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EXPO ISSUE

WEATHERING THE STORM

Sweet Home
stays the course
and nets big
results from its
I&I abatement
program

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Dominic Valloni
Engineering Technician
Sweet Home, Ore.

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INSIDE:

2013 PUMPER & CLEANER ENVIRONMENTAL
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ON THE COVER:

Engineering technician Dominic Valloni and the Sweet Home, Ore., collection crew have made huge strides in reducing flow to their treatment facility through a carefully planned and executed I&I abatement program. Daily flow has been reduced by 10 mgd since the program began in 2001. (Photography by Peter Krupp)



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- ◆ Better Mousetraps: Micromonitoring device targets I&I
- ◆ Human Side: Keep your employees engaged

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FROM THE EDITOR

Luke Laggis

You may have already noticed, but in case you haven't, we've recently launched the new *MSW* website. It's an entirely new look with a new flow, improved navigation and an entirely new philosophy.

We want MSWmag.com to be your one-stop source for all things related to sewer and drain cleaning and rehabilitation, and we want it to be incredibly easy for you to find whatever you're looking for. That's why we're letting content be our guide, and yours.

We know that if you click on a story about pipe bursting you're likely going to be interested in other stories and information about pipe bursting. The same goes for CIPP lining, leak detection and CCTV inspection. So when you

select these or any of the other topics at the top of our homepage, you'll enjoy a feast of content directly related to your specific area of interest. Of course, there are many topics to choose from, so you'll be able to get your fill of whatever subject you're searching for.

Perhaps the biggest change is the mobile- and tablet-friendly design.

We want MSWmag.com to be your one-stop source for all things related to sewer and drain cleaning and rehabilitation, and we want it to be incredibly easy for you to find whatever you're looking for. That's why we're letting content be our guide, and yours.



The site is built to work on your desktop, smartphone and everything in between. When you check out the latest *MSW* stories on your phone, you won't have to deal with tiny text or pages that flow off your screen. Everything will automatically scale to fit your browsing device. Clean, easy and made to help you succeed.

Beyond the architecture of the site, we're also filling it with more content you can't get anywhere else. Everything from the magazine is there, but that's just the start. Our online exclusives include news and features you won't find in print, blogs, more photos, and a growing library of videos so you can see the people and equipment we feature in action. It's all part of providing you a resource for improving your utility, and we hope you'll take advantage of it.

Pumper & Cleaner Expo

The 2013 Pumper & Cleaner Environmental Expo is another great opportunity to improve your utility. We're back in Indy this year with a long list of educational seminars and a show floor full of the latest tools and innovations to help your utility prosper.

I'll be walking the show floor looking for stories that matter to you. I'll also be in the editors' booth outside the main doors by the registration desk. Please stop by and introduce yourself. I'd like to hear your story. As an added bonus, we'll be preparing press releases customized with your utility information and a photo of you and your crew that we'll send back to your local newspaper for publication. It's a great way to let your customers know you're staying ahead of the industry curve and working to provide the best service possible.

If you can't make it to Indy, be sure to keep an eye on MSWmag.com for updates, blogs and video from the Expo.

Enjoy this month's issue. I hope to see you in Indy. ♦

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MAKING The GRADE

The first in a series of case studies chronicling various intricate sewer installations using the AXIS® guided boring system

Subdivision sheds septics for city sewer service

The process of converting the established septic systems of several homes within an Olathe, Kan., subdivision and connecting each residence to the city sewer network presented a unique combination of challenges for installation contractor Beemer Construction. First, the varying elevations of each home made the task of installing a new gravity-flow sewer all the more difficult. Second, was the rock — a hard granite formation with random layers of shale — situated directly beneath a thin layer of topsoil. And finally, consideration for maintaining the aesthetics of the meticulous landscapes was essential.

After surveying the terrain and revisiting the installation plan, project engineers identified several places along the route where digging depths — often exceeding 45 feet (13.7 m) — necessary to achieve the minute grades required for the gravity-flow sewer line to function properly, prohibited using the open cut method exclusively. So Beemer Construction tapped EJM Pipe Services, based in Lino Lakes, Minn., for assistance in devising an alternative for efficiently installing the HDPE sewer line, ranging from 8-inch (20.3 cm) diameter on the upper end to 15-inch (38.1 cm) toward the lower side; all housed within 24-inch (61 cm) casing.

CHANGING COURSE WITH AXIS

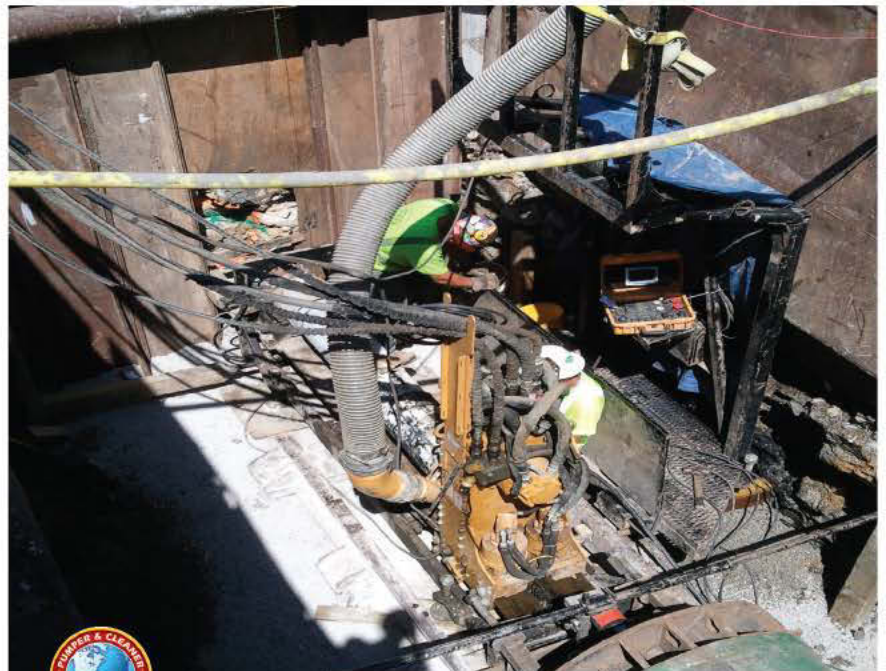
The amended recommendation specified a combination approach, incorporating the AXIS® guided boring system in addition to trenching.

Developed by Vermeer, the AXIS system is a pit-launched trenchless installation method engineered to achieve pinpoint, on-grade accuracy while eliminating some of the difficult steps associated with other techniques. The guidance system features a laser that determines the line and grade of the bore and allows for precision throughout the process, even in the rock conditions encountered in Olathe.

PEAKS AND VALLEYS

The rolling terrain presented extraordinary challenges. Described by Lynn Miki, project foreman with EJM, as a sloping hillside with a significant incline in elevation from launch to exit pits, the AXIS system was employed to tackle several pilot bores — up to 450 feet (137.2 m) in length — at grades ranging from 3.975 percent to just less than 1 percent. One of the bores necessitated preparing a launch pit at a depth of 47 feet (14.3 m) to accommodate the upward incline of the bore en route to the exit pit positioned some 30 feet (9.1 m) deep. Considerable shoring at this depth was required to ensure the walls surrounding the pit were secured.

"Boring this deep and in these rock-laden conditions, you want to make sure you get it done right the first time," Miki says. "It's not easy to move a 30-foot-deep (9.1 m) breakout hole over 10 feet (3 m) and retry. Having to go back after the fact is not only tricky, but expensive. The laser incorporated



into the drill head of the AXIS system projects onto a screen that has a scope similar to a rifle. Even the slightest veer up or down or right to left can be adjusted immediately."

After pilot bores were completed, a separate crew followed behind, using an auger boring machine with disc cutter head to upsize the bore to the diameter necessary to accommodate the 24-inch (61 cm) HDPE housing. This procedure allowed the crew to jump ahead and keep the project moving forward.

"All the pilot bores were completed on target, on grade and on line," Miki says. "There are always concerns when drilling through rock about noise and vibration; even causing cracks and damage to foundations. But noise is minimal with the AXIS system. The residents barely knew we were there and were elated to get hooked up to the city's sewer without having to worry about septic pumping and maintenance hassles anymore. Everything worked really well."



Vermeer.com



FOCUS: WATER

Metro Water Services CCTV operators Antwon Merritt (at controls) and Anthony Zelina do a CCTV inspection of a sewer main with CUES equipment. (Photos by Rachel Paul)

ADAPTING TO THE TIMES

Metro Water Services maintains quality services while leaning on outside contractors to compensate for a shrinking workforce

By Pete Litterski

Hal Balthrop and his team in the Water Distribution and Sewer Collection Division of Metro Water Services like to stay ahead of potential problems in the system serving Nashville and residents of surrounding Davidson County in central Tennessee. The city and county operate under a combined government. MWS also serves portions of two adjoining counties that are part of the Nashville metropolitan area.

Balthrop, the assistant director overseeing the MWS distribution and collection systems, says that tracking the condition of the systems and preventing potential problems has become even more important as the utility relies more and more on outside contractors for a wide array

of services once performed in-house.

In recent years Nashville, like many cities, has established hiring freezes to help address funding cuts due to the faltering economy. Those freezes mean that even as the customer base rises and the system grows, Balthrop and his fellow managers at MWS have to make do with smaller staffs as attrition shrinks the workforce.

As a provider of essential services, MWS has had to find ways to continue operating without cutting back on the final outcome. To that end, Balthrop says, they have stepped up their preventative efforts to avoid problems that drain manpower and financial resources while impeding customer service.

"We put emphasis on preventative and predictive actions versus

reactive. We try to use the programs we have — like leak detection — to take action before a situation becomes a failure," Balthrop says. "Especially on the water side, it's not effective and it doesn't serve the customer well if we run the system to failure."

Calling on contractors

Metro Water Services has a total of 645 employees, with 154 working under Balthrop in the distribution and collection system. To adapt to the hiring freeze, the division leader says he relies more and more on outside contractors to perform specific programs needed to keep the systems operating at optimal levels.

Balthrop, who has been in his position for 12 years, says the use



PROFILE:

Metro Water Services, Nashville, Tenn.

POPULATION SERVED: 529,525

SERVICE AREA: Nashville, Tenn.; Davidson County, Tenn.; and portions of Rutherford and Williamson counties

INFRASTRUCTURE: 2,889 miles of distribution line and two water treatment plants

ANNUAL OPERATING BUDGET: MWS total: \$104.6 million; water distribution/collection division: \$20.4 million

WEBSITE: www.nashville.gov/water

of contractors for selected programs started before the hiring freeze, but adds that it has been a key to maintaining operations since the fiscal vise began to tighten on city hiring.

(continued)

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Valve technician Nash Dent from Mueller Service Co. uses the E.H. Wachs Trav-L-Vac to clean a valve box.

“Beyond those core functions, we found many programs that could be performed by contractors. It has worked for us and we believe we get good value. We think we’ve been good stewards for our customers.”

Hal Balthrop

“Over time, as we reviewed what our core functions are, we decided ours was treating water and distribution of water,” he says. “Beyond those core functions, we found many programs that could be performed by contractors. It has worked for us and we believe we get good value. We think we’ve been good stewards for our customers.”

Services currently under contract include the MWS leak detection program and the city’s valve exercise program, an operation that had been overlooked in the past. Mueller Service Co., based in



The Vac-Con combo unit is set up for water supply.

Plant City, Fla., has a contract to locate and exercise all of the approximately 76,000 valves (including 19,000 fire hydrant leads) in the MWS distribution system. While the location of most valves is already accurately recorded in the utility’s asset tracking system, Balthrop says Mueller employees are hunting down a number of valves that have been covered, paved over or improperly recorded in the records.

