) pipe in diameters of 100 to 1,500 mm.

Singer Valve receives NSF 372 certification

Singer Valve received NSF 372 certification for low lead content in its control valves. Singer uses high-quality stainless steel for the wetted areas of its valves.

Juniper Systems offers extended service plans

Juniper Systems offers Complete Care Gold and Platinum extended service plans that provide additional benefits beyond its standard manufacturer's warranty. The Gold plan provides normal wear and tear coverage, shorter repair times and expedited return shipping. The Platinum plan includes accidental damage coverage and loaner unit option. Both plans are available in one-, three- and five-year increments.

McElroy adds distributors

McElroy named R & B Company of San Jose, Calif.; Miami International Machinery and Equipment Corp. of Medley, Fla.; and SOFIPO of Moscow, Russia, as domestic and international distributors for its pipe fusion products.

Klein receives tool award

Klein Tools was named Hand Tool Brand of the Year by readers of Tools in Action online magazine. Klein received 38 percent of the vote.

Cretex Specialty Products names regional manager

Cretex Specialty Products named Robin Wolf Eastern regional manager. She will oversee sales and marketing for the Cretex product lineup and provide support for contractors and municipalities in 23 states.



Robin Wolf

SAK president named most valuable professional

Jerry Shaw, president of SAK Construction, received the 2014 Most Valuable Professional award from the Underground Construction Technology Association (UCTA). SAK maintains and restores aging water, sanitary and oil and gas pipelines.



Jerry Shaw

National Pump & Compressor opens Louisiana branch

National Pump & Compressor opened a branch in Lake Charles, La. The company's 32nd location primarily serves the refining and municipal industries. Austin Swindle will manage the branch. Daniel Legnion is the local sales representative. The Texas-based company provides pumps, compressors, dryers and related equipment for sale and rent.

Industry loses a pioneer

Francis "David" Magill Jr., Avanti International CEO, lost his battle with cancer on Jan. 19. David was a dedicated businessman and an early pioneer of the trenchless technology industry. He was Avanti's first employee and the company's first president, and he purchased controlling interest of the company in 1988. The company is now under the leadership of David's son, Daniel Magill.

Lee Supply, Tyco-Grinnell form partnership

Lee Supply Company of Charleroi, Pa., has partnered with Tyco-Grinnell, producer of piping systems, fittings and accessories. Lee provides municipalities and the mining industry with pipe and pumping systems, custom fabrication, fusion equipment sales, service and rentals. ♦

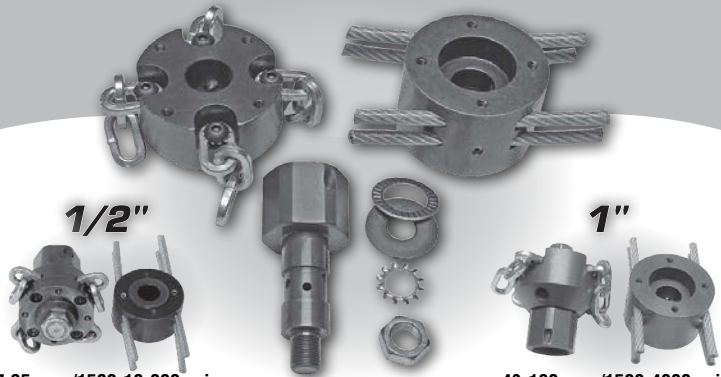
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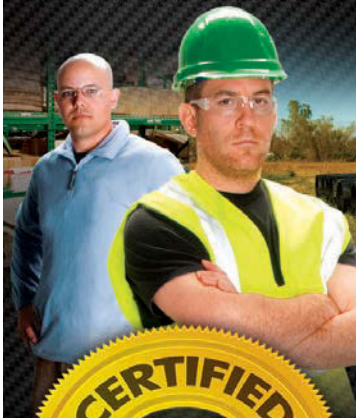
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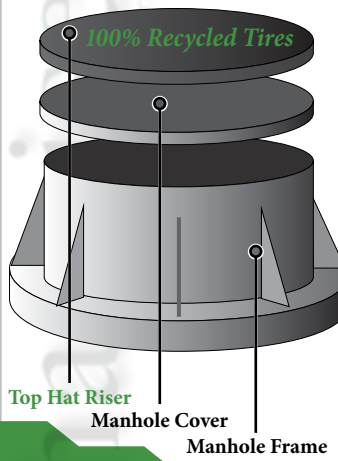
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PEOPLE/AWARDS

Jess Knight, Deputy Director of Public Works in Ocala, Fla., was recognized by the Ocala City Council for serving 35 years with the city.

