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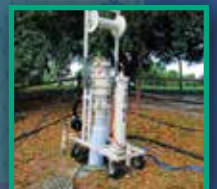
# A TRADITION OF INNOVATION

Novel water-recycling program helps  
California agency protect region's  
most precious resource

PAGE 12

Lead Operator Mike Ewing  
Groundwater Replenishment System  
Orange County Water District

PRODUCT FOCUS:  
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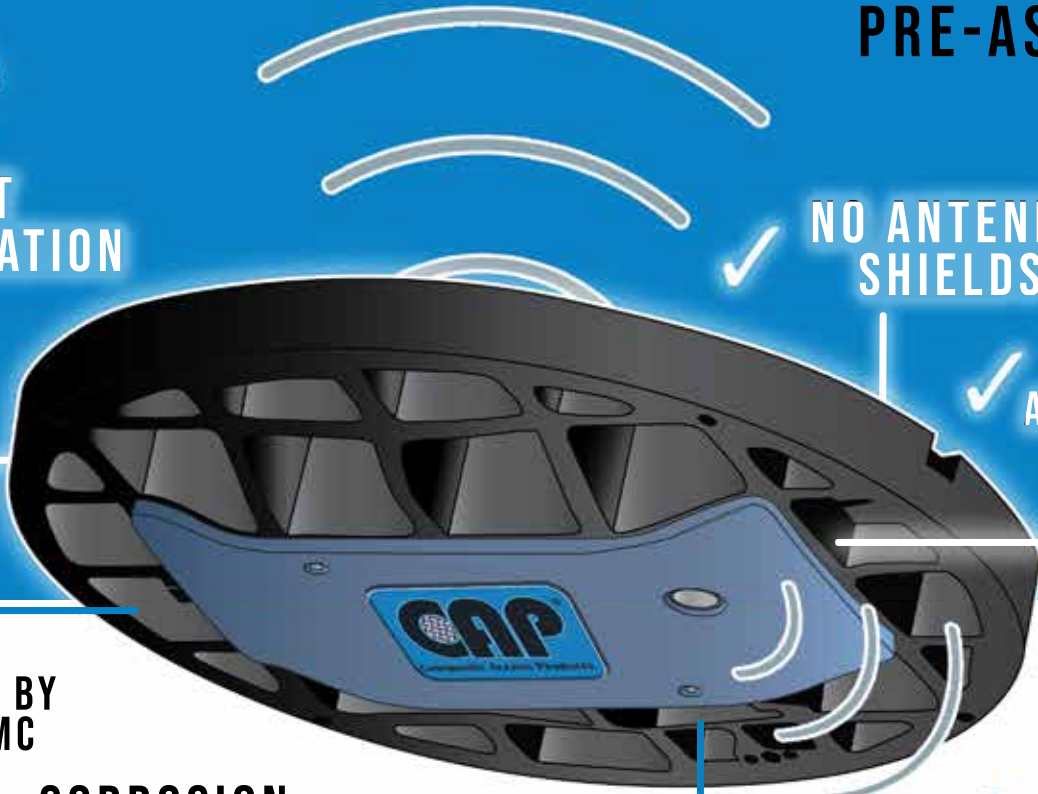


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# USING HDPE RINGS TO Eliminate Manhole Infiltration & Inflow Quickly and Inexpensively

## STUCK IN THE I&I RUT

The number one problem for wastewater collection systems is infiltration and inflow (I&I) and its associated costs.

The degradation of manhole grade adjustment rings contributes to I&I and related significant expenses to a city's public works department due to water system and road damage, high maintenance and wasted capacity on water that should be kept out of the system.

## ITS CAUSES AND ITS COSTS

Over time, manhole grade adjustment rings made from concrete degrade due to freeze and thaw cycles, increased traffic, impact loading and chemical attack, leading to the infiltration of soil and water through the ring interfaces and manhole chimneys. All these forces exert pressure on the manhole to push the concrete riser rings and other components apart, eventually resulting in settlement, cracking of the roadway surface or structural failure of the manhole.

According to 13 years of studies researched by the City of Bryan, Ohio, the largest amount of I&I – up to 60% – enters the sanitary sewer system through cracked manhole chimneys. During a rain event, seepage through a single broken chimney can be as much as 50 gallons of water per minute.

The cost to cities is multi-faceted:

1. Cost to repair or replace damaged manholes and manhole chimneys
2. Cost to repair roadway cracking
3. Cost to repair damage to water system caused by excessive flow caused by I&I
4. Environmental and public health cost and regulatory fines of sanitary sewer overflows (SSOs) that occur when untreated sewage discharges into the environment due to exceeded capacity caused by I&I

*“Jim Fruechtl has told us all along, with the Ladtech rings there is no I&I, no rehab, no deterioration in the pockets and the rings endure freeze thaw. The rings actually do what they say they will do.”*

Tim, the current supervisor in charge of the road construction projects in Apple Valley, MN

## A LONG-TERM SOLUTION

If inflow & infiltration are ongoing problems and existing manhole fixes don't last, a change in approach is necessary. Specifiers of the Ladtech System™ have praised its easy installation, effectiveness at preventing I&I and zero repair work. Learn more by reading about projects in Revere, Massachusetts and Apple Valley, Minnesota.

CITY OF APPLE VALLEY, MN

Tim, the current supervisor in charge of the road construction projects in Apple Valley, MN just reiterated what Mr. Jim Fruechtl a retired Apple Valley City Engineer, has confirmed back in 2011 and even in the last few years when he inspected the existing manholes that were installed in 1998. He states “The beauty of the Ladtech rings is that they indeed prevent I&I and also eliminate reconstruction, which has benefited the city of Apple Valley. Jim Fruechtl was so impressed back in 1998 he connected Dave Hanson, area supervisor for Bonestroo Rosene Anderlik & Associates a consulting and engineering firm in Minnesota. Dave Hanson field tested the Ladtech System™ in two different locations in 1998.

This is what Dave Hanson had to say, “We were concerned about how the rings would hold up during the spring thaw. Because of the success of this evaluation we have specified LADTECH rings in twelve additional residential street projects. “The LADTECH rings last longer and they don't cost any-more and are much quicker and easier to install.” Dave said he was always concerned about the quality control of concrete rings. “We were not able to obtain consistency with installation of concrete rings. Construction companies would use different mortar mixes, sometimes causing deterioration of the concrete. With the LADTECH rings, we eliminate this variable.”



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Luke Laggis

## IN DRY TIMES AND FLOODS

Balancing the ebbs and flows requires a focus on the future

I took a drive Easter Sunday hoping to find a mountain bike trail that had dried out enough to ride. March and early April brought one significant snowstorm after another to Northern Wisconsin. The snowbanks in my driveway were still 6 feet high, but 70 miles south the snow was mostly gone. Trail condition info was scant, so I figured it was worth investigating.

It was wishful thinking and, as it turned out, I would have had to drive about four hours to get on a decent open trail. What I found instead was plenty of soft ground, waterlogged gravel backroads and one trail system that was somehow still open for cross-country skiing.

Water was the theme of the day. Rivers and streams were all high. Every ditch and depression was full from the spring melt — paradise for ducks and geese making their way north, but not so much for mountain bikers.

**We can't predict every weather pattern but we can account for and accept the cycles.**

Out west, many areas are dealing with the spring melt on a far more significant scale. Following the worst drought in centuries, the Sierra Nevada snowpack, which provides 30% of California's water, was among the deepest in decades. As if a prayer were answered from above in the form of rain and snow, the majority of the state's reservoirs are now at or above historic averages.

But even drought relief presents its own challenges. The "atmospheric rivers" that brought record snows to the mountains also dumped heavy rains and caused severe flooding, mudslides and evacuations across areas of lower elevation. Now, as the weather warms (early April as I write this) the melting snowpack is poised to unleash more flooding. For local governments, utilities and citizens, fears of an evaporating water supply have been replaced — at least temporarily — with the urgent need to repair and replace damaged and destroyed infrastructure.

I think it's important to remember that no matter the circumstances, nature will present challenges. And while those challenges at times might seem insurmountable — drought in the western U.S. looked like it could last forever — nature does have cycles, even if they aren't evenly metered. Some changes are permanent, some aren't. But as long as we keep looking forward and focus on meeting tomorrow's challenges, we'll be prepared.

The Orange County (California) Water District, profiled in this issue of *Municipal Sewer & Water*, isn't sitting back and counting on heavy rains to alleviate water supply concerns. Instead, it's looking forward and working to replenish the Orange County Water Basin, a vital resource for the region.

Protecting the 270-square-mile basin is critical because it's the main source of water for roughly 2.5 million residents in Orange County. In fact, the recycled-water program — called the Groundwater Replenishment System — supplies 77% of the county's drinking water, a figure that's expected to rise.

Rivers flood and rivers run dry. We can't predict every weather pattern but we can account for and accept the cycles. And hopefully, if we keep our eyes downriver and continue working to better preserve and protect our resources, we'll be able to smooth out the ebbs and flows.

Enjoy this month's issue. ♦

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



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## WATER MANAGEMENT STRATEGIES

### New Assessment Method

While Californians deal with damage from recent floods — after years of devastating droughts — University of British Columbia-Okanagan engineers are looking at better ways to manage the delivery of safe drinking water to homes. Their new framework is useful for water distributors that can potentially be impacted by climate change and economics. [mswmag.com/featured](https://mswmag.com/featured)



## GREAT LAKES MICROPLASTICS

### Breaking Down the Problem

A big challenge to the health of the Great Lakes takes a tiny form: microplastics. In a study of microplastics on 37 National Park beaches, microfibers were found at every site and made up 97% of the microplastic debris. The highest concentration of microplastics in this national study was found at the Apostle Islands National Seashore in Wisconsin. [mswmag.com/featured](https://mswmag.com/featured)

## OVERHEARD ONLINE

“The vast majority of deadly accidents would be preventable if managers and employees follow some simple tips for safer work sites.”

—*Tips to Avoid the Most Common Safety Mistakes on Job Sites*  
[mswmag.com/featured](https://mswmag.com/featured)

## CONSERVATION ART CONTEST

### Kentucky Students Celebrate Water

Every year a contest for Kentucky students focuses on one of four alternating topics: wildlife, water, soil and forestry. In 1974 Jim Clayhill, the first assistant director of the Division of Conservation and an educator, added an art contest to the competition. Read more about it in this online article.