As the contractor’s crews locate and exercise the valves, they are recording not only accurate locations for the city’s GIS records, but also helpful data for the MWS crews who will need to perform system maintenance and respond to emergencies in the future. The information collected includes the type, size and material of each valve and even the number of turns needed to fully open and close it.

All of the information is fed into a computer maintenance management system from Infor Public Sector/Hansen Technologies. That system is linked to Nashville’s GIS software system from Esri. When field technicians in the distribution system prepare to do maintenance or emergency work, they have full access to all of the information before they arrive.

“The more information you have, the better you can do your job,” Balthrop says.

In the past, MWS crews sometimes had to go back two or three extra valves to find one that could

LOOKING FOR THE STARS OF TOMORROW

Thanks to Washington, D.C., many people are familiar with the term “fiscal cliff.” But Hal Balthrop believes there is a similar dark cloud hanging over his industry, one that he calls the “aging cliff.”

Balthrop is an assistant director of Metro Water Services — Water Distribution and Sewer Collection in Nashville, Tenn. For several years, his operation, like many city departments across the country, has been under a hiring freeze due to the recession.

Balthrop has been able to find ways to overcome a shrinking workforce, but he is concerned about the future.

“Twenty years ago, we were all talking about what would happen when the wave of baby boomers began to retire. Now we look around and it’s coming in five years and will continue for several more years. I am concerned. With the attrition the last few years and the aging workforce, we would all like a little more bench strength to cultivate continuity.

“At a time when we would like to have a supply of young workers learning from experienced workers, we aren’t able to hire them,” Balthrop says. “We’re approaching a very critical time when we’re going to have to start bringing people in and getting them ready.”

The division chief says that new workers may be better prepared to handle the new technology associated with the operation of water distribution and wastewater collection systems, but there is still a lot of practical and local knowledge they can best learn from experienced technicians and supervisors.

Balthrop says the use of outside contractors for many programs has proven beneficial for Metro Water Services but adds that the utility will always need a solid core of staff employees to handle maintenance, emergencies and customer service. That’s why he is anxious for the hiring freeze in Nashville to thaw sooner rather than later, so he can bolster his bench to take lead roles in the future.



Hal Balthrop

shut down flow to an area where they needed to perform maintenance or address an emergency. That meant more customers than necessary were losing their water service while the work was under way, something the assistant director says is unacceptable.

MWS managers don’t rely only on contractors for vital data to bolster their maintenance program; they stress to their own employees the importance of providing information for the CMMS. “We make sure that the field personnel under-

stand that what they do is important and that the data they record is important. We try to demonstrate how we use the information they provide us; how critical it is for our operation.”

Mueller was one of three companies that responded to the Request for Proposals issued by MWS when it decided to contract for the valve exercise program. The contract was awarded on a per-valve basis with a scale based on valve size and access.

In addition to providing better customer service — better water

(continued)

AROUND THE WORLD IN 10 YEARS?



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ABOVE: The Metro Water Services team includes, from left, industrial maintenance supervisor James Bradley, engineer Lyn Fontana, Mueller Service Co. sales representative Steve Coleman, engineering technician Kenny Gann and System Services Division Assistant Director Hal Balthrop. **RIGHT:** Operator Corey Reese uses a Vac-Con combo unit to clean a sewer main.



quality and palatability, improved operating pressure and water age reduction — Balthrop says he expects the valve exercise program to enable a better and more dependable use of their hydraulic model and set a baseline for future exercising.

Among the other key services contracted out by the water distribution operation is a leak detection program that Balthrop says is essential in preventing major failures. Water Systems Optimization, an international engineering firm,

flow and pressure for fire suppression while minimizing the potential negative impact on residential customers' water quality.

Another key element in the MWS preventive maintenance program is its comprehensive cross-connection control plan that involves the annual inspection and testing of about 25,000 devices and/or locations. The inspections on facilities with 2-inch and larger meter connections are done primarily in-house. Inspections of individual

Balthrop adds, he was particularly pleased with the performance of the distribution system during the flooding. "I am happy and proud to report that we did not have to issue any boil water notices throughout the flood and the flood recovery."

Sticking to the schedule

Generally, Balthrop is pretty satisfied with the condition of the MWS water distribution system, a 2,889-mile network of lines ranging from 60 inches down to 2 1/4 inches. The most challenging areas of the system tend to be in older areas of Nashville, including downtown, where the effective diameter of unlined cast iron water lines can impede delivery of sufficient flow. Those are also the areas where MWS sees the most problems with leaks caused by some of the cold weather that can hit Nashville.

"We track percentages on our work orders — emergency vs. scheduled," Balthrop says. "In terms of water distribution work orders, we are tracking at 98 percent scheduled."

MWS officials lean heavily upon the data collected by field employees and contractors to guide maintenance schedules and long-term planning. Balthrop says those decisions are based on an analysis of varying criteria such as water quality — including water age — materials, break history and available funding.

Available funding is an even

more critical factor, not only because of the economic difficulties in recent years, but because of higher priorities in the MWS collection system. After several years of negotiations, Nashville and the EPA have agreed on a plan to alleviate sewer overflows and Balthrop says, "We are under a collection system consent decree so most of our capital over the next 11 years will be spent for compliance." ♦

"We put emphasis on preventative and predictive actions versus reactive. We try to use the programs we have — like leak detection — to take action before a situation becomes a failure. Especially on the water side, it's not effective and it doesn't serve the customer well if we run the system to failure."

Hal Balthrop

was awarded a second five-year contract to continue the MWS leak study in 2010. The company, whose office serving the eastern half of the United States is located in Nashville, also has the contract to conduct an annual water audit required by the state.

Balancing needs

A study focusing on what MWS needs to do as it works to optimize the distribution system operation, including availing system-wide fire protection, is also under way. Balthrop says it has been a difficult task to balance the needs for sufficient

households and some small commercial accounts are done under contract.

The Nashville utility faced one of its greatest tests in 2010 when historic floods on the Cumberland River inundated large areas of the city and forced the shutdown of one of the two water treatment plants operated by MWS. Fortunately, Balthrop says, the utility had designed redundancy into the operating capacities of its plants, and with some conservation measures was able to meet the needs of the customers even while the damaged plant was under repair. And,

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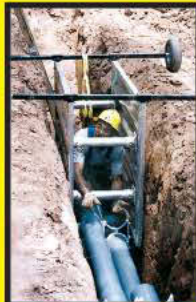
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LISTENING FOR DEFECTS

Acoustic technology provides improved condition assessment of asbestos cement water mains

By Marc Bracken and Dave Johnston

Asbestos cement-lined water mains degrade when subjected to long-term exposure to sulfates and byproducts of biofilms that form on their interior walls. AC pipes also lose structural integrity as a result of “leaching,” a chemical process in which calcium contained in the cement is absorbed by soil surrounding the pipe, resulting in reduced structural wall thickness. Water utility operators see the result of such effects in the form of “soft” AC pipe.

Condition assessment — or measuring the remaining wall thickness — of AC pipe has been problematic for many utilities, as most traditional methods are based on excavating sections of pipe and extracting samples for phenolphthalein dye testing. In many cases, samples cannot be obtained without taking the pipes out of service, and due to the costs and

acoustic sensors that are either placed on available appurtenances or on the outside walls of the pipe. The measured velocity is then used to calculate the average wall thickness of the pipe between the two sensors.

Background theory

The acoustic wave velocity of a fundamental vibro-acoustical wave (a pressure-induced wave) of the pipe is a function of the Young’s Modulus of the pipe, and the Bulk Modulus of the fluid. An acoustic wave is induced in the pipe by lightly “tapping” on the pipe, or by running water through a hydrant. The propagation velocity of the wave is then measured based on the sensor spacing and the measured time delay between the two sensor locations. The average wall thickness of the pipe section between the acoustic sensors is then reverse-calculated from

between the two sensors. Typically, the length of the pipe section over which the acoustic velocity is measured is 100 to 300 meters; however, if an anomalous measurement that could represent a degraded pipe is found, this distance can be decreased to anywhere between 30 to 100 meters. Closer measurements can also be taken by using existing fittings on the pipe that are more closely spaced.

The use of this method has been very accurate at assessing the condition of AC pipe that is in good, moderate or bad condition.

Las Vegas Valley Water District

Las Vegas Valley Water District turned to a condition assessment specialist to acoustically measure the remaining wall thickness of a major pipeline in its water system in order to more efficiently prioritize what it anticipated to be a large repair and replacement project. However, the district’s engineers wanted to test the technology’s accuracy beforehand on a section of 6-inch AC pipe that was scheduled to

be abandoned — without breaking ground.

Following the assessment, samples of the pipe were obtained and sent to a consultant, whose lab specializes in AC pipe testing in accordance with ASTM standards. When the results came back, they were compared to the specialist’s condition assessment report and found to be nearly identical.

The acoustic method employed found the remaining wall thickness of the pipe to be .74 inches. The result of .74-inch wall thickness was not expected, as the standard wall thickness of a pressure class 150 AC pipe is .66 inches. Phenolphthalein dye tests conducted by the consultant found the samples to be in excellent condition,

Fortunately, recent developments in non-invasive acoustics can help utilities to accurately and non-invasively determine the remaining wall thickness of AC transmission and distribution mains in their water systems.

low sample sizes associated with such methods, few utilities have a true understanding of the condition of water distribution assets that are comprised of AC.

Fortunately, recent developments in non-invasive acoustics can help utilities to accurately and non-invasively determine the remaining wall thickness of AC transmission and distribution mains in their water systems. These developments have been tested and confirmed by a number of utilities, including the Las Vegas Valley Water District and the District of Maple Ridge, British Columbia. This new method involves measuring the velocity of acoustic waves in a pipe, using a leak-noise correlator and two

a theoretical model. As the pipe wall thickness decreases over time, the acoustical wave velocity decreases.

The acoustic propagation wave (the water hammer mode) propagates as a compression wave in the fluid, and a dilatational wave in the pipe. The pipe will breathe on a microscopic level, and therefore the pipe will go into stress. The implication of this is that only the structural part of the pipe that can carry load will contribute to the structural stiffness of the pipe. Therefore, deposits on the pipe wall such as tuberculation or graphite are not included in the average wall thickness measurement. The measured wall thickness represents an average

with a remaining wall thickness of .75 inches. The consultant also conducted chemical analysis of the samples, which indicated that the pipe's chemical composition was within normal limits.

Based on its analysis, the consultant assigned a remaining service life of 48 years to the samples. The results of the analysis essentially confirmed the results predicted by the specialist and the acoustic-based technology.

Based on the reliability of these and other acoustic measurements, the water district has since cut back its sampling program on AC pipe, and uses acoustic technology as its primary condition assessment tool.

The District of Maple Ridge, British Columbia

The District of Maple Ridge, British Columbia, was experiencing leaks and main breaks in sections of its water system, which is comprised mainly of ductile iron pipe. However, approximately 18 percent of its water system is comprised of asbestos cement and cast iron, and most of the leaks and breaks it experienced were occurring in these areas.

Normally, Maple Ridge would analyze the break histories of parts of its water system to prioritize

Once both sections of pipe were acoustically surveyed, Maple Ridge compared physical samples of the pipes to the acoustic condition assessment report and found the results to be nearly identical.

sections for replacement. However, it turned to a specialist that leveraged acoustic-based methods in order to more accurately prioritize replacement projects — without breaking ground or disrupting service.