Northbrook's \$5 million stormwater update near the intersection of Techny and Pfingsten roads was named one of the Projects of the Year by the Suburban Branch of the American Public Works Association's Chicago Metro Chapter. The project, which helped reduce flooding at more than 80 surrounding properties, received the 2014 award in the environment category for projects that cost between \$5 million and \$25 million.

The Commonwealth of Virginia awarded the Town of Christiansburg \$631,000 in grant money from the Stormwater Local Assistance Fund.

Marilyn Sucoe was named Engineer/Stormwater Administrator for the City of Lisle (Ill). Sucoe replaces **Mary Lou Kalsted**, who retired after serving Lisle for 32 years.

Matt Carlson was named Asotin County (Wash.) Stormwater Program coordinator. He replaces **Cheryl Sonnen**, who retired.

LEARNING OPPORTUNITIES

American Water Works Association

The AWWA has a Financial Management Cost of Service Rate-Making Seminar on April 7-9 in North Charleston, S.C. Visit www.awwa.org

Wisconsin

The University of Wisconsin Department of Engineering-Professional Development is offering the following courses in Madison:

- April 3-4 – Using WinSLAMM v.10.0.1: Meeting Urban Stormwater Management Goals
- June 2-3 – Advance Modeling Using HEC-RAS
- June 4-6 – Unsteady Flow Modeling Using HEC-RAS
- Oct. 20-21 – Using WinSLAMM v. 10.0.1: Meeting Urban Stormwater Management Goals

Visit <http://epdweb.engr.wisc.edu>.

The Wisconsin Department of Natural Resources is offering the following courses:

- May 6-8 – Pumps and Motors, Madison
- May 14 – General Safety, North Fond du Lac
- Sept. 17 – Permit-Required Confined Space Entry, Plover
- Dec. 9 – General Safety, Plover

Visit <http://dnr.wi.gov>. ♦

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.

CALENDAR

March 30-April 4

American Water Works Association-Missouri Section Annual Conference, Osage Beach, Mo. Visit www.awwa.org.

April 13-17

American Water Works Association-Texas Section Annual Conference, Dallas, Texas. Visit www.awwa.org.

April 21-24

American Water Works Association-Alaska Section Annual Conference, Juneau, Alaska. Visit www.awwa.org.

May 3-7

American Water Works Association-British Columbia Section Annual Conference, Whistler, British Columbia. Visit www.awwa.org.

May 4-7

American Water Works Association-Ontario Section Annual Conference, London, Ontario. Visit www.awwa.org.

May 4-7

American Public Works Association 2014 North American Snow Conference, Duke Energy Convention Center, Cincinnati, Ohio. Visit www.apwa.net/snow.

May 6-8

American Water Works Association-Pennsylvania Section Annual Conference, Bethlehem, Pa. Visit www.awwa.org.

May 6-9

American Water Works Association-Pacific Northwest Section Annual Conference, Eugene, Ore. Visit www.awwa.org.

May 6-9

American Water Works Association-Hawaii Section Annual Conference, Honolulu, Hawaii. Visit www.awwa.org.

May 7-9

American Water Works Association-Arizona Section Annual Conference, Glendale, Ariz. Visit www.awwa.org.

May 12-14

American Water Resources Association 2014 Spring Specialty Conference, Snowbird Resort, Salt Lake City, Utah. Visit www.awra.org.

June 8-12

American Water Works Association Annual Conference & Exposition (ACE) 2014, Boston, Mass. Visit www.awwa.org.

June 18-21

American Society of Agricultural and Biological Engineers-Florida Section Annual Conference, Waldorf Astoria Naples, Naples, Fla. Visit www.asabe.org.

June 30-July 2

American Water Resources Association Summer Specialty Conference, John Ascuaga's Nugget Casino Resort, Reno, Nev. Call 540/687-8390 or visit www.awra.org.

July 13-16

American Society of Agricultural and Biological Engineers Annual International Meeting, Montreal, Quebec, Canada. Visit www.asabe.org.