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# A TRADITION OF INNOVATION

Novel water-recycling program helps California agency protect region's most precious resource

By **Ken Wysocky**

The recently completed \$310 million final phase of a wastewater recycling program is helping the Orange County Water District meet a challenging mission: Keep replenishing the Orange County Water Basin, arguably the region's most valuable natural resource.

Protecting the 270-square-mile basin is critical because it's the main source of water for roughly 2.5 million residents in Orange County, just southeast of Los Angeles. In fact, the recycled-water program — called the Groundwater Replenishment System — supplies 77% of the county's drinking water.

And that figure is expected to rise to 85% this spring due to increased production of recycled water and recent increases in stormwater, says Mike Markus, general manager of the OCWD. The organization is headquartered in Fountain Valley.

Throw in the fact that the semi-arid desert region receives an average of just 13 inches of rain per year — and much less in recent years — and has suffered from drought for decades and it's easy to understand why the GWRS is such a critical component of the district's water portfolio.

"The GWRS is the largest potable recycled water system in the world," Markus says. "It's also nationally and globally recognized for its innovative approach to groundwater management."

"Groundwater costs about half of what imported water costs, so it's very important to provide as much groundwater as we can while still sustainably managing the Orange County basin," he adds. "We don't want to over-pump the groundwater basin, so we have to ensure we have a sufficient supply of water to refill the water basin."

**“We can now can continuously replace about 130 million gallons per day in the basin.”**

**Mike Markus**

"With the third phase of the GWRS in place, we now can continuously replace about 130 million gpd in the basin."

## Collaborative project

The water-recycling system was developed in collaboration with the Orange County Sanitation District. Normally, the OCSD

would safely discharge treated water into the Pacific Ocean. Instead, it's now diverted via gravity feed to a nearby adjacent water treatment plant operated by the water district.

The water then proceeds through a three-step purification process — microfiltration, reverse osmosis and ultraviolet light — that converts it into high-quality, near-distilled water that exceeds state and federal drinking-water requirements.

From there, the water is pumped through a 13-mile-long pipeline to four recharge ponds in the city of Anaheim, where it percolates back into the aquifer. Anaheim was selected as the site for the recharge ponds because of its naturally coarse-grained soil, which is conducive to water percolation.

The first phase of the GWRS, which went online in January 2008 at a cost of \$481 million, produced 70 mgd of high-quality drinking water. In 2015, a second phase — which cost nearly \$143 million — was completed; that increased the system's capacity to 100 mgd.

Roughly \$100 million of the total cost of all three phases was paid with grants. Revenue generated by user fees pays for the balance, funded by municipal bonds.

Over the years, the OCWD has received many visitors from other states and even foreign countries who want to study the replenishment system's operation.

"Our water-recycling program is nationally and internationally recognized," Markus points out. "We've had visitors from South Korea, Japan, England, India and other countries."

In addition, the GWRS has earned more than 80 awards, including the prestigious U.S.



### PROFILE:

**Orange County Water District, Fountain Valley, California**

### SERVICE AREA:

Northern and Central Orange County

### POPULATION SERVED:

about 2.5 million people

### INFRASTRUCTURE:

More than two dozen recharge ponds covering about 1,000 acres; 36 injection wells for seawater barrier; about 10 miles of injection-well pipelines; 13 miles of pipelines for recycled-water program; two inflatable rubber dams

### WASTEWATER TREATMENT CAPACITY:

130 mgd

### MAIN WATER SOURCES:

Recycled water, Colorado River, Santa Ana River, stormwater

### EMPLOYEES:

About 225

### WEBSITE:

[www.ocwd.com](http://www.ocwd.com)



**“Our water-recycling program is nationally and internationally recognized. We’ve had visitors from South Korea, Japan, England, India and other countries.”**

Mike Markus

**Mike Ewing, lead operator of OCWD’s Groundwater Replenishment System in the treatment plant. (Photography by Matt Dayka)**

Water Prize in 2014, the Lee Kuan Yew Prize in 2014, the American Society of Civil Engineers Outstanding Civil Engineering Achievement Award for the most outstanding national engineering project in 2009 and the Stockholm Industry Water Award for the most outstanding international water project in 2008.

### **Going with the flow**

To further understand the importance of the GWRS, it’s helpful to look at how water management has evolved in Orange County, which is adjacent to Los Angeles County.

The basin — which extends from the Pacific Ocean to Yorba Linda (roughly 35 miles southeast of Los Angeles) and holds more than 40 million acre-feet of water — used to naturally recharge itself, primarily via the Santa Ana River, which flows westward from the San Bernadino Mountains and is replenished by rainwater and snowmelt.

But when the county was beset by periodic dry spells and fluctuating water flows from the Santa Ana, the OWCD began importing water, starting with the Colorado River in 1949.

Around 1977, the OCWD added water from the Sacramento-San Joaquin River Delta to its portfolio. Together, the two sources provide 23% of the county’s drinking

Scott Brandon (left) and Frank Valencia (right) troubleshoot a DC drive problem with a threshold inhibitor pump control panel at the Groundwater Replenishment System plant.



## HYDRAULIC DAM PROTECTS AQUIFER

There are a lot of moving pieces in the Orange County Water District's water-management system, which protects and preserves the precious Orange County Water Basin, an aquifer that covers 270 square miles, holds more than 40 million acre-feet of water and supplies around 2.5 million people with drinking water.

One critical component is the Talbert Seawater Intrusion Barrier, which prevents saltwater from the Pacific Ocean from contaminating water in the basin, says Mike Markus, OCWD general manager.

Seawater enters the basin through the so-called Talbert Gap, a geological feature composed of alluvial deposits of sand and gravel, which makes it prone to seawater intrusion. The gap is located near the mouth of the Santa Ana River, another source of the region's drinking water.

This underground "hydraulic dam" is maintained by pumping up to 20 million gpd of water into 104 injection wells clustered at 36 injection sites strategically located in the Talbert Gap, roughly four miles inland from the ocean in Huntington Beach. The water is generated by the OCWD's innovative Groundwater Replenishment System, which converts treated effluent from a local wastewater treatment plant — which is normally discharged into the ocean — into 130 million gpd of high-quality drinking water.

"The injections keep seawater out of the basin," explains Markus. "Via 10 miles of pipelines, we inject water at 30 psi into injection wells on the western end of the basin.

"The ability to do this has a tremendous amount to do with our geology," he continues. "Our basin is like a big bowl and along the coast, the aquifers are a lot thinner — maybe a couple hundred feet thick — so we can inject into them and create a large 'head' of water to keep the seawater in check."

Water in the wells gets tested periodically to measure its salinity.

The saltwater intrusion initially occurred when over-pumping in the 1940s and 1950s eventually caused the aquifer's water level to fall below sea level. That allowed saltwater to intrude into the aquifer up to about 5 miles inland and led to numerous well abandonments, according to published reports.

The seeds for the Talbert barrier were planted in 1965. That's when the OCWD initiated a pilot project that determined a seawater barrier, a concept that had been used successfully elsewhere in southern California, could solve the problem.

The first well was drilled in 1975 and over the years, more wells were added. The wells were injected with treated water from an Orange County wastewater treatment center.

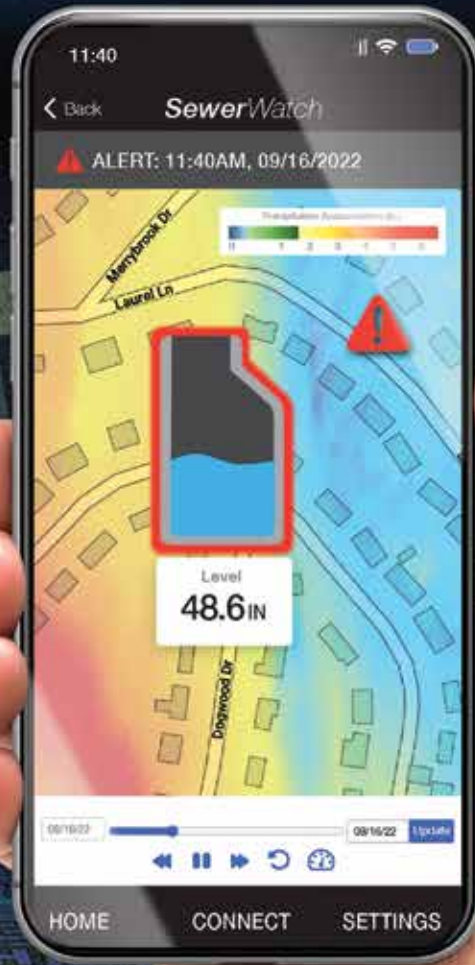
But around 1990, the OCWD determined more wells were needed as groundwater pumping increased. And by 2008, 20 more wells were drilled in key intrusion areas, this time supplied by water from the GWRS.

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**Ray Camacho replaces UV lamps for the Groundwater Replenishment System's Trojan UV Phox UV reactor core.**

water, which is purchased from the Metropolitan Water District of Southern California, a regional water-management organization and water wholesaler.

In turn, the OCWD distributes and sells a blend of imported and recycled water to 19 retail water agencies throughout Orange County.

"They pump the water and serve it through their distribution networks to commercial and residential customers," Markus explains.

### History of innovations

Another key component of the OCWD's water system is roughly two dozen more recharge ponds, in addition to the four in Anaheim that receive recycled water. These recharge basins — essentially small lakes or large ponds that cover more than 1,000 acres and range in depth from 5 to 150 feet — accept water diverted from the Santa Ana, Markus explains.

The system relies on two inflatable rubber dams to direct stormwater flows from a 6-mile stretch of the river owned by the OCWD in Anaheim. The water then is transported to the recharge basins via a complex, computer-controlled network of pipelines, channels, valves, sensors and pumping stations.

"The majority of water going to percolation ponds just sinks into the ground," Markus says.

The OCWD uses monitoring wells to track the level of water in the aquifer.