Maple Ridge's superintendent of water works wanted to gauge the accuracy of the acoustic condition assessment method prior to its full-scale deployment, so he had a specialist assess two sections of 6-inch AC pipe in the system, which the district already knew were badly degraded.

Once both sections of pipe were acoustically surveyed, Maple Ridge compared physical samples of the pipes to the acoustic condition assessment report and found the results to be nearly identical. The acoustic-based findings indicated that both pipes had remaining wall thicknesses of 7.7 mm, which meant that the pipes were significantly degraded, as they had lost more than half (54.2 percent) of their original wall thickness. The results closely correlated with the condition of the physical samples of the pipe. Impressed with the accuracy of the results, Maple Ridge now uses acoustic-based pipe condition assessments along with breakage histories to prioritize water system repairs and replacement.




These case studies are just a few of the many examples that help validate the accuracy and effectiveness of acoustic-based technology that leverages propagation velocity when it comes to determining the remaining wall thickness of water mains comprised of AC. The condition assessment capabilities of this type of survey-level technology are impor-



tant for utilities in that they can help them to efficiently prioritize water system repairs and replacement and continue providing customers with safe, clean drinking water. ♦

About the Authors

Marc Bracken, M.A.Sc., P.Eng., is vice president and general manager of Toronto-based Echologics and has more than 18 years of experience in acoustical and vibration engineering.

Dave Johnston, B.Eng., is manager of field service and technology for Echologics. He has played key roles in developing non-invasive leak detection and condition assessment solutions for many different pipe types and materials.











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A photograph showing three workers in safety gear (hard hats, high-visibility vests, and work clothes) operating a piece of machinery. One worker is bent over, looking into a circular opening in the ground. Another worker stands to the right, holding a long, thin rod that is connected to a camera. The third worker stands to the left, observing. The background shows a large piece of industrial equipment, likely a sewer inspection vehicle.

From left, Alexander City sewer operators David Keel, Stanley Hill and William Hayes lower an Aries Pathfinder camera into a sewer line. (Photography by Kenneth Boone)

FOCUS: SEWER

THE FOG IS LIFTING

Technology upgrades and targeted maintenance have helped Alexander City reduce SSOs by 50 percent over the past two years

By Dan Heim

RECYCLING WASTE

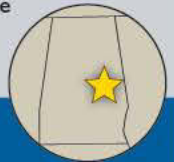
Alexander City runs two treatment plants. The Sugar Creek Plant (AWWTP) came first, and was designed to handle dyes and chemicals from local textile industries. With that industry in decline, the plant is currently running at only 60 percent capacity. Designed for 6 million mgd, primarily from the large textile plants, the load has gone to nearly zero. The textile plants have closed, reducing tax revenue and budgets. So Alexander City is aggressively seeking to attract new industry.

Coley Creek Plant (WWTP) handles the residential waste stream, and is designed to remove typical solids and organic components. It's a much smaller plant. Solids from this facility are trucked to Sugar Creek, where they're combined for further processing.

The Sugar Creek Laboratory, a modest operation with two full-time employees adjacent to the Sugar Creek Plant, is charged with monitoring the quality of effluent.

The real work goes down at the Sugar Creek Plant. There, polymers are added to bind the solids into sludge, which is then sent through a belt press to squeeze out most of the water. What's left is solid cake. That cake is trucked to several permitted sites where it's spread for final drying.

These sites use the cake, which is rich in nitrogen, phosphorus and organic compounds, to condition the soil for growing straw and hay used by local cattle ranches. One or two truckloads of cake are delivered each day. The entire process is closely regulated by the ADEM and the EPA, monitored for application limits and chemical content, and is subject to more stringent constraints than commercial fertilizers. Storage of cake at the plant is necessary, since it cannot be applied during the wet season.



PROFILE:

Alexander City (Ala.) Sewer Collection Department

SERVICE AREA:
25.8 square miles

CUSTOMERS:
5,821 residential,
1,380 commercial

POPULATION DENSITY:
387 per square mile

INFRASTRUCTURE:
150 miles of 8 to 30 inch
gravity mains, a mix of vitrified
clay, PVC, concrete and
ductile iron; 5,000 manholes;
21 lift stations; two treat-
ment plants: one AWWTP,
one WWTP rated

ANNUAL BUDGET:
\$577,000 operational,
\$800,000 capital

EMPLOYEES:
11 full-time workers

AVERAGE RAINFALL:
55-60 inches per year

WEBSITE:
www.alexandercityonline.com/waste.html

Alexander City is located in central Alabama, midway between Birmingham and Montgomery. The Tallapoosa River runs nearby and feeds Lake Martin, a major resource for recreation and fishing. With 440,000 acres of water and close to 750 miles of shoreline, it looks like a Norwegian fjord. Problems with I&I and SSOs could threaten its water quality, but the city hasn't let that happen.

They do get some rain — 58 inches annually. Aging infrastructure, mostly vitrified clay pipe, was creating additional problems with I&I. Excess discharge could make it into the waterways, and ultimately to the lake. Known for exceptional water quality, Lake Martin has been designated a "Treasured Alabama Lake." The city is committed to preserving this asset.

Gerard Brewer, P.E., and director of Public Works for the Alexander City Sewer Collection Department (ACSCD) notes, "We knew we had potential problems, and both Alabama Department of Environ-



**Alexander City Public Works
Director and City Engineer
Gerard Brewer.**

plete on that GIS now," says Brewer. "It's helping us tremendously by prioritizing what needs to be done."

Previously, smoke testing was the only method used to identify

"We did have an existing grease ordinance, but it was a single paragraph, said nothing about grease traps, and was kind of vague. We had 50 different interpretations of what it meant. Our new ordinance is much more specific — and effective."

Gerard Brewer

mental Management (ADEM) and EPA were watching closely to see how we handled it."

Beginnings

ACSCD partnered with CH2M HILL, an environmental consulting firm, back in 2000. According to Scott Cummings, consulting engineer with CH2M, "One of the first things we recommended was a GIS. If you don't know what you have in the system, you can't really fix it." Cummings and CH2M associate Dana Raughton have been onboard at ACSCD advising them every step of the way.

"We're about 95 percent com-

pipe breaks or bad joints. Acquiring a truck-mounted Aries Pathfinder camera system, and Aries pole and push cameras, was another significant step forward. ACSCD has now inspected 40 percent of their pipe using CCTV. ITpipes software (Infrastructure Technologies) handles the data logging. Their plan is to inspect another 20 percent of their pipe each year.

"Until you actually look into those pipes, you have no idea where the problems are coming from," says Danny Pike, foreman of the SCD and jack-of-all-trades with camera systems. "We knew we had a FOG problem, but until we saw

how much had settled into low pipe sections, we didn't appreciate the extent of the problem. Now we can also see breaks, bad joints and root intrusions."

Brewer notes enacting a grease ordinance and installing grease traps at 54 food service facilities played a big role in solving the FOG problem. "That's where 65 percent of our SSOs were coming from. We've also inspected and cleaned about 40 percent of our pipe. Together, that's eliminated 50 percent of our SSOs.

"We did have an existing grease ordinance, but it was a single paragraph, said nothing about grease traps, and was kind of vague. We had 50 different interpretations of what it meant," Brewer says. "Our new ordinance is much more specific — and effective."

Superintendent Mike Waldrop says root intrusion in this heavily



ABOVE: The Alexander City team includes, from left, Public Works Director and City Engineer Gerard Brewer, Shelby Richardson, William Hayes, Leroy Thornton, Danny Pike, David Keel, Stanley Hill and Mike Waldrop. **LEFT:** From left, Hayes, Pike, Thornton and Keel use a vacuum system to remove debris and solids from a sewer line.



wooded area was another significant source of I&I. “When you have roots, they will find the water. So we need a pretty aggressive program,” he says. “That includes keeping trees and shrubs out of our easements, cutting and trimming as needed with Bush Hogs, and using chemicals to kill back the roots. It’s a daily job, and we track all this work on our GIS.”

High groundwater levels, averaging 7 feet, and several streams also exacerbated I&I. The city’s 5,000 manholes, mostly constructed of brick and mortar, didn’t help. Many of those have already been inspected and rehabilitated using a cementitious mix brushed on from the inside.

Current efforts

The Middle Tallapoosa Clean Water Partnership (MTCWP) is a local, privately funded environmental group. It’s a consortium of stake-holders that includes industry, civic organizations and educators. Their mission: oversee all aspects

of the Tallapoosa watershed.

“We’ve got a lot of eyes on how our system affects the water quality. But the partnership also gives us a platform for educating residents about how to protect that watershed,” Brewer says. “We do everything from advertising to water festivals to ‘state of the watershed’ meetings.”

Local schools are also involved with environmental education. MTCWP provides grants for teachers to fund student projects addressing water quality. They also act as a clearinghouse for information about rain barrels, rain gardens, and what not to put down your drain.

“Alexander City is not required to have a formal stormwater program, but the city makes use of the partnership to promote preservation of water quality throughout the basin,” says Cummings. Partnerships like that, during economic downturns and reduced budgets, allow the city to cut back as needed but still get the job done.

Rehab efforts on the system’s

pipes are ongoing, and ACSCD is three years into their pipe replacement program. They know much of their pipe is nearing the end of its 50-year average lifetime, so they've been inspecting 2 percent of that pipe each year for several years. They're also on the verge of some large construction projects, and with a capital budget of \$800,000 per year, Brewer thinks they'll be able to get where they need to be.

"We're moving to PVC for those pipes, replacing the vitrified clay so popular back in the 60s and 70s," says Pike. "When we televised that stuff, we found lots of bad joints and cracks. It's pretty easy to break clay pipes."

Replacing or rehabbing that pipe was a high priority, and officials identified it as among the city's top 10 sources of I&I. The worst 40 percent of that pipe was addressed in the first two years of the program.

Working smarter

Technology upgrades have allowed ACSCD to work smarter and more efficiently, and Brewer and Pike can cite several examples.

"Back when we were just smoke testing, we did the best we could with that simple tool. Our motto is 'find it, flag it, fix it.' But once we added GIS, we

"Until you actually look into those pipes, you have no idea where the problems are coming from. We knew we had a FOG problem, but until we saw how much had settled into low pipe sections, we didn't appreciate the extent of the problem."

Danny Pike

found we were making redundant spot repairs and not using our resources to best gain," Brewer says. "The spatial element of GIS let us see many problems we'd been missing. Now we can get the whole picture."

Pike adds that when they made the move to CCTV and actually started looking into those pipes, they found a lot of things that never showed up with smoke testing, including sagging lines where grease had built up, offset joints and root intrusions. It was an eye-opening experience.

"It was that video of our pipes that really got the mayor and City Council behind our efforts," Brewer says. "They could see the extent of our problem with their own eyes. It seems funny now, but they watched that video during a lunch meeting. As you might expect, sewer videos and lunch at the same time can make a big impact."

As a result, the City Council is fully behind ACSCD's efforts. They understand the scope of the problem, appreciate the engineering challenges, and are backing ACSCD to the extent the budget allows. "That's really helped us do our job," Brewer says. "It's more 'glamorous' for them to fund highly visible projects, say, ball fields or parks. But they understand the importance of this essential and invisible infrastructure."