Aug. 3-7

StormCon, Oregon Convention Center, Portland, Ore. Visit www.stormcon.com.

Oct. 6-8

National Rural Water Association WaterPro Conference, Sheraton Seattle, Seattle, Wash. Visit www.waterproconference.org.

Nov. 3-6

American Water Resources Association Annual Conference, Sheraton Premier Hotel, Tysons Corner, Va. Call 540/687-8390 or visit www.awra.org.

See

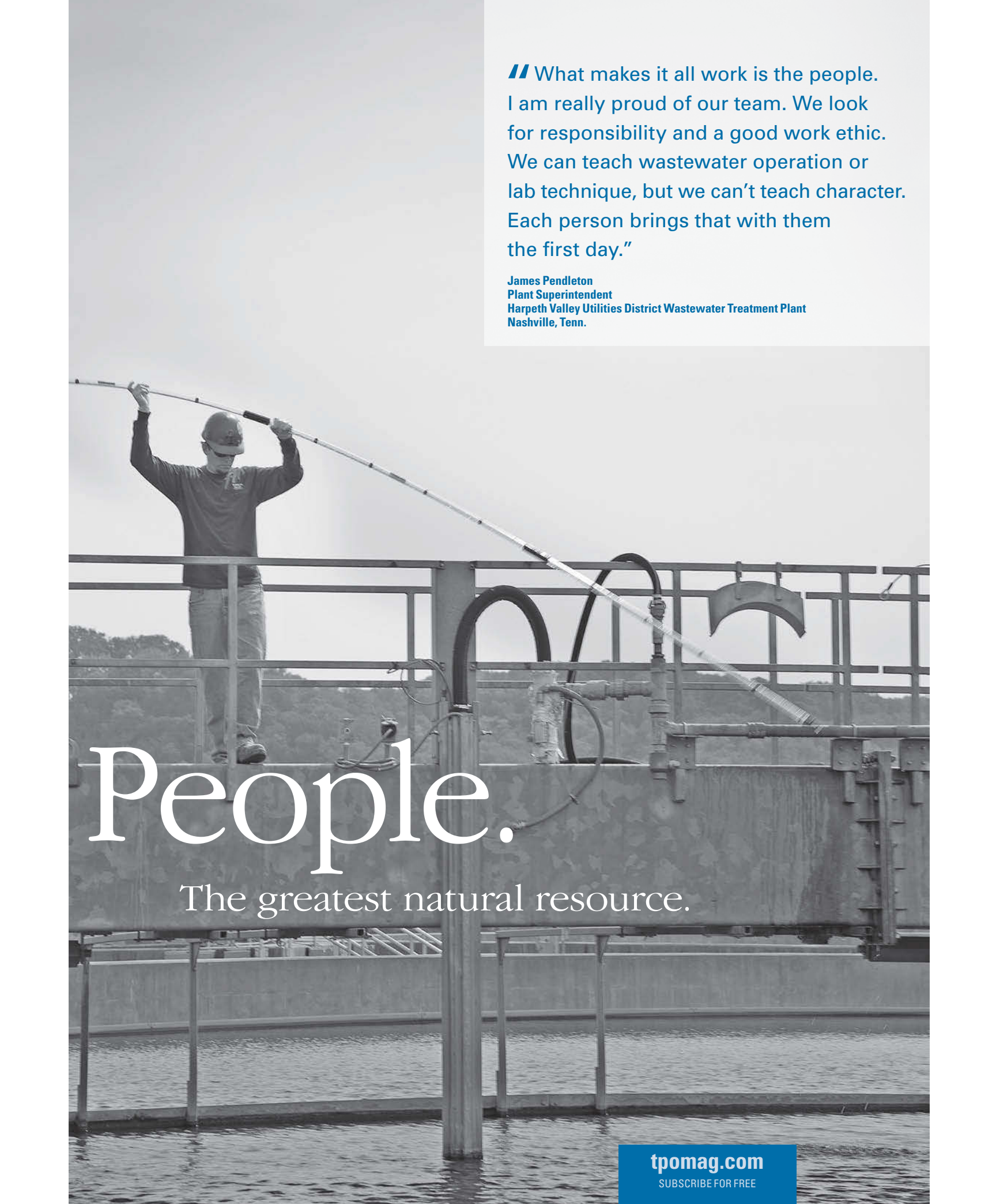
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