Another aspect that sets the OCWD apart from similar organizations is its state-of-the-art research and development facility: the Philip L. Anthony Water Quality Laboratory, which opened in 2009 and is named after a late, long-standing member of its board of directors. It now handles more



**Mike Ewing performs a reverse osmosis membrane change using LD Technology's ESPA2-LD.**

than 400,000 analyses of nearly 20,000 water samples a year.

"We're one of the few water agencies that has its own research department that looks for ways to improve processes," Markus explains. "It's a fair statement to say we have a reputation for innovation."

For example, in the mid-1990s, researchers piloted different products from microfiltration and membrane manufacturers to see how the microfiltration, reverse osmosis and ultraviolet-light technologies would work together in the OCWD's water treatment plant for the GWRS.

"At that time, we were one of the first water agencies to utilize membrane technology to take secondary effluent and turn it into near-distilled water," he says. "There's a reason why our slogan used to be 'tradition in innovation.'"

One of the lab's current priorities is determining the best ways to remove PFAS — so-called "forever chemicals" — during water treatment. In fact, the agency's laboratory was the first public-agency



**Rodrigo Ibarra works on pigging the lines at the GWRS plant.**

facility to achieve state certification to test for PFAS in drinking water.

### Poised to face challenges

Between drought conditions, little rainfall, and serving a large, high-density population with limited water resources, the OCWD has its share of challenges. But Markus believes the agency is up to the task, especially with the last phase of GWRS now in place.

"We've remained steadfast in our mission of managing the Orange County groundwater basin and we will continue to do everything we can to protect our current supplies and create locally-controlled, drought-proof sources. Whether it's increasing stormwater capture, enhancing operations, researching innovative technology and science or investing in new infrastructure, it's our responsibility to consider all options." ♦

**"We're one of the few water agencies that has its own research department that looks for ways to improve processes."**

Mike Markus

## OCWD'S WORLD RECORD

In 2018, the innovative Groundwater Replenishment System operated by the Orange County Water District set a Guinness World Records title for the most wastewater recycled to drinking water in 24 hours: 100,000,008 gallons.



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# NEW LIFE FOR OLD BONES

Peoria's ambitious rehab projects bring pump stations up to date and keep wastewater flowing

By Giles Lambertson

At the foot of Grandview Drive, which Teddy Roosevelt famously dubbed “the world’s most beautiful drive,” Greater Peoria Sanitary District engineers are doing something pretty attractive in its own right. They are filling a nearly-75-year-old brick building with 21st-century sewer pumping components to make the Illinois district’s sewer system more efficient and reliable.

The pumping station was constructed in 1949 — more than three decades after the 26th U.S. president made his observation about the scenic drive — and it has served the sanitary system well. However, it was last upgraded about 40 years ago and district officials concluded it was time for a makeover.

“The pumps were getting to the end of their useful life,” says Josh Auxier, the district’s lead engineer on the project. “We could have rebuilt them, putting in new parts here and there. That was one option. We decided to go in with a clean slate and rehab the whole thing.”

The project is about 90% complete. G.A. Rich & Sons is prime contractor.

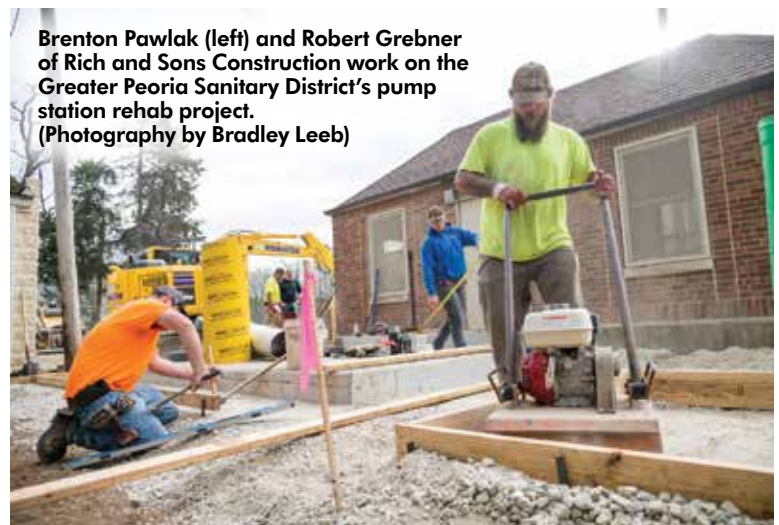
## No simple feat

The Grandview station is not the largest of the district’s 16 pump houses, but it is important. “We have much bigger ones, but the Grandview station is critical because it is fed by two other pump stations on the Illinois River. At times of flooding, they take on a lot of water. So, in addition to being very old, they didn’t have the capacity to pump what we needed to have pumped.”

Transforming the interior of the building into a state-of-the-art pumping station was not as simple as deftly substituting one pump for another. For one thing, the building is small — 12 feet by 28 feet — and the new variable frequency 10-inch self-priming centrifugal drive pumps are much larger than the ones being replaced. “The new VFD pumps are massive by comparison,” Auxier says.

The brick structure originally was built to house two 8-inch pumps. In the 1980s, the two pumps were traded out for three 6-inch pumps. The three-level station has controls on the second level (underground) with the wet well on the level below that. Each level is connected by a stairway.

Because of where the building is situated, razing it and starting from scratch wasn’t feasible, says Auxier, acknowledging “that would have been



Brenton Pawlak (left) and Robert Grebner of Rich and Sons Construction work on the Greater Peoria Sanitary District’s pump station rehab project. (Photography by Bradley Leeb)



Design engineer Josh Auxier makes sure pumps are performing to desired setpoints.



easier.” Fitting the new pumps inside the cramped space was a challenge that he and his engineering team only met using 3D software.

“We brought in a 3D laser scanner and used it to build a full-dimensioned model of the pumps and pump infrastructure and stairs,” the engineer says. “We spent quite a bit of time just determining if it all would fit in there. We did 14 iterations of the model just to get it to fit around the stairs.”

**“Lots of places would have just torn down the building. We salvaged it and kept costs down.”**

Josh Auxier

The new 10-inch VFD controlled pumps are Gorman-Rupp units, which are popular in the district. “We’ve had tremendous success with the Gorman-Rupp pumps. They are some of our favorites. They require very little maintenance and flat-out run.”

The two variable-frequency drive pumps replaced three pumps that were configured to run in parallel. That is, one pump was turned on to handle normal flow, then a second one when flow increased, and the third one at periods of



**PROFILE:**

**Greater Peoria  
Sanitary District**

**SERVICE AREA:**

66 square miles including Peoria, Peoria Heights, Bartonville, West Peoria, Bellevue and unincorporated areas

**CUSTOMERS SERVED:**

140,000

**TREATMENT PLANT:**

Average volume is 25 mgd, capacity is 154 mgd

**WASTEWATER  
INFRASTRUCTURE:**

716 miles of sewer mains, 14,000 manholes

**NUMBER OF  
PUMPING STATIONS:**

16

**EMPLOYEES:**

68

**WEBSITE:**

[www.gpsd.org](http://www.gpsd.org)

Greater Peoria Sanitary District Design Engineer and Project Manager Josh Auxier.



Brenton Pawlak sets concrete forms at the pump station rehab project.

**“We’re working on the bones of a 1929 plant and just keep breathing new life into the old place.”**

**Josh Auxier**



Rich and Sons Site Superintendent Andy Snyder (left) with GPSD design engineer and Project Manager Josh Auxier, Director of Engineering Tim Leach and field inspector Jeff Vogel.

high flow. While that worked, it meant that each of the pumps was run wide open whenever it was in use. It was a simple on-off operation technology with no ability to moderate pump speed.

Whereas the VFD units can fluctuate their operating speed. That not only gives the pumps variability in matching output to flow rates, it lengthens their service life by reducing physical wear on components.

“That 10-inch pump running full bore at 1,450 rpm is like a 100 hp pump, but when it’s run at 925 rpm, it’s the equivalent of a 30 hp pump. We won’t see a huge savings in electricity consumed by the new pumps, but it dramatically increases our flexibility in moving wastewater.”

### Everything new

Transitioning a sanitary system pump station is not a matter of simply taking it offline during the fix. In this case, the fix has taken most of a year — far longer than anticipated — and the community’s wastewater never stopped moving through the system toward the treatment plant.

To keep the waste flowing, the first stage of the project was replacement of an old brick manhole upstream from the pump station with a precast concrete manhole containing a sheer valve that would block flow to the station. The existing force main downstream from the pump station then was uncovered and a bypass line from the new manhole was looped around the station and connected to the main, using portable pumping equipment. The whole Grandview project cost \$1.3 million.

The rehabbed pumping station is computer operated or will be when in full operation. All the systems were upgraded. “Every piece of electrical wiring in the building is new, all auxiliary components of the pumps are new. Everything is new.” To accomplish all that, Auxier says as many as 15 workers were crowded into the small building during the height of the overhaul.

The district’s engineering staff and maintenance crews learned a lot in the course of revamping the old station — and will put it all to good use when they undertake the identical rehabilitation of a station upstream from the Grandview building. Once again, a 3D laser scanner will produce a model to guide the work, but this time Auxier and his team will bring the Grandview building experience to the task.

Greater Peoria Sanitary District has 16 pumping stations. All are to be overhauled eventually to some extent. The general goal is to make them more efficient and reliable. “Sometimes ‘reliable’ means extra capacity. Sometimes it means backup power,” Auxier says.

Station overhauls, including insertion of VFD controlled pumps

## MORE THAN MEETS THE EYE

Josh Auxier (pronounced awk-sure) is lead engineer at Greater Peoria Sanitary District. He began working with the district four years ago after 12 years as a consulting engineer. The 38-year-old professional — P.E., LEED AP — is in his element in Peoria in more ways than one.

For one thing, he is teaching. As a student, he started working on a degree in physics at Illinois State in Normal, Illinois, eventually transferring to civil engineering and finishing up his degree work at Bradley University in Peoria. Now, when he is not solving sanitary district issues, he sometimes can be found back at his alma mater teaching senior-year engineering students. “It’s been fun going back and teaching.”

On the job, Auxier demonstrates current knowledge of engineering best practices. He has the sanitary district surveying tasks from the air using an unmanned aerial vehicle — a drone, if you will — and the rehabbing of a pair of pumping stations was only possible because he and his team of engineers utilized 3D laser scanning technology to build a visual model.