Down the pike

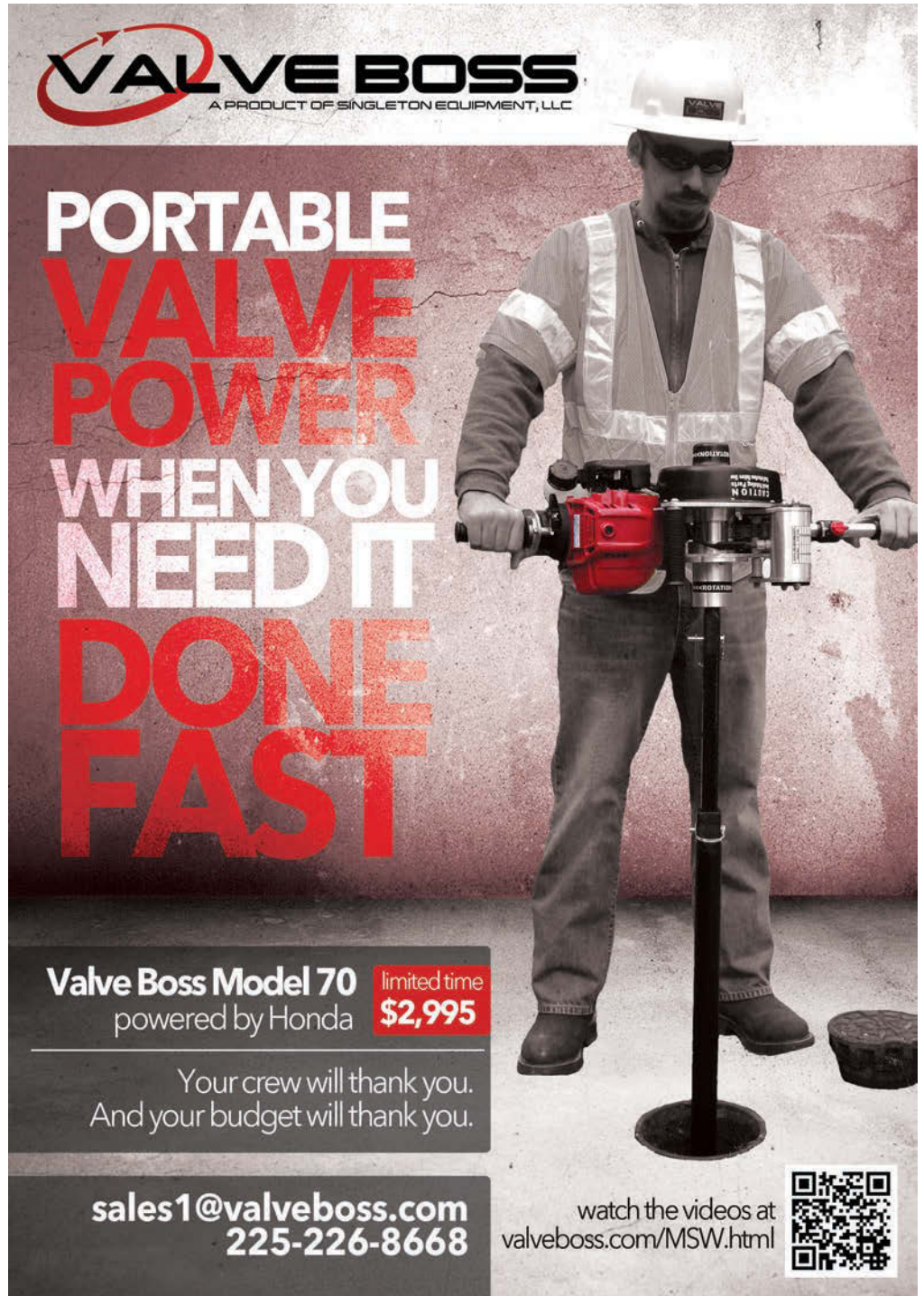
"One of the things I think we're doing right, and supported by our politicians, is doing what we can in-house, but subcontracting certain types of work to local contractors. That includes things like

spot repairs and full line replacement," Brewer says. "Keeping that money in our local economy is important. We sometimes go out-of-state if special equipment or methods are needed, but we really try to do all we can right here."

With most of the textile industry now offshore, Alexander City has begun an aggressive program to attract new industry, build their tax base, and increase local jobs. The city, by using attractive tax structures, has been successful in attracting new industry from the automotive sector. Honda, Hyundai and Kia are already in the area are with parts assembly plants and associated support industries.

In the meantime, ACSCD will continue doing what they do best.

"One thing we've learned is to recognize where our strengths and abilities are, and to leverage those skills," Brewer says. "Danny [Pike] and Mike [Waldrop] have done a tremendous job with our CCTV program. That's already helped solve a lot of our problems. Good managers need to



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Leroy Thornton looks at a closed-circuit-video feed of a sewer line from inside the Aries CCTV truck.

“We’ve stayed on top of things, avoided consent orders, and believe we have a long-term strategy that works. We know we won’t be able to fix everything next year, but we’re making great progress. We’ve stayed within our budget, and are proud of what we’ve done so far.”

Scott Cummings

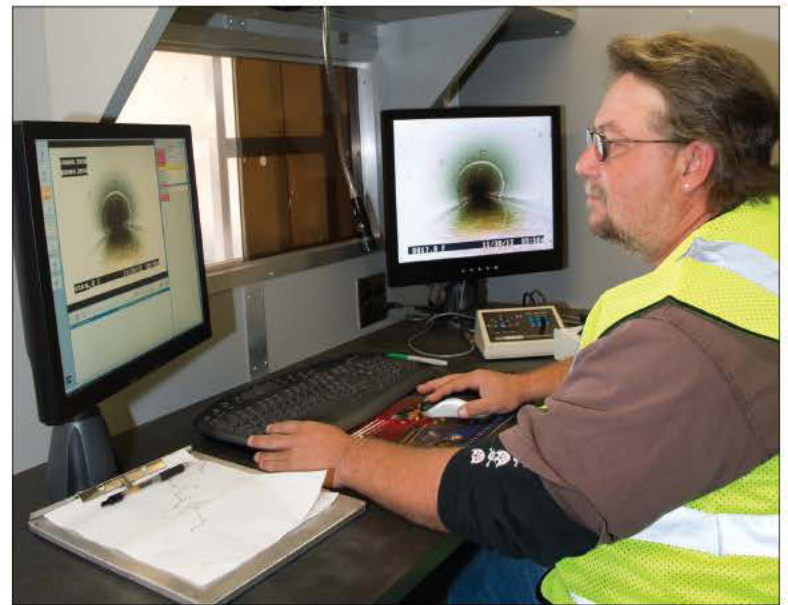
recognize and reward skills like that. In terms of technology, we went from being novices to as good as or better than most in the business.”

ACSCD has been doing their work totally on self-generated revenue. There’s been no bonds, grants or rate increases. That’s crucial for keeping customers and politicians happy. It’s being done with good management and dedicated employees who feel appreciated.

“We’ve stayed on top of things, avoided consent orders, and believe we have a long-term strategy that works,” Cummings says. “We know we won’t be able to fix everything next year, but we’re making great progress. We’ve stayed within our budget, and are proud of what we’ve done so far.”

Brewer notes the utility has a group of employees who have close to 100 years total experience in the business. “We’re like a family. And we’ve all taken it upon ourselves to learn how to use this new technology, fix our own equipment, and stay up to date with the software.

“I can’t emphasize enough what technology has done for our program. A large part of that is GIS, CCTV and the Cityworks software package. It’s all integrated. You can’t manage what you can’t see.” ♦



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City of Des Moines manhole restoration crew members Albert Salazar, left, and Stan Lamay lower the AP/M PERMAFORM PermaCast system into a manhole while Lenny Terrell mixes grout on the trailer. The city has a dedicated PermaCast trailer outfitted with all the necessary equipment for their work. (Photos courtesy of Linda Keairns)

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MANUFACTURER:
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www.permaform.net

APPLICATION:
Spray-on manhole
rehabilitation system

BENEFITS:
Prevents inflow and infiltration,
saves money over reconstruction
and replacement, minimizes
confined-space entry, eliminates
concrete shadows

USER:
City of Des Moines

EXTENDING LIFESPANS

Des Moines successfully takes on a major manhole rehabilitation challenge with the PermaCast system

By Angus W. Stocking

“It’s a good system, and it lines the old manhole from top to bottom. We usually apply a half-inch-thick layer of concrete in one complete pass, and we find that that is completely structural.”

Rick Powell

Des Moines is Iowa’s largest city, but with a population of only 203,000, it deserves its reputation as a quiet, prosperous community. In recent decades, however, Des Moines has been tested severely by two major flood events. The “Great Flood of 1993” was the most devastating flood in U.S. history, according to the U.S. Geological Survey, and the Iowa Flood of 2008 was so devastating that it caused about \$64 billion in damage and is referred to as, ‘Iowa’s Katrina.’

So Des Moines’ sewer system deals with occasional intense flooding and high groundwater, and it’s an aging system. “Our main sewer infrastructure in most of the city is about 100 years old, and it’s al-

most all brick — brick lines and old brick manholes,” explains Des Moines Section Chief Rick Powell, who is in charge of manhole rehabilitation and levee maintenance.

For five years, the City of Des Moines has been sealing and structurally rehabilitating failing brick manholes without contractor assistance, using the PermaCast system and AP/M PERMAFORM’s City Self-Install Program. The city has already rehabilitated 1,000 of its 18,000 manholes, saving approximately \$3,000 per manhole over reconstruction. Powell says the savings have already paid for the system in the first two years of the program.

Even before the city bought their own application equipment,

they used the system in test projects to evaluate the solution over time. Some of these date back 15 years and are holding up well with no sign of failure. That long-term performance convinced Powell that the PermaCast system is cost-effective and durable.

“I think it saves taxpayers a lot of money in the long haul, and from what we’ve seen it will greatly extend the useful lifespan of our aging manholes,” Powell says.

A good system

Des Moines’ experiences with AP/M PERMAFORM actually go back about 20 years, when the company’s president, Bill Shook, demonstrated a manhole cleaning system based on high-pressure spin

washing. That system evolved into PermaCast, which uses a patented, bi-directional robotic spincaster to apply thin layers of high-strength, fiber-reinforced cementitious grout to the interior of failing manholes.

Prior to signing up for the self-install program, Des Moines didn't have a formal protocol for manhole repair. When manholes failed completely, they'd be rebuilt with new materials. Various patching methods were also used from time to time. "These weren't very good," Powell says. "It seemed like they ended up breaking down after just a few years."

Now, the city systematically rehabilitates manholes prior to failure. They don't have a fixed annual goal for the number of manholes to be rehabilitated, but they do take advantage of good conditions. "When the weather is good, we're able to repair up to five manholes a day," Powell says, "That's with an average depth per manhole of 10 to 12 feet."

Making it like new

Manhole surfaces must be thoroughly cleaned prior to rehabilitation. Some also require patching before spin-casting. Manholes can be wet to the touch, but for the system to be effective there can be no running water. If hydrostatic pressure is detected, patches or plugs are used to stop any inflow.

Once the manhole has been cleaned and prepared, the PermaCast spincaster is lowered from above, eliminating the need for confined-space entry. The bidirectional feature is important. Since the spray nozzle spins in one direction on the descent — clockwise or counterclockwise — and the opposite direction on the way up, there are typically no concrete "shadows" caused by uneven bricks or other protrusions. This eliminates handwork. The result is a smooth, watertight, completely structural new manhole that tightly adheres to and stabilizes the existing manhole. PermaCast can be used to repair brick, concrete or even steel manholes.

Sewer flow does not need to be stopped during the application process. The system does not cover the inverts, but those can be done by hand if necessary. Temperatures must be above 50 degrees, and curing typically takes four to six hours.

The grout used is typically MS-10,000, or another specialty grout from AP/M PERMAFORM. These are specially formulated for manhole rehabilitation, and if microbiologically induced corrosion is an issue, they can be mixed with ConmicShield, an antimicrobial additive that provides permanent corrosion protection.

"It's a good system, and it lines the old manhole from top to bottom," Powell says, "We usually apply a 1/2-inch-thick layer of concrete in one complete pass, and we find that that is completely structural. If the old manhole is failing or especially bad, we might do another layer after the first layer has cured, for a total of about an inch."

Training was initially provided by AP/M PER-

MAFORM staff who visited the site and worked with Des Moines crews in the field. But since then, Powell says, on-the-job training has been more than sufficient to get new employees started on the PermaCast crew. "It's not really too complicated a process," he says. "It's become routine for us, and we treat it as an entry-level job for new employees. So, we have a lot of turnover on that crew, but we're always able to consistently do high-quality work."

(continued)

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BETTER MOUSETRAPS



A pallet of PermaCast MS-10,000 grout mix rests on the City of Des Moines' manhole restoration trailer.



Lenny Terrell, left, and Stan Lamay prepare the PermaCast system for a manhole rehabilitation.

Like many cities, Des Moines struggles to keep up with pressing infrastructure maintenance issues while coping with shrinking budgets. In the case of manhole rehabilitation, the city has learned that sometimes, doing it yourself is the best way to go. ♦

About the Author

Angus W. Stocking, L.S., is a licensed land surveyor and a full-time infrastructure writer.

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FOCUS: STORM/SEWER

WEATHERING THE STORM

The City of Sweet Home uses modeling and inspection data to target I&I sources and reduce excess treatment demand by 60 percent

By Dan Heim

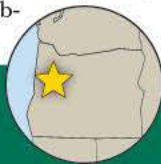


The Sweet Home team includes, from left, maintenance worker Rick Kopf, Crew Chief Doug Latham, maintenance worker Dean LeBret, engineering technician Dominic Valloni, Maintenance Superintendent Pat Wood, and Brown and Caldwell engineer Rob Lee. (Photography by Peter Krupp)



Swet Home, Ore., is nestled in central Willamette Valley, about 100 miles south of Portland, near the foothills of the Cascade Range. They get plenty of rain — some 45 inches per year on average. With an aging collection system, I&I had been a huge problem, often overwhelming their treatment plant during peak wet-weather events. Still, they've reduced I&I significantly with smart planning and coordinated rehabilitation efforts.

"We knew we had a real problem with I&I, so starting in 2001 we embarked on a four-phase plan to solve that prob-



PROFILE:
City of
Sweet Home (Ore.)
Engineering Division

SERVICE AREA:
8.5 square miles

CUSTOMERS:
2,400 residential,
800 commercial

INFRASTRUCTURE:
64 miles of pipe (30 miles
PVC or rehabbed, 34 miles
original concrete dating
to 1938); 1,020 manholes;
one activated sludge
treatment plant

ANNUAL BUDGET:
\$1.8 million

EMPLOYEES:
3 full-time workers plus
1 engineering technician

AVERAGE RAINFALL:
45 inches per year

WEBSITE:
www.ci.sweet-home.or.us



PHOTO COURTESY OF DOMINIC VALLONI

Dale Jarvis from subcontractor K&R Plumbing performs an electro test on an Epoxytec manhole liner.

lem," says engineering technician Dominic Valloni.

Under the leadership of Mike Adams, Sweet Home Public Works director, guided by Rob Lee, P.E., of Brown and Caldwell, the city formulated a plan to solve their wastewater issues. Lee says that led to their continuing relationship, and they've stayed on board to assist with all phases of the city's efforts to mitigate I&I.

Early results showed that flow to the treatment plant, which was sized for seven times average flow, could reach 22 times its design capacity during peak weather events. Brown and Caldwell recommended an aggressive approach to I&I reduction, and the city decided to implement the firm's recommendations for flow reduction.

Phase 1 of their plan involved the installation of flow monitors, smoke testing and video inspection of the pipes. The city also asked Brown and Caldwell to build a hydrologic model of their system so they could predict problems and focus their resources. The result was a multi-phase I&I abatement program. Flow monitoring after each phase drove analysis and helped fine-tune the program.

The problem

Sweet Home faced some huge issues with I&I, amounting to a treatment capacity 15 mgd over what their existing plant could handle.

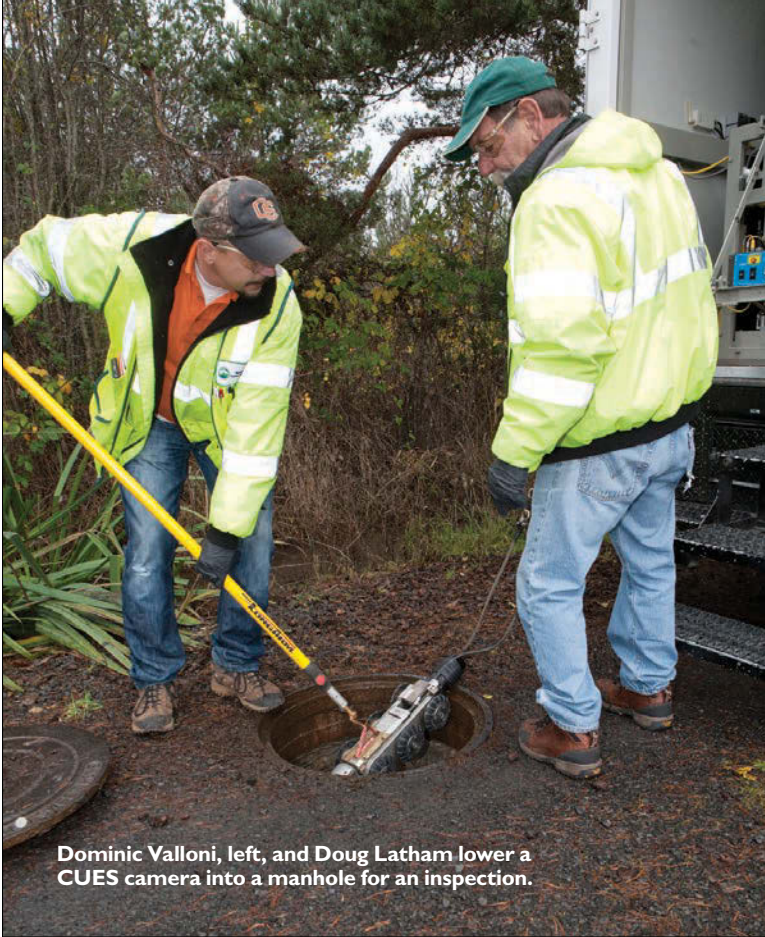
"As of last year, we had reduced that to a few million gpd over our current treatment capacity of 7 million," notes Valloni, putting their progress into perspective.

Issues were compounded by very high groundwater levels and many springs in the area. This exacerbated I&I, especially in the winter, and made trenching or excavation difficult at best. There are also many trees in the Sweet Home environs, and root intrusion further contributed to I&I.

Finally, their aging collection system had pipes dating back to 1938, composed mostly of concrete. That pipe was rapidly deteriorating, and much of it had already reached the end of its serviceable life.

Phases 1 and 2

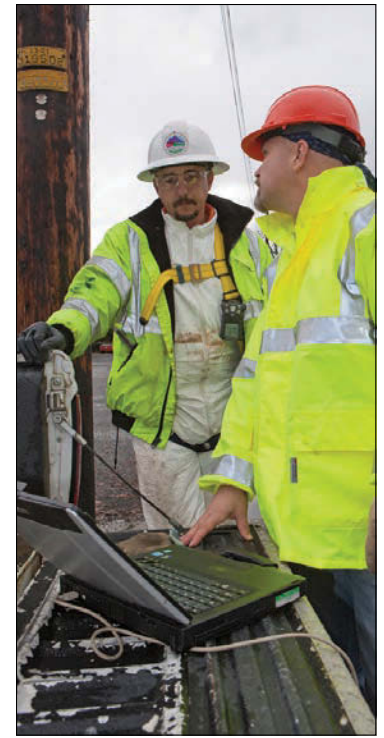
Phases 1 and 2 of the city's program began in the early 2000s. Smoke testing revealed a number of cross-connections between storm sewers and private roof drains. These were disconnected early on by in-house staff.



Dominic Valloni, left, and Doug Latham lower a CUES camera into a manhole for an inspection.



Rob Lee of Brown and Caldwell, left, and Dominic Valloni review sewer plans.



Valloni, left, and Dean LeBret get the software ready to download flow rate data once Valloni is lowered into the manhole.

“The success of the city’s program was their willingness to address the private side laterals. Without that commitment, reduction in I&I would have been much less, and several times more expensive, to get the same results.”

Rob Lee

Rehabilitation utilized a number of technologies including open-cut replacement, cured-in-place pipe and pipe bursting. Additionally, the type of work varied by sewer basin. In some basins, only mainline sewers were rehabilitated. In others, mainlines and laterals to the property line were rehabilitated, while in others private-side laterals were addressed.

At this point, Brown and Caldwell conducted another round of flow monitoring and modeling. This allowed the city to determine which methodology was most effective, and how much of the collection system required attention.

Modeling results were conclusive: Addressing only sewer mains and manholes would result in a 10 percent decrease in I&I during peak weather events, while addressing manholes, sewer mains, and laterals to property lines would yield a 30 percent decrease. If private laterals were included, a 60-80 percent

reduction in peak I&I was expected.

“The success of the city’s program was their willingness to address the private-side laterals,” says Lee. “Without that commitment, reduction in I&I would have been much less, and several times more expensive, to get the same results.”

These predictions convinced the city to move forward by rehabilitating mains, manholes and laterals as far as possible. Given the limited number of rehabilitation contractors, the city followed Brown and Caldwell’s recommendation to allow various rehabilitation techniques to be bid against each other. Pipe bursting was bid against CIPP, and various manhole products were tested in numerous phases. The result was greater competition and lower bid prices, with contract documents emphasizing quality.

Phases 3 and 4

During the first three phases of work, Sweet Home experimented with the gamut of products for manholes from various manufacturers: polyurea, several spray-on products, fiber-reinforced cementitious compounds, and cured-in-place manhole liners. By Phase 4 they had settled on an epoxy product manufactured by Epoxytec.

PROTECTING THE RIVER

The Santiam River is ultimately where excess effluent goes. It’s a tributary of the Willamette River, which is a tributary of the Colombia River. The North Pacific is its final destination. Proper stewardship is essential, and Sweet Home takes this responsibility seriously. The Santiam is a popular whitewater rafting route and also provides salmon fishing opportunities. It’s one of the major tourist draws for Sweet Home.

Settlers first arrived in the Willamette Valley in the early 1850s. In 1893, the City of Sweet Home was incorporated. The Santiam Wagon Road, a toll road connecting the Willamette Valley with central Oregon, was opened in 1865. The road supplied goods from western Oregon to central Oregon, but competition from railroads and the newly opened McKenzie Pass Highway made it obsolete by 1940. That road is now U.S. Route 20, also known as the Santiam Highway.

Sweet Home enjoyed significant growth during the 1940s, fueled by demand for timber from local forests. Further growth occurred when construction began on nearby Green Peter Dam in 1962 and continued as construction began on Foster Dam in 1966.

At an elevation of 537 feet, and a location on the windward side of the Cascade Range, Sweet Home enjoys a temperate, near rainforest climate. That portends greater-than-average rainfall, but a pleasant environment.

The city calls itself the “Gateway to the Santiam Playground.” Sweet Home Public Works employees are dedicated to protecting their idyllic setting, and keeping the water clean is just one facet of those efforts.

"This is a trowel-on product, with great capabilities for bonding to the existing substrate, and it had excellent test data backing up its performance," Lee explains. And since Epoxytec has a distributor in Portland, Sweet Home was able to get small quantities and test kits to do a lot of the initial trials, as well as repairs and touchups, using only in-house staff.