“We wouldn’t have been able to do that even 20 years ago,” Auxier says, noting that the 3D technology only became popular in construction settings as recently as 2010. The modeling let the sanitary district’s engineers retrofit a small pumping station with state-of-the-art pumps. “It allowed us to take a little pumping station and make it act like a big pumping station.”

The technology almost makes the work look easy. Because everything was retrofit into the old building, Auxier says the district’s customers will likely never recognize the transformation of the old pump station and appreciate all the engineering involved.

“That’s the story of water and wastewater work.”



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Corey Little feeds jetter hose into a sewer line during a cleaning and inspection project.

and incorporating modern controls, are a trend in the industry as utilities strive to become more and more efficient. Yet this Peoria project was different, too. “Lots of places would have just torn down the building. We salvaged it and kept costs down. We tackled the job in a way that was economically efficient, using 3D design technology. The way we approached it might lead the industry.”

### Progressive maintenance

The sanitary district serves a broad area and includes quite a variety of customers, from a Komatsu machinery manufacturing plant to the campus of Bradley University to homeowners. About 70% of wastewater sent to the system’s treatment plant is industrial or commercial. One reason why is a BioUrja corn-processing plant that produces ethanol and alcohol products. Auxier says the plant is a big component in the district’s wastewater.

“All the wastewater is treated the same, but our treatment plant is designed around the load we get. We have a larger ammonia load than some systems because of the industrial effluent, so we are geared up to handle the higher loads.” Average flow into the treatment plant is 25 mgd, but its capacity is 154 mgd.

The district’s pipe infrastructure is “fairly old,” Auxier says, probably averaging 50-plus years, “but we do a lot of in-place rehab work with lining. We have an annual contract for in situ lining.” The bulk of the pipe is 8- to 10-inch stock, which carries wastewater to a pair of 84-inch interceptor lines.

Maintaining the district’s lines largely falls to a full-time cleaning crew that keeps tabs on the infrastructure with video inspection cameras and hydro-vac trucks. The crew performs light repair tasks, but major leaks or pipe replacement jobs are contracted out. A Peoria firm, JC Dillon Inc., has won the annual repair contract for several years.

Auxier says the district tries to be progressive in its oversight and maintenance of the sewer system. He cites the use of drones to survey projects from the air. “We try to be cutting edge in our work. We try to put all the pieces together to get a good result and do it while being light on the manpower. We want to be good stewards of the money that comes to us.”

The next big project is an overhaul of the system’s treatment plant, a \$30 million upgrade. Construction on the plant began in 1927 — nearly a hundred years ago — but the facility is continually rehabbed. “We’re working on the bones of a 1929 plant and just keep breathing new life into the old place.”

The first phase of the work will be reinforcing levees that protect the plant from Illinois River waters flowing right next to it. “That’s my next big project,” Auxier says. “We’ve had three major floods in the last 10 years and there is a quarter-billion-dollar facility sitting inside that levee. It’s a huge thing we’re looking at.” ♦

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# REDUCING BURSTS AND LEAKS

Continuous pressure monitoring helps detect transients and improve system resilience

By Mark Hendy

Evides is a water company that delivers 3.6 billion liters of water per week to 2.5 million customers in the southwest area of the Netherlands. This includes the large port city of Rotterdam, a city of about 650,000 people. In the Hoeksche Waard, south of Rotterdam, Evides was experiencing frequent pressure variations, resulting in a high rate of nonrevenue water and significant repair expenses. To investigate and determine the causes, they worked with Syrinix to deploy a series of PIPEMINDER-ONE pressure monitors throughout the district's metered area.

## Detecting transients

Hydraulic transients are pressure surges in fluid transmission lines caused by sudden changes in pipeline and pumping system flow rates. In most cases, transients are traced to a problem involving a pump station or customer behavior. Transients can exert enough pressure to exceed the capacity of the pipe and cause a burst, so tracking transients in real time provides the opportunity to take immediate action to calm the network. In this way, water system managers can drastically reduce breaches, save money on water loss and repair costs, and build a more reliable and resilient network.

Pressure and acoustic monitoring are the foundation of transient and leak detection as well as prevention of non-revenue water and service outages. PIPEMINDER-ONE from Syrinix is a small pressure monitor that utilizes a highly precise 20 bar pressure sensor sampling at 128 times a second, alongside precision network timestamping, that fits into a hydrant or chamber and collects data that can be analyzed in real time to predict a transient or locate a burst.

The pressure monitors and their corresponding software generate instant text and email alerts as well as alarm exports to operational platforms. These alerts and alarms inform operators of critical events like pressure valves going above or below desired limits. RADAR, Syrinix's secure, cloud-based data analytics platform, automatically tracks the source location of bursts and major pressure events.

Minor but more frequent transient "noise" can, over time, cause significant wear and tear on pipes and other assets. High-resolution monitoring can often mitigate this behavior quickly and inexpensively, averting larger transients and improving the overall network health. If a burst does occur, the technology already has the historical data that helps locate the burst quickly, to minimize water loss and system downtime.

Triangulation algorithms make use of multiple devices on a network to locate the source of irregular behavior in the network. Due to the high sample rate and analytics platform, a system problem can quickly be located and addressed.

Using proactive tools, the Syrinix system provides burst alerts, transient event detection, operational and maintenance alarms and support for integrating flow, water quality, SCADA and other third-party data.

## Identifying problem areas

In Rotterdam, the first phase included 21 devices, which were spread out across the municipality's water system in March 2022 to detect the system transients that were causing leaks and bursts. In June, system operators spotted irregular transient activity in an area of the service district. Evides used data from the pressure

## BETTER MOUSETRAPS

### PROBLEM:

Frequent water system pressure variations resulting in a high rate of nonrevenue water and significant repair expenses.

### SOLUTION:

Tracking hydraulic transients in real time, allowing crews to take immediate action when problems arise.

### EQUIPMENT:

Syrinix PIPEMINDER-ONE pressure monitors

## Minor but more frequent transient "noise" can, over time, cause significant wear and tear on pipes and other assets.

monitors and analytics from RADAR to automatically analyze data from multiple sensors to determine the exact onset of the pressure wave at each monitor. These onsets were then grouped together into an event, and the event source location was calculated using Syrinix's triangulation algorithm.

In the Hoeksche Waard, RADAR triangulated the source of the transients to a fire station. Further investigation revealed that when filling their fire truck water tanks during weekly Thursday night practice sessions, station personnel were closing the ball valve in the fire truck and opening their hydrant too quickly, which resulted in a major pressure drop and subsequent disturbance throughout the system. The same activity was also occurring on Monday and Tuesday nights, which happened to coincide with practice sessions for the youth fire department.

## Outreach and education

The problem was solved by a visit from Evides, during which the company representatives showed fire station personnel the RADAR dashboard and demonstrated how opening the hydrant too quickly was causing the transient. They then instructed them on how to gradually open the hydrant when filling their tanks to avoid causing a transient in the future.

With this transient issue resolved, Evides continues to distribute pressure monitors to other places in the service area to check for problematic activity, calm their system and ultimately reduce bursts and leaks. Insights from the PIPEMINDER-ONE devices, along with smart, actionable alarms, empower Evides to enhance, mitigate and innovate to extend asset life and minimize adverse impact on customers.

## Better resilience

The resilience of the underground water infrastructure and water conservation are two key elements of Evides' environmental strategy. By keeping tabs on system pressure and minimizing transients, Evides is helping to prolong the life of the water distribution network and avoid bursts and leaks. This is one way the utility is supporting its commitment to the environment and future-proofing its water supply in the Netherlands, a coastal nation with a long history of learning how to optimize its relationship with water, where both the public and private sectors have prioritized water resiliency.

"In short, thanks to the Syrinix devices, we found the main source of the transients in our system, explained what was causing them and have significantly reduced the number of transients in our network," says Evides reliability engineer Niek Bossers. ♦

*Mark Hendy is the vice president of business development for Syrinix, EMEA.*





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# STATUS CHECK

Determining who exerts influence and commands respect is key to creating great teams

By Ken Wysocky

Few things will doom a project faster than poor leadership. Without a respected captain at the helm, teams can easily be riven by friction over decision-making authority, assignment of tasks and responsibilities, perceptions of who is or isn't pulling their weight and who gets credit for success — or blamed for failure.

But picking great team leaders can be a somewhat arbitrary and nebulous process — more art than science. Sure, managers can use metrics like seniority, experience and levels of technical expertise as criteria, but none of those guarantee how effectively people work together as a team.

Worse yet, there's no tried-and-true litmus test or key personality traits that can help managers predict how people will collaborate and work together.

So how are managers supposed to divine who's a great leader and who's not? New research shows there actually is a key trait managers can hone in on — something researchers call status intelligence.

"Status intelligence is the ability to look at social interactions and perceive them accurately," says Gavin Kilduff, an associate professor of management and organizations at New York University's Leonard N. Stern School of Business. He participated in a study led by Siyu Yu, an assistant professor of management and organizational behavior at the Jones Graduate School of Business at Rice University.

"More specifically, it focuses on the extent to which people can detect status hierarchy in groups — how much influence, esteem and respect each individual on a team commands," he explains.

This includes observing positives, such as which employees team members look to for approval or listen to the most, and negatives, like which employee suggest ideas that are consistently passed over or who constantly interrupt colleagues, Kilduff says.

## Measuring status

To determine status intelligence, Kilduff and his colleagues developed a 10-minute test. The first step involved bringing in groups of four people at a time to a lab and directing them to work on a business project. The groups were filmed while they worked and were not told how to act, so their behaviors were natural and organic, replete with interruptions and ego clashes.

At the end of each session, the team members were asked to grade their colleagues on things like how much respect and admiration they garnered from other team members and who exerted the most influence on processes.

Researchers then edited down the 45-minute videos into nine 1- to 2-minute long clips and showed them to a new set of workers. They each were asked to rate the meeting participants in the same way the actual participants graded each other, with an eye toward who they thought had the most status and influence, Kilduff says.

Researchers then compared the test-takers' answers to the actual test-participants' answers. Those whose ratings best matched the participants' ratings prob-

ably will work well with others, Kilduff says.