The city uses PVC for open-cut replacement of mains and laterals, but pipe bursting with HDPE is their preferred method for rehabilitation. "We found that if you can burst a pipe with HDPE, it is the best way to go," Valloni says.

Ongoing maintenance

Sweet Home is not a large city, with around 3,200 customers, 8.5 square miles of service area, 64 miles of pipe, and 1,020 manholes. They're currently on a two-year maintenance cycle, and proactively clean and flush their system. Dealing with roots and other blockages is an as-needed priority. FOG is not a huge issue, as Sweet Home has few commercial sources. Valloni describes Sweet Home as "more of a bedroom community."

Ongoing training of employees is also a given. Oregon State Wastewater and Stormwater Collection Certification, confined-space training, and other health and safety programs are required for all city employees. That's an investment in quality the city has been willing to make, and the city's support is a large part of this success story.

Phase 5?

Sweet Home is just now wrapping up Phase 4 of their grand plan. Valloni says there's nothing official on the books yet, but they've already gotten most of the low-hanging fruit. So if there is a Phase 5, future work might best focus on continuing improvements to the treatment plant.

Lee says the city has been monitoring flows during all phases of their program and will continue that process to see what really works. "We'll also be entering into an extensive round of hydrological modeling where we investigate how our system will respond to peak weather events," he says. "That will tell us whether it's better to throw our resources at treatment plant capacity upgrades

"We'll also be entering into an extensive round of hydrological modeling where we investigate how our system will respond to peak weather events. That will tell us whether it's better to throw our resources at treatment plant capacity upgrades or collection system upgrades. We really need to look at the balance there to get the most bang for our buck."

Rob Lee

or collection system upgrades. We really need to look at the balance there to get the most bang for our buck.

"In addition, we'll continue looking for other I&I sources. That means continuing camera inspections and staying involved with controlling inflow sources. We've done some rain gardens and green

streets improvements, but our focus continues to be our deteriorating collection system."

Lessons learned

Significant I&I reductions are proof of the value of Sweet Home's approach to system improvement.

"Starting 10 years ago, the city's Public Works director recognized the need to address this whole I&I issue," says Lee. "Adams has been creative in obtaining funds for this effort, and the City Council has been extremely supportive. They realize this is a process ... you can't do it all in one fell swoop. Dominic and the Engineering and Maintenance Division have been in continuous communication with Sweet Home city managers, and that communication has been invaluable.

"And the city is funding this work the right way. Instead of slapping customers with a 40 percent rate increase in one shot, gradual and consis-



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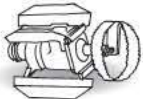
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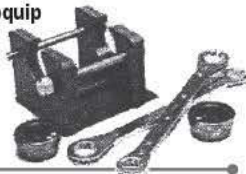
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Dominic Valloni, left, is lowered into a manhole as Doug Latham and Dean LeBret adjust an ultrasonic flow device (Teledyne Isco) and calibrate area velocity.

"Instead of slapping customers with a 40 percent rate increase in one shot, gradual and consistent rate increases compatible with future planning went a long way toward preventing customer backlash."

Rob Lee

tent rate increases compatible with future planning went a long way toward preventing customer backlash."

Valloni notes that the city has spent close to \$17 million over the last decade, which is a huge amount of money for a city its size. "Much of our funding has come through DEQ, and a few federal grants. The rest of it is just good planning and overall support from the city. We need to maintain the mentality that 'we're not done,' and the city has supported us in that respect."

Lee says five years from now, he'd like to see Sweet Home in total compliance with permits, and doing minor tweaks to keep the system in spec. He says the city has already done the bulk of the necessary work, and should be proud of the progress to date.

"One final thing I'd like to emphasize is the importance of knowing your system, whether by monitoring, modeling or inspection," Valloni concludes. "Utilizing that information when planning projects has been critical to our success." ♦

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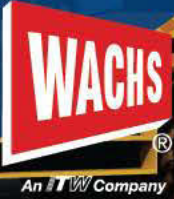
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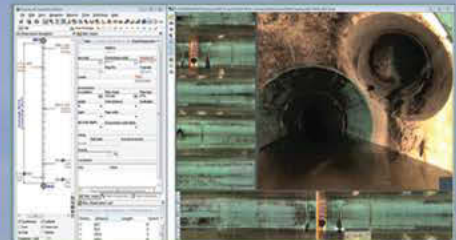
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PUT ON YOUR LISTENING HAT

Effective listening is an important communication tool, but speakers bear some responsibility, too

By Ken Wysocky

An ancient Greek philosopher named Epictetus once observed that we have two ears and one mouth so we can listen twice as much as we talk. Unfortunately, that advice too often falls on deaf ears—which subsequently squelches opportunities for employees’ professional growth and hurts workplace productivity.

“Listening is the most important yet underdeveloped skill for personal and professional success in what I call today’s ‘new normal,’ yet it’s never formally taught,” says Alan Adler, an organizational-performance consultant, business speaker, and the author of *Upstream and Getting the Fish to Swim to YOU and Keeping Them In YOUR Boat* (www.alan-adler.com). To underscore his point, Adler notes that the American Management Association offers more than 300 communication courses, but only two that cover listening skills.

“The only way we can improve our listening skills is to understand the barriers to good listening and how to overcome them,” he continues. “Many people don’t realize that if they’re a good listener, people are more likely to listen to them. And in today’s ‘new normal,’ being a good listener is a great way for people to rise above the clutter and get noticed in a positive way, both personally and professionally.”

So how do we become better listeners? Adler suggests focusing

on the three C’s: concentration, content and collaboration. The first refers to our biggest barrier to listening — staying focused on what someone is saying. The second refers to trying to understand what is being said, and asking questions that show you’ve been listening (as in, “If I understand you correctly, you’re saying that ...”). And the third involves not just listening to support your own understanding, but also being open to other people talking and enabling them to do so, along with asking questions and providing feedback that indicate you’re engaged, Adler notes.

Adler also contends that listening is not necessarily a skill, but a choice. So you need to make a con-

finished. Interrupting someone before they finish speaking is rude and disrespectful.”

To emphasize the point, he points to one of his favorite cartoons, which shows a group of people talking with a caption that reads: “Oh, I’m sorry. I didn’t realize the middle of my sentence was interrupting the beginning of yours.”

Speakers are responsible, too

However, the responsibility is not only on the listener, Adler suggests. The person doing the talking or making a presentation also must bear some of the responsibility for good listening by making their message *more listenable*. “My message is more holistic than just

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satisfy one part of the audience, along with poems, songs and photos to reach the other 70 percent,” he says.

Adler also encourages messages with “more signal and less noise.” In other words, cut down on things like acronyms and jargon that people may not understand, and instead speak in simpler, more easily understood terms.

“Most use acronyms because they think it’s faster or cute,” he points out. “But in reality, if people don’t know what they mean, they instead create their own meaning for it. If someone doesn’t ask what it stands for, they’re likely to miss the point ... yet another reason why we only retain about 5 percent of what’s said. That’s a big problem.”

“Listening is a choice we make every minute of every day. We’re all capable of listening, but it requires a conscious effort.”

Alan Adler

scious decision that when someone talks to you, it’s important enough to warrant your undivided attention. Sounds easy enough, but in reality, it takes effort and discipline.

“Listening is a choice we make every minute of every day,” Adler says. “We’re all capable of listening, but it requires a conscious effort. We have to fight to do away with distractions and assumptions ... and give a speaker time to finish, and wait to pose questions at the end, not before the speaker is

walking away with a list of six things that can make you a better listener,” he notes.

For example, when you make a presentation at a business meeting, Adler says it’s important to keep in mind that in most audiences, about 30 percent of the people are left-brained thinkers, or more analytical and logical, while the rest are right-brained, or more inclined to be creative types.

“So you need to make certain that you have enough charts, facts, graphs and empirical evidence to

Body language is also important, he says. For example, if you talk with your arms folded or put your weight back on one leg, you’re subtly sending non-verbal cues that your message may not be credible.

“People take in subtle cues not only from the volume of what you say and the passion with which you say it, but by your body language,” he says.

How do you know if people are listening to you? Whether you’re talking in a one-on-one conversation or making a presentation, it’s

not rocket science — take your cues from visual clues. Are they avoiding eye contact with you? Glancing down at a cellphone? Showing no facial expression? Interrupting you and presuming to know what you'll say next? Quickly changing the topic when you're finished talking? All of these signals indicate an unengaged person or audience that's not picking up what you're putting down. And if you do the same things while someone else is talking, you're not exactly headed for an A grade in Listening 101, either.

In today's world, listening — and making yourself more listenable — is more challenging than ever. We face an unprecedented number of choices on numerous levels every day; as Adler notes, even something as simple as buying toothpaste these days involves selecting from an incredible array

of options. And the 24/7 bombardment of marketing messages from multiple kinds of platforms, from traditional media to Twitter and Facebook, makes it difficult to focus on listening — or make your message heard above the din.

But with discipline and focus, you can become a better listener and keep the attention of your audience. ♦

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A FREE EXCHANGE OF INFORMATION

WATERiD is aggregating a wealth of industry knowledge for the benefit of sewer and water professionals

By Ted DeBoda, P.E.

We all try to learn from our mistakes, but it is far more efficient to learn from the successes (and failures) of others, particularly when we are charged with making the best use of public funds.

The benefit of networking at conferences, seminars and other meetings is that it fosters an environment of communication and cooperation that helps municipal professionals learn from their counterparts. Associations such as the National Association of Sewer Service Companies, Water Utility Infrastructure Management, and the Water Environment Federation and its local membership organizations, provide these opportunities for sharing information and experiences.

The free exchange of information related to condition assessment, renewal engineering and even management practices is extremely valuable. Case studies can provide an understanding of the use of certain technologies, inspection practices, contracting techniques or even regulatory initiatives that can be applied to other situations in other municipi-

palities. The volume of information exchanged is enormous, but the exchange is limited to those who attend certain presentations within certain conferences. As funding to support attendance at these conferences decreases, so do opportunities to share information.

Ideally, this data could be collected and housed in one warehouse of knowledge that could be accessed and utilized by interested parties throughout the country. This is the goal of WATERiD (Water Infrastructure Database).

WATERiD is the result of the work of Sunil Sinha, an associate professor of civil and environmental engineering at Virginia Tech and a National Science Foundation Career Award recipient in the area of sustainable water infrastructure management systems.

Mr. Sinha attended the 2013 NASSCO annual meeting to share his personal insight into WATERiD. "The database ensures one-stop shopping for the utilities where they can find all the relevant information that will help in expediting the decision-making process for the selection of appropriate condition assessment and

rehabilitation technologies," Sinha said.

WATERiD is structured to help bridge the product and service knowledge gap so the true promise of asset management can be achieved. At present, utility managers and decision makers frequently struggle to gain access to comprehensive, unbiased information about condition assessment, renewal engineering and pipe locating technologies, and especially utility experience with such technologies. Information such as best practices, cost drivers, availability by region, and positive and negative experiences are not typically shared across utilities.

WATERiD is a venue for water and wastewater utilities to share information and knowledge pertaining to the application of pipeline asset management. WATERiD is structured to serve as a continual source of updated industry knowledge in areas including benchmarking, condition assessment, renewal engineering, utility engineering and financial information. All WATERiD content is structured for easy retrieval and is subject to rigorous public peer review.

WATERiD will help drinking water and wastewater utilities of all sizes sustain their targeted level of service.

NASSCO (National Association of Sewer Service Companies) is located at 11521 Cronridge Drive, Suite J, Owings Mills, MD 21117; 410/486-3500; www.nassco.org

In doing so, it will provide the required uniform national standards for water infrastructure systems; establish a centralized platform that utilizes a GIS-driven, Web-based interface; develop and provide access to open-source applications; provide dynamic aggregation and centralized storage of inventory and inspection data from utilities; leverage the centralized data set to calibrate, verify, benchmark and visualize the models and tools for reliable use; provide registered users with secure access to analyze their own utility data; and provide educational and professional outreach for a structured procedure to implement advanced sustainable asset management.

WATERiD aligns with NASSCO's mission to set industry standards for the assessment and rehabilitation of underground infrastructure, and to assure the continued acceptance and growth of trenchless technologies. For more information, visit waterid.org.

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

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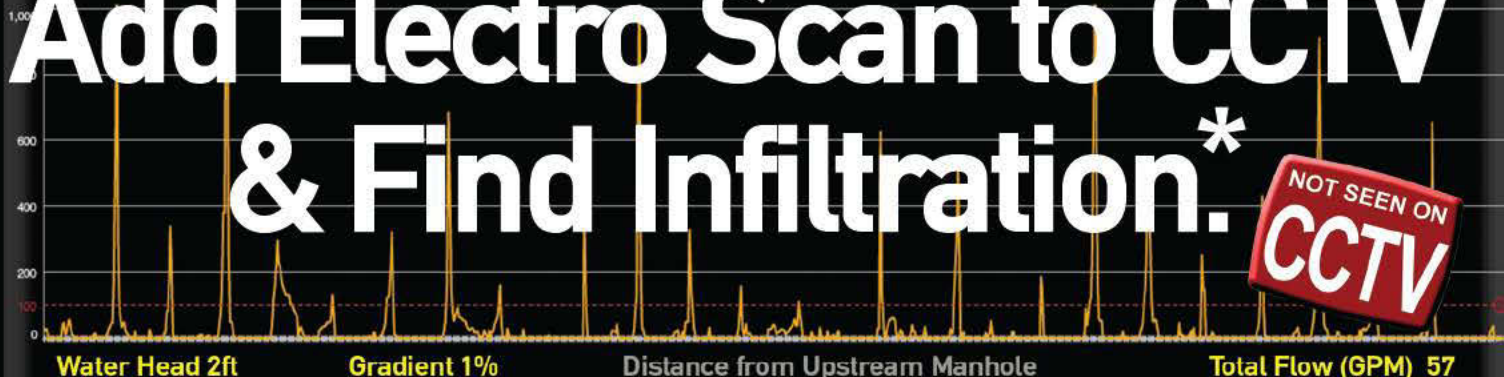
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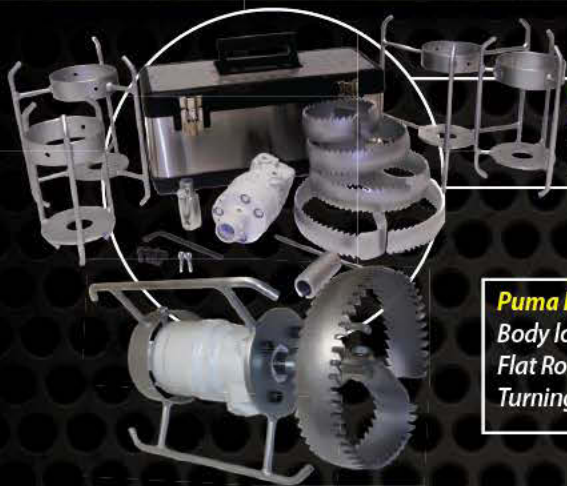
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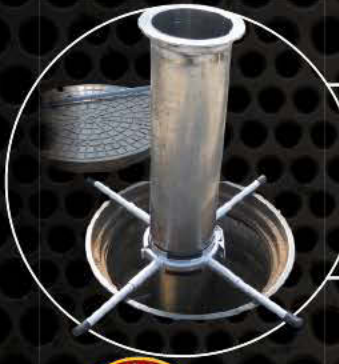
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Puma Hi-Torque Hydraulic Root Cutter kit includes the Hi-Torque low speed motor with 235 ft/lbs. of torque. This Kit includes 4 EZ-Skids, 4 Concave or Flat Root Saws in 6", 8", 10" and 12". Includes Tool Box, Saw hub, Motor Turning Tool, Allen wrench and instructions.

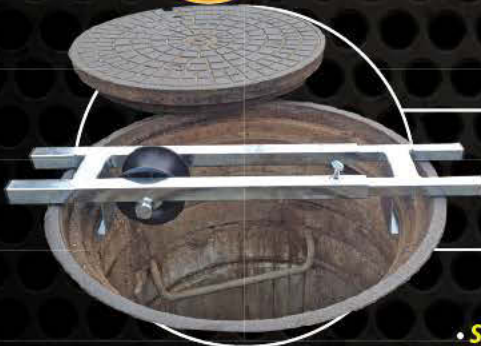
Puma Intelligent Hydraulic Root Cutter kit includes the Our Round Body low speed motor. Kit includes 4 EZ-Skids 4 Concave or Flat Root Saws in 6", 8", 10" and 12". Includes Tool Box, Saw hub, Turning Tool, Allen wrench and instructions.



The "Deep-Vac" Manhole Tube Holder is a "Patent Pending" design that solves a constant and at times, dangerous situation. For manholes, catch basing and Wet wells. Clamp the Deep-Vac around your tube in any location. The tube is then lowered into the manhole and supported by the Deep-Vac's 4 steel extension arms. Keep adding tubes and unclamp the "Deep-Vac" holder and move up and over the next flange connection.



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Adjustable Top Manhole Roller. This top manhole roller is unique in that it has two opposing clamps that grab the manhole ring from underneath. Since the roller is adjustable you can extend to clamps and create a fixed in place roller that won't "flip out". We see this as a safety improvement in addition to a new an innovative top manhole roller.

Southland tools also carries a large inventory of other items including:

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- NOZZLE EXTENSIONS • HYDRO CUTTERS • SPOONS • DEEP-VAC HOLDERS & more!

Denso offers training videos, product gallery

Denso has released petrolatum training videos and an online product gallery. The videos show different methods of applying petrolatum tapes on straight pipes and irregular surfaces. The videos and product gallery can be viewed at www.densona.com.



Harris Utilities SmartWorks names VP of business development

Harris Utilities SmartWorks named Chris Lewis vice president of business development. He will be responsible for expanding MeterSense and CustomerConnect market share and bringing new products to market.

Itron names president, CEO

Itron appointed Philip Mezey president and chief executive officer. He also was named to the board of directors, succeeding LeRoy Nosbaum. Mezey had been president and chief operating officer for Itron's global energy segment. John Holleran was named Itron's executive vice president and chief operating officer for the energy and water segments. He also will serve as interim president of the company's global energy segment.



Philip Mezey

Munden receives ASTM Award of Merit

Wallace J. Munden, former vice president (retired) of Scurlock Industries, received the Award of Merit from the ASTM International Committee C13 on Concrete Pipe for individual contributions to standards activities. He has been a member of the ASTM International Committee C13 since 1994, serving as chairman of Subcommittee C13.07 on Acceptance Specifications and Precast Concrete Box Sections.

Radiodetection hires inside sales support specialist

Radiodetection named Crystal Machado inside sales support specialist at Pearpoint, located in Palm Desert, Calif. She will be responsible for sales and support for inspection equipment, frontline handling of sales inquiries, executing sales strategies, service promotion, development of price and bid quotes, and marketing and trade show coordination.

Plasti-Bond names S-Squire sales representative

Plasti-Bond named S-Squire its product representative for New Mexico. Plasti-Bond supplies PVC-coated galvanized rigid conduit and fittings.

ABEL RECON expands into Ohio

ABEL RECON, part of Abel Companies of Mountville, Pa., expanded its infrastructure rehabilitation services to Ohio. The company is a licensed applicator for Sprayroq spray-applied polyurethane liners and Reline America UV cured-in-place-pipeline products.

Xylem offers Bell & Gossett catalog app

Xylem is offering a Bell & Gossett brand mobile application for iPad, iPhone and Android devices. The app provides access to brochures, submittals, performance curves, drawings, specifications, parts lists, and installation and operation manuals. The free app is available from the iTunes App Store or the Google Play Store.

Chin recognized as outstanding trainer

Suzan Marie Chin, CMO and founder of Creative Raven, was recognized by California Resources and Training (CARAT) as a 2012 Outstanding Trainer in Community Economic Development. Chin was selected from a group of professional technology trainers based on evaluations by small business owners whom she trained. Chin will be presenting "10 Steps to Marketing Success" at the 2013 Pumper & Cleaner Environmental Expo International.



Suzan Marie Chin

Versa-Matic launches pump support app

Versa-Matic launched a mobile application designed to support air-operated double diaphragm (AODD) pumps, enabling users to locate information for a specific pump. The app, available at www.versamatic.com/mobileapps.asp, also provides information on chemical compatibility, as well as access to catalogs, training and service videos.

VAC2GO opens Richmond office

VAC2GO opened a vacuum equipment rental office in Richmond, Va., serving Richmond, Newport News, Norfolk and Washington, D.C. The company's third branch rents Guzzler Classic and ACE vacuum trucks, as well as Vactor combination units, vacuum truck hoses and accessories. ♦

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Product Spotlight

Ultrasonic level and flow sensor offers long-life remote monitoring

By Ed Wodalski



SonicSens 2 from Fluid Conservation Systems

The SonicSens 2 ultrasonic level and flow sensor from Fluid Conservation Systems provides remote monitoring of open channels, combined sewer overflows, storm drains, storage tanks and flood warning systems. The battery-powered sensor is non-contact, non-contaminating and requires little maintenance.

The device measures approximately 6 by 4 by 2 inches and weighs 1 pound. "It can be used in a number of applications," says Griff Machinski, FCS Eastern U.S. sales manager. "It can be installed in manholes or used in weir channels for flow measurements."



The sensor has up to a five-year battery life at a two-minute sample rate and uses self-diagnostics and echo loss alarms to minimize site visits. It can send alerts to 16 phone numbers if predetermined alarm conditions are met and provide dial-in functionality, allowing rapid access to data during an event.

"It connects to any number of data logger options," Machinski says. "The user can go on site to retrieve the data manually or it can be brought in through telemetry." The device can transmit data via SMS or GPRS for immediate analysis.

The sensor mounts above the level to be monitored and emits an ultrasonic acoustic beam to the water surface that is reflected back and detected by the emitting transducer. "It works on an echo effect by measuring the time delay of the sound reflection," Machinski says. "It's easy to mount and has a leveling bubble built in so the ultrasonic beam is correct." 800/531-5465; www.fluidconservation.com.

Xylem open-channel UV system

The WEDECO Duron open-channel ultraviolet disinfection system from Xylem eliminates the need for chemical-based disinfection while reducing energy costs. Designed for midsize to large open channels, the system delivers clean, safe-treated wastewater in a minimal footprint. 704/409-9700; www.xylem.com.



Val-Matic Swing-Flex check valve

The Swing-Flex check valve from Val-Matic Valve & Manufacturing Corp. features a smooth, unrestricted, full-flow design for sludge and slurries and non-slam performance. Valve sizes range from 2 through 48 inches with fusion-bonded epoxy interior and exterior for pressure ranges up to 250 psi. 630/941-7600; www.valmatic.com.