"People who can accurately determine the status hierarchy of those teams are more likely to be good team players," he explains. "The better they can interpret what's going on in those groups in terms of status hierarchies, the better they'll be at working in groups."

## Finding great team players

The test is not commercially available, but it might be in the future.

"We'd like to help make the workplace function a little more smoothly as a result of our research," Kilduff says.

But absent such a test, there still are ways for managers to determine which employees will play well with each other. For example, they could perform a survey to determine which employees are most respected and admired by their co-workers, then distribute that information as a guide for colleagues. This information could even be provided to new employees so they know which co-workers might be the best ones to network or mentor with, ask for advice or help them get good proposals green-lighted, Kilduff says.

"If you want to implement an idea, you want to pitch it to the people with enough say and influence to get it done," Kilduff says.

**"If you want to implement an idea, you want to pitch it to the people with enough say and influence to get it done."**

Gavin Kilduff

## Provide hierarchy context

It also helps to have open and explicit conversations that point out everyone's relative strengths and areas of expertise, as well as acknowledge that some individuals will exert more influence over certain decisions than others. This can help teams reduce potential for status conflict because everyone knows where they stand.

"It can be very beneficial to have an open conversation about a task at hand and discuss what each team member brings to the table in terms of task-relevant expertise," he says. "This can clarify which employees could be influential in what domains and reduce disagreements about decision-making.

"If you don't provide this kind of context, it's easier for someone who speaks loudly and with great authority — but really isn't a good team player — to become a leader."

Kilduff concedes this can be a tough conversation to have with employees. But if it's handled carefully, with a focus on backgrounds and work experience, it can be successful.

Wouldn't it just be better and easier to let status hierarchies emerge organically? Not necessarily, he says, pointing out that the absence of any knowledge about status just creates more potential for status conflict.

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

## THE HUMAN SIDE

### Status awareness is good

Of course, this approach runs counter to many current workplace dynamics where status is downplayed, if not outright eliminated through elimination of titles, for example. Kilduff points out that this is a recipe for poor team performance because it decreases everyone's status intelligence.

"If organizations try to ignore status and say it's bad and that no one should have it, it creates more confusion than good," he explains, noting that it's difficult for employees to pretend that an employee with decades of experience is on the same plane as a new employee.

Looking ahead, Kilduff is excited about the prospects of bringing the status intelligence test to market.

"Our research has identified a whole new human ability," he says. "Before this, there really wasn't any examination of how well people work in groups or how facile they are in group interactions.

"Once we get this test out there and coach people about how to use it, we think it could be a powerful tool for improving workplace interactions and productivity." ♦

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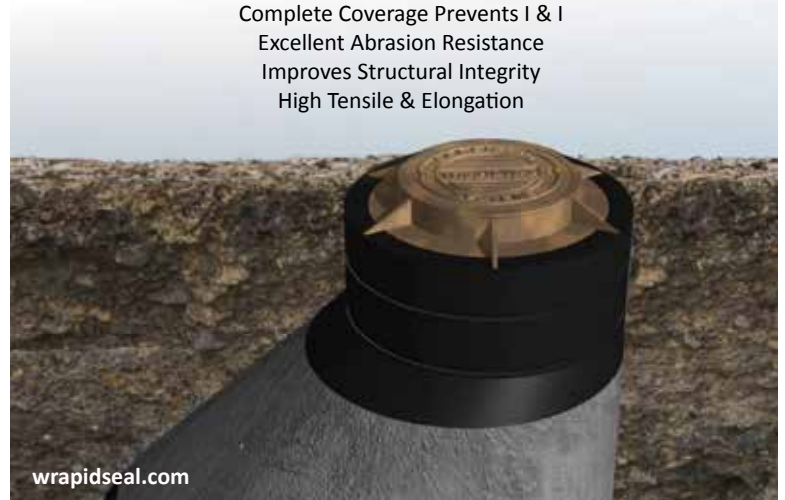


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# DATA LOGGING 101

Improve data collection accuracy and boost overall efficiency

By Terry Nagy

**D**o you need a way to capture important information such as flow rates or levels but don't know how to get started? This brief overview will help guide you through the basics of data loggers and how they can simplify data collection for your organization.

A data logger is an electronic device designed to measure and store data values, often independently of a PC. Nowadays most data loggers are compact and relatively inexpensive. Data loggers may be single input devices or may accept inputs from multiple types of sensors. Some loggers have built-in sensors and others have connections for external sensors. Data loggers have internal memory, a real-time clock for time/date stamps, and may have an LCD display. A datalogger typically has an internal battery and records at a once-per-second or slower sample rate with internal memory for thousands or millions of readings.

A device like a simple temperature and humidity data logger may be located at the point of interest for the measurement and retrieved at a later date to unload the data using a USB connection. More sophisticated data loggers have Ethernet, Wi-Fi or even a cellular modem that allows for real-time monitoring and alerting for out-of-tolerance (alarm) conditions. This feature will let you take immediate action to out-of-limit conditions instead of just collecting or logging the data. With network-connected data loggers, fully automated data transfer to network drives or even cloud-based applications provides labor savings and convenience. Data loggers are much more reliable and accurate than manual measurements and free up labor for other duties.

## Advantages of a data logger

Because of their accuracy and reliability, data loggers save personnel the time otherwise spent reading and recording measurements on paper. Whether you have a short- or long-term problem to solve, they give you an automated solution for both monitoring and recording information.

Data loggers can even transmit alarms via email or text messages, or trigger phone calls. This feature is important if you need to be alerted on an operationally critical piece of equipment, process or environment going out of tolerance. This can help you to avoid potentially disastrous situations.

Data loggers can also operate in a standalone format by themselves without human interaction. Running on battery power, they can be used over long periods of time in critical applications. They'll operate 24/7 including weekends, holidays and outside of work hours when no person is available for the task. Data loggers are also used for more complex tasks such as recording multiple sensor data

## This can help you to avoid potentially disastrous situations.

from machines for diagnostic purposes or to identify areas for energy savings.

There are a wide variety of devices on

the market with internal or external sensors to measure the data you need. Also, for some applications, it is important to know the measurement accuracy that is required.

While some data logger models are designed to log just one measurement value such as temperature, there are models recording two, three or more types of data.

## Easy data retrieval

Typically, data loggers save their measurements to a memory card or other internal memory for convenient retrieval. More advanced models transfer the data automatically over your choice of communications.

These include but are not limited to:

- Ethernet
- USB
- Wi-Fi
- Cellular modem
- Proprietary wireless
- Bluetooth

## Setting alarms

Today's technology gives you several choices of how you'd prefer to receive alarms. For example, alarm notifications can consist of anything from bright LED indicators and loud audible alerts to data loggers with external alarm outputs for connection to sirens, lights, etc.

More advanced models can automatically send you an email or text alarm to your smartphone or tablet, ensuring that you're always notified of critical changes in your system or process. Alarm setup and other configuration details are handled using software provided by the data logger.

Data loggers that offer changeable settings typically use Windows-based software to handle setup and configuration. Simply connect your data logger to a PC, follow the simple configuration wizard, and pick your recording rate and start time — all this normally just takes a few mouse clicks.

The latest generation of data loggers provides simple connectivity to cloud-based applications to view and store data. Simply configure the logger to connect to your network, Ethernet or Wi-Fi, open

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a web browser to access your cloud account, and get your data. You can be up and running in just a few minutes. Being designed for simple operation, many compact data loggers require minimal to no maintenance or IT department involvement. That makes them ideal for use in nearly every industry and application.

## Finding the right fit

When searching online for the right data logger, you want to be confident that the device itself can perform the functions you need for your particular application.

It is important to work with a vendor that knows the right questions to ask to make sure that the product you end up with fits your needs.

This includes (but is not limited to) the right number of channels/inputs to cover all your monitoring points, communication options and software features. For example, if you need alarming capabilities or a trend chart for data or if you need to comply with some special regulatory or calibration requirements, make sure you specify this when speaking with a solutions provider.

You'll find lots of data logger manufacturers and distributors online, so make sure you consult with an experienced distributor. While data loggers are easy to use, you won't get stuck if there's a free technical support number you can call if you run into a problem, especially if you're a first-time user. ♦

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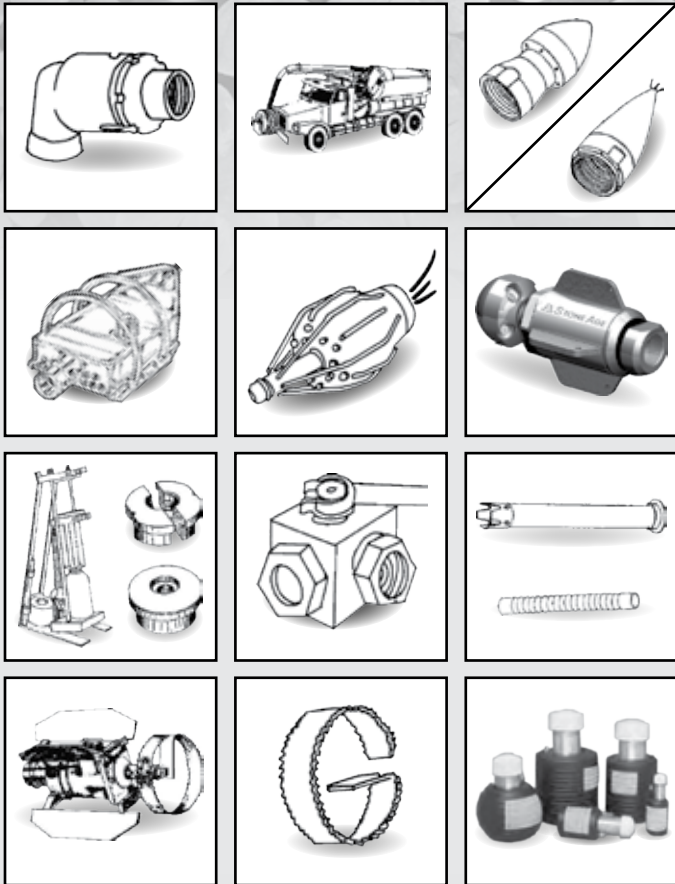
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## STAYING SAFE

# UNDERSTANDING THE RISK

Planning and proper precautions can reduce the threat of confined-space entry

By **Ronnie Freeman**

**W**ithout looking it up can you name the three parts of the OSHA definition for a confined space? If not, that lack of knowledge can be the first common hazard of a confined space.

Many employees who enter a confined space may not realize how valuable it is to know that vital definition before entering a confined space. What about a permit-required confined space? Can you say what makes a confined space a permit-required confined space? If not, read on.

The OSHA definition of a confined space is a space that has limited or restricted means of entry, is not designed for continuous occupancy, and is large enough and configured so that a person can enter the space and maneuver well enough to perform tasks. The OSHA definition of a permit-required confined space is one that has the potential to expose personnel to hazards that require controls to prevent injury or death. With that understanding of the definitions of a confined space and a permit-required confined space let's talk about some of the common hazards that employees face when entering confined spaces.

### One of the more deadly hazards is lack of oxygen in a confined space.

One of the more deadly hazards is lack of oxygen in a confined space. Any level below 19.5% is considered dangerous and as the levels continue to drop the danger increases and death can occur in minutes if the oxygen levels are low enough. Common causes of low oxygen levels include hot work like welding or grinding, the oxidation process and bacteria. Exposure to levels at 12% or lower will bring about unconsciousness without warning and so quickly that the employee will not be able to protect themselves or escape.

While low oxygen levels are bad enough, high oxygen levels can create a different problem altogether. Oxygen levels above 23.5% can create an explosive atmosphere that can ignite with just a spark from a metal tool on metal.

You can have issues with toxic atmospheres as well. These atmospheres are dangerous because of either the product stored in the confined space or the work being performed while in the confined space. Methane, hydrogen sulfide, and carbon monoxide are just a few of the more well-known gases that can create very hazardous atmospheres.

Atmospheric hazards can be dangerous and, in some cases, deadly, but they are the only hazards of confined spaces. You still have to pay attention to the common physical hazards such as energized sources like electricity (failing to lockout/tagout), falling into a confined space or objects that fall into a confined space that could strike the employee, engulfment and drowning, and slick and wet surfaces that create slip hazards. Noisy environments, temperature extremes and weather can create hazards as well.

These common confined-space hazards can lead to serious injuries or even death. The good news is that adhering to a proper written confined-space program can eliminate most of the hazards and provide protection methods for employees who must enter confined spaces. ♦



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Sheila Joy is executive director of NASSCO. She can be reached at [director@nassco.org](mailto:director@nassco.org).

# THE ROLE OF ARTIFICIAL INTELLIGENCE

NASSCO is actively providing leadership in the evolution of sewer inspection

By *Sheila Joy*

Artificial intelligence is the theory and development of computer systems that can perform tasks that normally require human intelligence (such as an operator coding pipe defects), visual perception, speech recognition, decision-making and translation between languages.

AI techniques lend themselves to solving complex problems involving large volumes of data. Data, by virtue of its magnitude, can challenge problem-solving initiatives. Data, regardless of size or level of complexity, require organization to promote clarity and consistency to make informed decisions. With an estimated 800,000 miles of wastewater sewers and 500,000 miles of lateral sewers in the U.S. alone, pipe inspections and the ability to perform condition assessments have become an attractive candidate for AI processes.

As it relates to condition assessments, the success of AI in sewers requires machine learning, automated defect recognition and advance analytical processes. Machine learning is an algorithmic process that helps software improve, like humans do, through iterative trial-and-error experiences using mass amounts of training data (such as photographs or video of known defects/features), to make better decisions or choices. Automated defect recognition is the software output that uses ML techniques, to progressively identify defects “observed” within individual images of video, and to advance analytical processes are the broad spectrum of processes uniquely focused on the analysis and leveraging of information in large data compilations. In sewer networks, this can embrace a wide range of studies from deterioration analysis of specific cohorts or eras of pipes, sustainable funding assessments and optimization techniques, among others.

## The present advantage of AI for CCTV pipe inspection is its efficiency to code large volumes of legacy and new inspection data in a cost-efficient manner.

NASSCO recognizes the use and growth of AI and machine learning within the sewer inspection and rehabilitation industry and is actively providing leadership on the subject, including the development of a workgroup and collaboration with software and hardware developers. Presently, there are no AI systems that NASSCO has certified for recognizing every PACP/LACP/MACP observation. End users may not need this level of functionality, however, if the observations that are recognized and captured are consistent with their individual goals for CCTV inspection. Regardless, the present advantage of AI for CCTV pipe inspection is its efficiency to code large volumes of legacy and new inspection data in a cost-efficient manner that is consistent with the quality standards per the “Guidelines for Quality Control of NASSCO’s PACP, LACP and MACP Surveys,” April 2022. The NASSCO AI workgroup additionally recognizes the following uses for AI-collected inspection data:

- Training aid to supplement and improve PACP coding for novice inspection personnel or operators becoming familiar with code classification for pipe types that they do not have experience coding.
- Improved workflows whereby an AI algorithm is used as first inspection followed by manual operator checks to correct missing or inaccurately coded defects/features.
- Quick coding of legacy inspection video for benchmarking purposes
- Cross-bore identification
- Embedment of NASSCO QC guidelines for automated quality validation

As the market evolves, NASSCO’s Software Committee, Infrastructure Condition Assessment Committee, Technical Advisory Council and other industry professionals will determine the best approach for assessing and rating ADR software products and their level of accuracy as they pertain to NASSCO’s PACP, LACP and MACP codes. While that process has not yet been defined, NASSCO will ensure that it presents a fair picture of AI/ADR technological capabilities and how they are applied in the field, knowing that it will evolve as the technology becomes more developed, advanced and accepted in the future.

NASSCO is committed to providing similar written updates on the subject to inform the industry, our users, and our membership on the advancement of AI in the PACP-environment. Later this year, watch for the release of PACP Version 8.0, which will incorporate current AI knowledge to support our students’ understanding of this topic.

To learn more, download NASSCO’s entire position document on AI technology at [www.nassco.org](http://www.nassco.org). ♦

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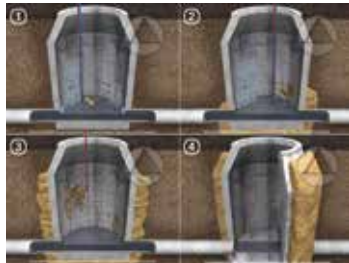


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grade fiberglass, providing a consistent cross-sectional area with very high-flow capacity for the most efficient conveyance through the manhole.

800-508-6001; [www.reliner.com](http://www.reliner.com)

### USB-USA Spin-Jet

The Spin-Jet from USB-USA is a self-centering, controlled rotating nozzle that is used for cleaning lift stations, barrels and manholes prior to rehabilitation. Available in two different versions, it has driving nozzles that rotate in a 360-degree horizontal plane only. This action eliminates the need to cover the manhole during operation, allowing for constant viewing of the cleaning process. Front jets thoroughly clean any grease, sludge or mud at the bottom. 844-285-5770; [www.usb-usa.com](http://www.usb-usa.com)



### Riser

#### EJ INFRA-RISER

The INFRA-RISER rubber composite adjustment riser from EJ is a simple, efficient, long-lasting solution for manhole structure damage problems. Concentrated loads in high-stress areas cause structure failure and infiltration points. The dampening and compression properties of the adjustment riser help dissipate traffic vibrations and evenly distribute loads over the entire supporting structure. When installed according to guidelines, the INFRA-RISER creates a virtual tight seal between the manhole chimney structure and the manhole or catch basin frame. Infiltration prevention and dampening of the traffic loads help maximize the performance and extend the lifetime of infrastructures, while achieving significant cost savings. These adjustment risers are available in standard and custom shapes for a variety of applications and are made from 92% recycled materials.

800-626-4653; [www.ejco.com](http://www.ejco.com)



### Sealants

#### CCI Piping Systems WrapidSeal Manhole Encapsulation System

The WrapidSeal Manhole Encapsulation System from CCI Piping Systems consists of an engineered primer and a wrap-around, heat-shrinkable sleeve designed to seal joints and prevent groundwater from entering a collection system. This material has a high-shrink membrane (70% stretch and 40% recovery) designed to shrink around any manhole profile. In addition, the high-tensile strength accommodates structural movement, while the tough backing resists soil stress and provides suitable abrasion resistance. It can be used for new construction or for the rehabilitation of existing manholes to control infil-



tration through joints and prevent deterioration, thus eliminating costly maintenance repairs and the added expense of treating groundwater.

800-867-2772; [www.wrapidseal.com](http://www.wrapidseal.com)

### Oatey Hercules Shutout Manhole Lubricant and Sealant

Hercules Shutout Manhole Lubricant and Sealant from Oatey is a nontoxic, universal manhole sealant and lubricant that reduces inflow and makes manhole maintenance easier. It is applied to manhole frames to create a seal, enabling airtight and watertight frames and cover interfaces. It adheres to dry, wet, hot and cold surfaces, offering optimal protection in both freezing and high temperatures. In addition to inflow reduction, it promotes ease of use for waterworks contractors and municipalities. It requires no additional training and only takes a couple of minutes to apply, including preparation and cleanup. Applied with a caulking tube, it can be easily transported for use as part of regular operations and maintenance activities. It also makes it easier to open manhole covers, providing lubrication that prevents rust and corrosion between the two metal surfaces, thus decreasing the force required to open the cover.

800-321-9532; [www.oatey.com](http://www.oatey.com)



### Sauereisen SewerSeal F-170

Sauereisen's SewerSeal F-170 is a durable, calcium aluminate-based lining that prevents water infiltration to underground infrastructure. Its versatility allows for use in manholes and lift stations regardless of the type of substrate – concrete, brick or steel. It resists microbiologically induced corrosion common to the municipal environment. The combination of low permeability and high chemical resistance makes it a strong option

for protecting or restoring structures within sewage collection systems. Spin-cast equipment utilized for a rapid installation process is standard. The equipment includes a pump and common spincasting head, allowing installation from ground level. This accelerates the rate of application and improves safety by minimizing confined-space entry. Following proper surface preparation, the product can be applied in one pass of variable thickness, ranging from 1/2 to 2 inches. It is moisture tolerant and requires no primer to attain a tenacious bond.