Reed PE electrofusion pipe scraper

The PE scraper from Reed Manufacturing Co. removes dirt and oxidation from the outside diameter of pipe in preparation for the electrofusion process. Features include a non-skid, spring-loaded blade to keep constant pressure on the pipe for a smooth, finished surface. The scraper can be used anywhere along the pipe. A 6-inch clearance is required for turning the scraper around the pipe. 800/666-3691; www.reedmfco.com.



Opto 22 upgraded I/O processors

G4D32EB2-UPG and G4EB2 I/O processors from Opto 22 enable automation professionals to upgrade a legacy mistic or Pamux G4 digital I/O system on a serial network to operate as part of a modern, Ethernet/TCP-based control system without replacing or modifying existing I/O or field wiring. 800/321-6786; www.opto22.com.

Extech remote clamp meter readings app

The EX845 METERLINK industrial app from Extech Instruments enables plant workers who use Extech's EX845 clamp meter to remotely view and display readings from the meter on an Android phone or tablet from 30 feet away. The app is available at the Google Play Store. 603/324-7801; www.extech.com.

Badger electromagnetic flowmeter

The M2000 electromagnetic flowmeter from Badger Meter features an open-flow design that reduces pressure loss and achieves an accuracy rate of ± 0.25 percent. Communication protocols include HART, Modbus, RTU and PROFIBUS DP options. 800/876-3837; www.badgermeter.com.



Watson-Marlow chemical injection pumps

The 520R high-pressure chemical injection metering pump from the Watson-Marlow Pumps Group delivers flows to 55 gph and pressures to 100 psi. The tube element and pump head design enables the unit to be utilized in applications requiring accurate metering, dosing and transferring of harsh chemicals, including sodium hypochlorite, ferric chloride, sodium bisulfate, fluoride, carbon and lime slurries, polymers, aqueous ammonia, potassium permanganate and caustic slurries. 800/282-8823; www.wmpg.com.



Festo scalable water control system

The off-the-shelf modular and scalable water treatment control system from Festo Corp. provides operators with a graphical overview of the treatment process in real time. Graphical animation and touch-sensitive areas on the operator terminal create an intuitive interface. Touching the image of a valve, filter or pump brings up detailed information, including level, pressure, temperature and flow. 800/993-3786; www.festo.com.

Endress+Hauser electromagnetic flowmeter

The Proline Promag L800 battery-powered electromagnetic flowmeter from Endress+Hauser is designed for use in remote water and wastewater sites. It features an integrated GSM/GPRS cellphone system that allows data, such as alarms or totalizer counts, to be transmitted as email. The flowmeter can be configured as a point-to-point connection, or as a modem that can be openly accessed via the Internet or company intranet. A built-in data logger saves information on a 2 GB SD card and can be configured to send emails periodically (daily) with a CVS file attached. 888/363-7377; www.us.endress.com.



FreeWave board version wireless data radio

The FGR2-P board-level version, license-free, long-range wireless data radio from FreeWave Technologies offers industrial serial and Ethernet wireless connectivity. It can be incorporated into the Rockwell Automation family of PLC solutions in the water, wastewater, and oil and gas industries. 800/548-5616; www.freewave.com.

(continued)



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Omega turbine meter with pulse output

The FTB-630 series of turbine meters from Omega Engineering has a non-resettable mechanical totalizer for 2-, 3-, 4-, 6- and 8-inch pipe sizes. Made of cast iron and epoxy-coated, the meters have an optional pulse output and can be equipped with magnetic pulse reed sensors for remote totalizing, pacing of electronic metering pumps and water treatment applications. 800/826-6342; www.omega.com.



Fluid Components flow switch/monitor

The FS10A analyzer flow switch/monitor from Fluid Components International is designed for use with 1/8- to 1/2-inch tubing. Electronics can be integrally mounted or remote-mounted from the sensor element. There are no moving parts to foul or clog and no cavities, orifices or dead-legs to trap or contaminate samples. Applications include liquid or gas analyzer sampling systems with choice of electronic outputs, including open collector, relay and 4-20 mA. Limit alarms are programmable for time delay and/or hysteresis. 800/854-1993; www.fluidcomponents.com.



Ditch Witch vacuum excavator

The 49 hp FX50 vacuum excavator from Ditch Witch is designed for a range of cleanup and soft excavation tasks, including cleaning out sewers and valve boxes, horizontal directional drilling support, removing road construction debris, posthole digging and exposing utilities. The unit can be configured with a choice of four water tanks (80 to 500 gallons), four spoils tanks (300 to 1,200 gallons), hydraulic boom and hydraulic valve exerciser. 800/654-6481; www.ditchwitch.com.



Tamarron adhesive bonds HDPE, poly pipe

Tam Tech adhesive from Tamarron Technology is designed to work with hard-to-bond materials, including HDPE (high-density polyethylene), LDPE, polypropylene, ABS, nylon, Teflon, rubber, TPV and Santoprene. It also bonds to concrete, steel and aluminum. Supplied in dispensable cartridges, the adhesive bonds without heat or flame. 800/277-3207; www.tamarrontechnology.com.

Electric Eel ACE2 pipeline inspection system

The Ecam ACE 2 pipeline inspection system from Electric Eel Mfg. Co. has one-touch USB recording, on-screen footage counter, and wheel kit for easy transportation and maneuverability. Features include 1.68-inch-diameter color camera, 200 feet of Kevlar-braided 1/2-inch-diameter push cable, 512 Hz sonde, 5.4-inch LCD monitor, reel brake and centering skid. 800/833-1212; www.electriceel.com.




McElroy pipe roller

The MegaMc Rollers pipe roller from McElroy Manufacturing is designed for 12-inch IPS to 54-inch O.D. polyethylene pipes. The rollers keep pipe off the ground and aids in the pulling of fused pipe. They are tip-resistant and have a capacity of 9,000 pounds per unit. 918/836-8611; www.mcelroy.com/fusion.

Sure Seal aeration butterfly valves

Two-inch aeration butterfly valves from Sure Seal replace conventional ball valves and eliminate the need for additional components for individual hopper aeration. Weighing 3 pounds, the valves, designed not to gall or freeze up, are made of a lightweight alloy and the seats of FDA-approve silicone. They have a temperature range of -40 to 350 degrees F and maximum operating pressure of 100 psi. 800/382-1604; www.suresealinc.com.






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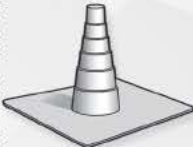
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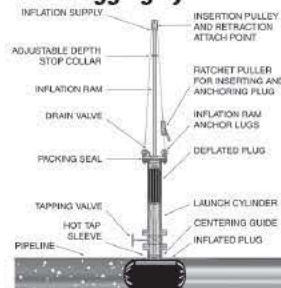
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Inspector Training and Certification:

April 3-4, 2013 - Bend, OR
OZWA, Belinda Rasmussen at (541) 389-6692
or info@ozwa.org

May 10-11, 2013 - San Antonio, TX
Real Estate Training Systems, Brian Murphy
at (817) 861-9998 or rets@rets-llc.com

August 28-29, 2013 - (TBA), Arizona
Univ. Of AZ, Janine Lane at (928) 782-5882
or janinel@cals.arizona.edu

Vacuum Truck Technician:

March 6, 2013 - Ruidoso, NM
N-MOWA - NAWT, Jace Ensor at 575-937-8304
or nmowa.president@gmail.com

Operation and Maintenance Training Certification:

March 1-2, 2013 - Helena, MT
Lewis and Clark County & NAWT
Beth Norberg at (406) 447-8385 or
bnorberg@co.lewis-clark.mt.us

Other CEU's for Recertification:

March 19, 2013 - San Francisco, CA
OSI Basic of Wastewater Analysis
Contact: Evelyn Rosefield at (530) 513-6658
or evelyn@cowa.org

March 20, 2013 - San Francisco, CA
OSI Basic of Wastewater Analysis
Contact: Evelyn Rosefield at (530) 513-6658
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-- Watch the NAWT website and industry publications for updates --

For more information call:
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PEOPLE/AWARDS

Rick Nelson of the CH2M HILL Water Business Group was named a recipient of the WATERiD DUG Award, which recognizes the outstanding individuals who championed and supported the research, development, implementation and population of WATERiD, a water infrastructure database.

Wes Welsh, Public Works director for the village of Lindenhurst (Ill.), received the 2012 Stormwater Manager of the Year Award from the Lake County Stormwater Management Commission.

The **City of Rome's stormwater management program** received a New York State Environmental Excellence Award from the Department of Environmental Conservation.

Harry L. Weed II, superintendent of Public Works for the village of Rockville Centre, N.Y., was appointed by Gov. Andrew Cuomo as a Public Works representative to the NYS Respond Commission, which was established in response to Hurricane Sandy.

Rick Duncan, the executive director of the Delaware Rural Water Association, received the Public Official of the Year Award from the Delaware Chapter of the American Public Works Association.

MSW welcomes your contribution to this listing. Please send notices of new hires, promotions, service milestones, certifications or achievements to editor@mswmag.com.

LEARNING OPPORTUNITIES

American Society of Civil Engineers

The ASCE has these courses:

- March 7-8 – Leadership Development for the Engineer, Chicago



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CALENDAR

Feb. 24-March 8

Water Environment Federation 2013 Water & Wastewater Leadership Center; University of North Carolina Kenan-Flagler Business School, Chapel Hill, N.C. Visit www.wef.org

Feb. 25-28

Pumper & Cleaner Environmental Expo International, Indiana Convention Center, Indianapolis. Call 866/933-2653 or visit www.pumpershow.com.

March 10-13

Water Environment Federation/American Water Works Association Utility Management Conference 2013, Renaissance Phoenix Glendale Hotel & Spa, Phoenix. Visit www.wef.org

April 7-10

American Public Works Association North American Snow Conference, Charlotte Convention Center, Charlotte, N.C. Visit www.apwa.net.

May 13-15

American Public Works Association Sustainability in Public Works Conference, San Diego Sheraton Hotel & Marina, San Diego. Call 800/848-2972 or visit www.apwanet.org.

June 12

American Public Works Association-Washington State Chapter Northwest FOG Forum, Greater Tacoma Convention & Trade Center, Tacoma, Wash. Visit www.apwa-wa.org/chapter.

July 21-24

American Society of Agricultural and Biological Engineers, Kansas City, Mo. Visit www.asabe.org.

Aug. 25-28

American Public Works Association International Public Works Congress & Exposition, McCormick Place, Chicago. Call 816/595-5241 or visit www.apwa.net.

- March 7-8 – NPDES Stormwater Permit Compliance, Pittsburgh
 - March 7-8 – Stormwater BMPs That Work: Effective Analysis, Design and Maintenance, Chicago
 - March 12 – Stormwater BMPs: What Works, What Doesn't and What About Maintenance, online
 - March 14-15 – Financial Management for the Professional Engineer, Secaucus, N.J.
 - March 14-15 – Pumping Systems Design for Civil Engineers, St. Louis, Mo.
- Visit www.asce.org.

American Water Works Association

The AWWA will hold a Financial Management: Cost of Service Rate-Making seminar April 22-24 in San Diego. Visit www.awwa.org.

Wisconsin

The Wisconsin Department of Natural Resources has these courses:

- March 7 – Personal Protective Equipment, Ashwaubenon
 - May 7-9 – Pumps and Motors, Madison
- Visit <http://dnr.wi.gov>.

The University of Wisconsin Department of Engineering-Professional Development has these courses:

- April 8-9 – Using WinSLAMM v. 10: Meeting Urban Stormwater Management Goals, Madison
 - May 1-3 – Using HEC-HMS to Model Watersheds, Madison
 - May 6-8 – Using HEC-RAS to Model Bridges, Culverts and Floodplains, Madison
- Visit <http://epdweb.engr.wisc.edu>. ♦

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