412-963-0303; [www.sauereisen.com](http://www.sauereisen.com)



### Sealing Systems Flex-Seal 2.0

Flex-Seal 2.0 from Sealing Systems is an all-purpose sealant that adheres to many surfaces and has over 800% elongation. It is designed to prevent inflow/infiltration and to provide corrosion protection at the grade adjustment ring section or joint section of manholes and catch basins. It's 100% safe and Prop 65 compliant. The internal seal is manually



## PRODUCT FOCUS

applied using a paintbrush and the kit is designed to cover 12 vertical inches on a 27-inch-diameter manhole.

800-478-2054; [www.ssisealingsystems.com](http://www.ssisealingsystems.com)

### The Strong Company Strong-Seal System

The Strong-Seal System from The Strong Company offers a variety of cost-effective engineered cementitious products designed to rehabilitate municipal concrete and masonry structures and effectively stop inflow, infiltration and exfiltration. When spray-applied to a minimum of 1/2-inch thickness, the cementitious mortars are an impervious monolithic liner with compressive and flexural strengths exceeding that of the original structure. Both MS-2A and MS-2C are fiber-reinforced spray-applied cementitious mortars. Made with Portland cement, MS-2A is the most cost-effective solution for stopping infiltration and restoring structural integrity. MS-2C provides high early strengths and added corrosion protection in mild sulfide environments. High Performance Mix is a pure-fused calcium aluminate mortar that stops infiltration, restores structural integrity, and protects against microbiologically induced corrosion in sanitary sewer systems with harsh sulfide conditions (pH of 1.0 or greater).

800-982-8009; [www.strongseal.com](http://www.strongseal.com) ♦



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## MANHOLE EQUIPMENT AND REHABILITATION

By **Craig Mandli**

### Manhole risers help growing community maintain infrastructure

#### **Problem:**

Per the U.S. Census Bureau, the city of Cookeville (population 35,000) is the largest of Tennessee's 20 "micropolitan areas," defined as "smaller cities which function as significant regional economic hubs." So, Cookeville is "officially" a growing town in a bustling region, and the city's Public Works and Water and Sewer departments feel pressure to maintain infrastructure efficiently and cost-effectively.



#### **Solution:**

One way they do this is by using **American Highway Products Pivoted Turnbuckle Manhole Risers** when raising manholes to grade. The city began using these particular adjustable risers in 1999 and since then has ordered and installed more than 2,000. "I've been here 13 years as a foreman and now purchasing officer in the Water and Sewer Department, and in all that time the American Highway Products riser is the only riser we've ever used here," says purchasing officer Nate Beaty. "In my time installing and now ordering them, I don't know of any failures or returns. When we install them right, they don't even rattle."

#### **RESULT:**

Riser installation is simple; it usually takes one person 5 to 10 minutes to clean out the original rim with a wire brush, set in the lightweight riser (a shaped ring of durable galvanized steel) and adjust the turnbuckle with a screwdriver used as a lever — this applies thousands of pounds of force and seats the riser tightly and permanently. "We never needed a class; it's an easy skill to pass on," says Beaty. "And like I say, no failures!"

**888-272-2397; www.ahp1.com**

### Utility employs better technology to raise exposed manhole to grade

#### **Problem:**

MidCoast Council is a small local government area in New South Wales, Australia, responsible for public infrastructure in its region, including the raising of manholes to grade after new paving. Typically, this has been a slow, labor-intensive process due to the weight, relative fragility and imprecision of concrete rings. This wasn't an attractive solution for MidCoast when faced with dramatically failing pavement in a heavy-use intersection with lots of bus and large truck traffic — the cracked and subsided roadway exposed 2 inches of manhole rim, creating an obvious safety hazard. They had to act quickly to repair the roadway, using a fast and durable technology that would permanently fix the intersection

and expose the public and repair crews to minimal risk.

#### **Solution:**

The council chose a **Cretex PRO-RING** supplied by ISC Services to make the repair. The manhole grade adjustment system is based on rings made from high-strength lightweight expanded polypropylene. The rings are precisely-sized, lightweight — 14 pounds rather than 240 pounds for a typical concrete ring — and much more efficient to install, usually saving hours of labor and requiring smaller crews. Like concrete, EPP rings have a 100-year life cycle and don't degrade or deform under load.



— 14 pounds rather than 240 pounds for a typical concrete ring — and much more efficient to install, usually saving hours of labor and requiring smaller crews. Like concrete, EPP rings have a 100-year life cycle and don't degrade or deform under load.

#### **RESULT:**

In one morning, MidCoast excavated and installed a 4-inch finish ring (secured and sealed with M1 adhesive) and placed a new heavy-duty cover and frame on top of the Pro-Ring. After backfilling, compaction, and cold mix, the rehabilitated intersection was immediately opened for use by heavy vehicles. **800-345-3764; www.cretexseals.com**

### City relies on manhole replacement system to complete massive repair and restoration project

#### **Problem:**

Several years ago, the city of Ames, Iowa, began a massive-scale repair and restoration of its sanitary sewer system. The team was warned that with projects such as this, residents can get anxious when their street is shut down and the sewer is torn up, especially when the repairs drag on and on.



#### **Solution:**

In an effort to reduce the project's timeline, materials, labor and overall costs, the city's engineering team decided to use a Mr. Manhole cutter to complete the work. "The manhole technology is incredibly fast," says Eric Cowles, a civil engineer with Ames. "On a good day, depending on the depth of the rehab that has to be done, our contractor is knocking out eight to 12 a day very easily."

#### **RESULT:**

The Mr. Manhole system transformed the way that Ames executed this large-scale project. The system is incredibly fast, and on a good day, depend-

ing on the depth of the rehab that was being done, contractors completed eight to 12 manholes. Everything was done quickly and efficiently with minimum impact to the public. "Overall, everything has been really smooth," says Cowles. "We were kind of warned that sometimes on these projects, residents get a little antsy. You shut down their street, tear up the sewer, and that really hasn't been a problem here." 567-242-2221; [www.mrmanhole.com](http://www.mrmanhole.com)

## Epoxy used for coating new large-diameter manholes at Arizona housing development

### Problem:

At a new housing development called El Cidro, the city of Goodyear, Arizona, elected to coat 14 new 60-inch manholes with epoxy to extend their life spans. The manholes were as deep as 36 feet.

### Solution:

For this project, Manhole Coatings chose to use Neopoxy's high-strength,



corrosion-resistant **NPR-5304** epoxy system applied via plural component spray equipment. First, the manholes were pressure-washed at 4,000 to 5,000 psi. Although NPR-5304 is a totally hydrophobic product and can cure underwater, hot air was then blown on the surface for 15 to 30 minutes in order to get maximum adhesion. Following this preparation, NPR-5304 was sprayed onto the surface in one pass as a monolithic 125 mil coating.

### RESULT:

The project was completed successfully and the manholes were in service shortly after application. Through this application of NPR-5304, the life span of the manholes was extended by approximately 50 years.

510-782-1290; [www.neopoxy.com](http://www.neopoxy.com) ♦

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# Product Spotlight

Hydroexcavation truck designed to maximize uptime

By **Craig Mandli**

Municipal sewer workers are constantly asked to do more work in less time. That means they need the right equipment. To enhance workers' productivity while potholing or cleaning up spills and debris, Ditch Witch has introduced the powerful W12 truck vac to its lineup. The first offering in Ditch Witch's new line of Warlock vacuum excavators, the W12 gives municipalities a PTO-driven vacuum excavator that's backed by the service and support of the global Ditch Witch dealership network.

"That's really why the W12 is such a great fit for municipalities," says Chris Thompson, vacuum excavation product manager at Ditch Witch. "If you need to get your unit serviced, you just bring it to one of our dealers, and you are back up and running quick. There's no need to have to get it across the country to get work done."

The W12 brings the capacity, versatility and performance technicians are looking for on job sites with 1,200 gallons of freshwater and a 12-cubic-yard debris tank. With 5,000 cfm and 27 inches Hg of vacuum power coupled with the larger storage capacity, crews can take on bigger jobs and maximize time on the job site, which will reduce time spent dumping debris.

"The increased versatility and capacity of the W12 allows crews to improve productivity and decrease downtime on even the toughest job sites," Thompson says. "Operators can stay on the job longer with the large tank capacity



and powerful vacuum, eliminating the need to bring in another crew."

The design and layout of the debris tank positioned between dual 600-gallon saddle tanks of freshwater creates a more stable truck, improving operator experience. For easier operator usability, a remote-control system controls the water system and boom, and can lift and lower the tank. The W12's dual hose reels coupled with the ability to use both a hydro and air method enable crews to use one machine for a variety of excavation tasks, even in harsh environments. Together, the size and versatility of the W12 allows it to be used for slot trenching, horizontal directional drilling, potholing and more.

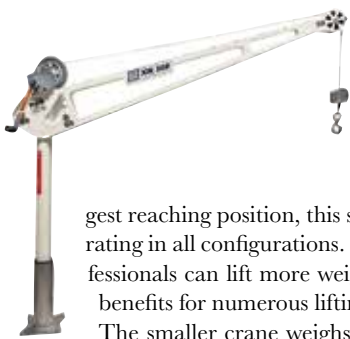
"We're building on 20 years of truck vac knowledge to bring excavation crews the innovative line of Warlock vacuum excavators," Thompson says. "Operators get improved technology and optimized design with the service and support that comes with the Ditch Witch name."

**580-336-4402; [www.ditchwitch.com](http://www.ditchwitch.com)**

**SPECIAL REPORT**

## OZ Lifting XR Series davit cranes

OZ Lifting Products has launched its XR Series of davit cranes for wastewater and water operators. The Winona, Minnesota-based manufacturer has released the model in 500- and 1,000-pound capacities, but the long reach of the range is a stand-out benefit for operators. Where other davit cranes typically have reduced capacity when it is in the longest reaching position, this series maintains its maximum capacity rating in all configurations. This means wastewater and water professionals can lift more weight, further out, which presents many benefits for numerous lifting and material handling applications.



The smaller crane weighs only 57 pounds and the larger crane weighs 95 pounds. Both have a maximum 62-inch reach and maximum hook height of 87 inches.

**800-749-1064; [www.ozliftingproducts.com](http://www.ozliftingproducts.com)**

**SPECIAL REPORT**

## All-New Brandt HX120 hydroexcavator

The all-new Brandt HX120 hydroexcavator is a high-output unit with a 1,150-gallon water tank and 11.6-cubic-yard debris tank. Nimble enough for urban settings, the HX120 helps contractors work more efficiently with maximized legal load weights, quicker debris loading and unloading time, and the capacity to take on larger jobs without load weight concerns. Real-time measurement of water and overall truck weight enables operators to make quick, informed decisions, which reduces the risk of damage or overweight penalties. The new unit features a 28-foot boom reach with 340-degree rotation.



**866-427-2638; [www.brandt.ca](http://www.brandt.ca)**

*(continued)*



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## SPECIAL REPORT

### New Vacall AutoValveSystem Option for AllJetVac Models

The Vacall AutoValveSystem option available on AllJetVac models is designed to improve operator efficiency and simplify switching water functions with the press of a button. The AVS all-electrical system option allows operators to switch from jetting to wash-down or optional tank flush from the AllSmartFlow control panel. No need to open or close manual water valves. This innovation also includes a new electric switch bank for raising or lowering the debris tank and tailgate and turning on or off the tank vibrator or sludge pump to be mounted anywhere on the truck. The Auto Valve System is compatible with front and rear AJV hose reel configurations and works with the belly pack remote control for operation of all functions. **800-382-8302; [www.vacall.com/allsmartflow](http://www.vacall.com/allsmartflow)**



### Vortex IMS UV curing system

Accommodating pipe diameters 6 to 80 inches, Vortex's IMS UV curing systems deploy an ultraviolet light chain and infrared sensors to capture data every 12 inches to ensure a complete cure and improve installation efficiencies. Vortex's new EnviroCure UV liner, developed in partnership with Applied Felts, is pre-impregnated with resin and constructed using a corrosion-resistant, styrene barrier sleeve, non-wicking fiberglass to enhance physical strength while delivering a thinner pipe wall design. Its unique construction enables reinstatements to be performed quickly and correctly the first time with reliable dimpling that clearly identifies junctions between laterals and the main line. Additionally, the liner is cold- and hot-weather friendly, and is ideal for environmentally sensitive locations.



**855-949-3441; [www.vortexcompanies.com](http://www.vortexcompanies.com)**

## SPECIAL REPORT

### Reed Manufacturing Feed Tap waterworks tool

The Feed Tap waterworks tool from Reed Manufacturing drills through PVC, polyethylene, cast iron and ductile iron pipe while under pressure using a corporation stop inserted into a service saddle. Compact design with an independent feed control allows the user to complete the tap using a drill for cast iron, ductile iron or polyethylene. Manual power is required for use on PVC, CPVC and similar plastic pipe. The independent feed control advances the shell cutter for tapping PVC pipe as recommended by the Uni-Bell PVC Pipe Association. Designed for use on plastic pipe only, the FTP2000UNIV kit relies on manual drilling operations using Reed PVC/PE shell cutters. The tool comes complete with all corporation adapters, shell cutters, shell cutter adapters and a ratchet wrench with socket to cover 3/4- to 2-inch service lines in PVC and polyethylene. Each machine ships with a sturdy carrying case.



**800-666-3691; [www.reedmfgco.com/en/products/water-services-tools/feed-tap-drilling-machine](http://www.reedmfgco.com/en/products/water-services-tools/feed-tap-drilling-machine)**

### Hydra-Flex Revolution sewer jetting nozzle

Hydra-Flex's new Revolution by Reaper sewer jetting nozzle features a forceful front rotating stream and powerful back jets to cut and clear the toughest blockages. And it goes a step further with a 360 degree rotating subhead with dual jets that completely clean and descale the pipe. The all-in-one tool simultaneously cuts, clears and cleans to help work faster, save water and money. The Revolution is built for 6- to 36-inch sewer pipes and can take on the biggest jetting challenges. The nozzle operates between 1,000 and 2,500 psi with a flow range of 40 to 80 gpm. The subhead is designed to maintain consistent speed throughout the nozzle's life, and a stainless steel centralizer is included to ensure the nozzle stays centered within the pipe.



**952-808-3640; [www.hydrflexinc.com](http://www.hydrflexinc.com)**

### VMAC G30+GEN rotary screw air compressor/generator

VMAC's G30+GEN gas powered rotary screw air compressor/generator combines two convenient forms of power into a single, innovative system. The G30+GEN provides 25 cfm of compressed air at 100 psi and is designed to maintain max cfm 100% of the time. Operators can quickly switch from compressor mode to generator mode for their tools, lighting and other equipment, and the G30+GEN will provide 3,600 watts of continuous AC output. The system weighs only 295 pounds and has a footprint of 7.1 square feet, providing more gross vehicle weight and space for other tools and equipment.



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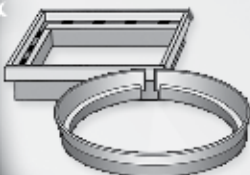
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### In-Situ rebrands with new tagline

In-Situ has been rebranded to reflect the company's current status as a leader in both environmental and process water monitoring solutions. The company's new tagline, "water simplified," speaks to its groundwater, surface water, coastal, drinking water and wastewater audiences and captures the essence of the In-Situ brand: to simplify and improve water monitoring to help protect the world's water resources.

### Franklin Electric launches new employee resource group

Franklin Electric formed a new employee resource group dedicated to providing an avenue for women to grow both professionally and personally through education, networking and advocacy. Known as Franklin Women's Network, the group's goal, according to a release, is to "build a welcoming, inclusive community, provide professional alliances, equip Franklin women with relevant development tools and resources, and guide Franklin women to identify and achieve career milestones."

### Victaulic promotes Gary Moore

Victaulic has promoted Gary Moore to executive vice president and chief revenue officer. Moore began his Victaulic career 35 years ago in sales for Canada and progressed to the role of president of Victaulic Co. of Canada, Limited. Later he joined the executive team at Victaulic's U.S. corporate headquarters and



Gary Moore

served as the executive vice president responsible for building and driving the global sales team.

### Hamid Sarshar named president of TESCO Controls

TESCO Controls, a United Flow Technologies company, has named Hamid Sarshar as president of the organization. Sarshar will lead the 50-year-old company into the next strategic phase of growth and innovation within the UFT platform. Hamid Sarshar joined UFT in October 2022 as executive vice president of operations focused on operational optimization efforts at TESCO.



Hamid Sarshar

### Pierre plant wins engineering project of the year

Pierre, South Dakota's new drinking water treatment plant was awarded the Central South Dakota Engineering Project of the Year, presented by the South Dakota Engineering Society. The facility's design was led by JLG Architects and the engineering consultant AE2S. The project is now the largest in Pierre city government's history, a \$37.5 million investment approved by the public to improve the city's drinking water and combat the water's high mineral content.

### CUES Accurate Mapping Probe used in Project of the Year

RAVAN AIR, alongside their sister company, Tru-Tek, completed a project installing a natural gas line underneath Chartiers Creek in Washington, Pennsylvania. During the pipeline inspection process, RAVAN AIR located a 70-inch steel wastewater pipe that was unable to be located using traditional means underneath a state road using the CUES Accurate Mapping Probe. This underground mapping method prevented major traffic disruptions, saved considerable time and resources, while providing the means to safely perform future projects without the possibility of cross bores or other damage. Chosen as the Gas Distribution Project of the Year, it was honored at the 2023 Underground Construction Awards.

### McElroy receives SHARP Award

McElroy was recognized for its commitment to workplace safety and its participation in the Occupational Safety and Health Administration Safety and Health Achievement Recognition Program. Oklahoma Labor Commissioner Leslie Osborn presented the company with a proclamation commending leadership and employees at McElroy's Tulsa campus. Osborn and OSHA Consultation Director Jason Hudson also presented company leadership with a flag announcing McElroy's SHARP-certified status. ♦



McElroy holding their SHARP Award

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- Collecting and storing required material data and documentation
- Sharing information through a map accessible to the public

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**Speakers:**



**Brendon Lockette, Asset Management Coordinator for the City of Plano, TX**

Brendon Lockette is an accomplished professional currently serving as the Asset Management Coordinator for the City of Plano, Texas. With a diverse background in several roles, he has gained hands-on experience in assessing and maintaining assets in the field, managing the city's signage infrastructure, and collecting and analyzing data related to the city's assets. Since coming to Plano Brendon's focus has shifted to Water and Wastewater infrastructure.

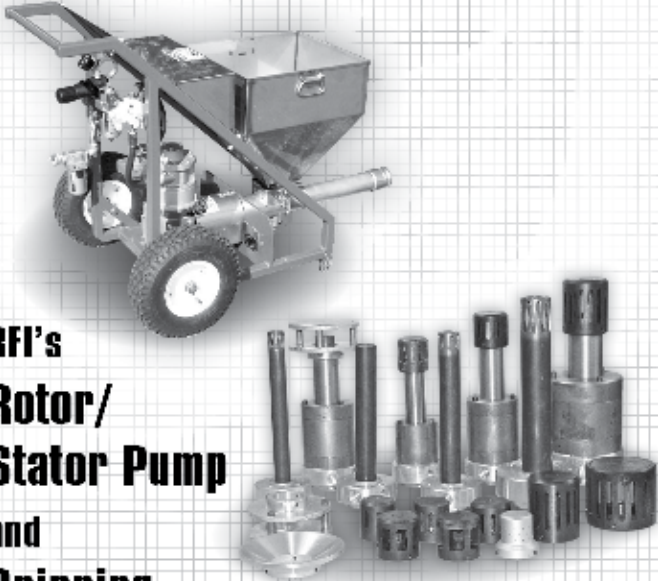


**Kurtis Warne, Solutions Engineer for OpenGov**

Kurtis Warne has spent the last 15+ years working in the Water Industry developing ways to make security, water quality compliance, and utility asset management more effective, efficient, and productive. As a Solutions Engineer at OpenGov, Kurtis works with the customers as a technical expert to design the best workflow processes ensuring the software meets/exceeds the customer goals.

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