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I&I

INFLOW & INFILTRATION SOLUTIONS AND EQUIPMENT

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MUNICIPAL SEWER & WATER

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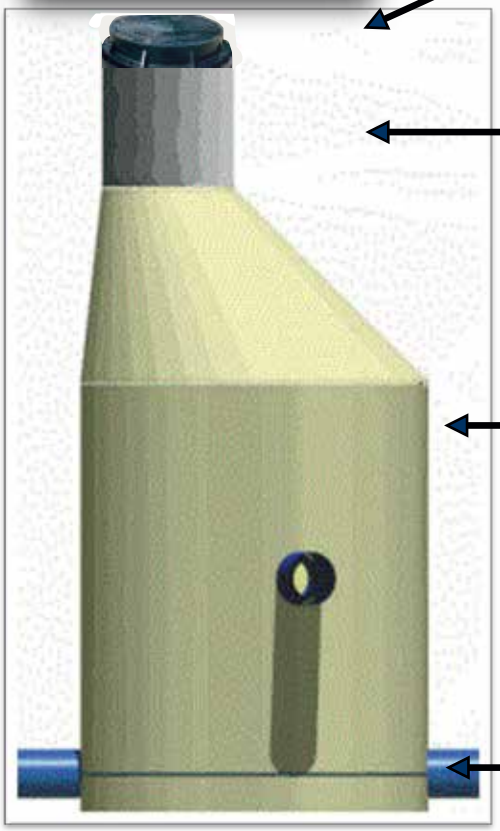

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CONTRACTOR SHOWCASE

COVER PHOTO: Austin Huggins of Advanced Lining LLC installs an OBIC 1000 liner inside a new manhole at an installation work site in Park City, Utah. (Photography by Kim Raff)

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“It is exceedingly rare, if ever, that we come onto a job site involving manholes that do not either have the presence of I&I or show that I&I exists.”

Seth Huggins

Austin Huggins of Advanced Lining sprays OBIC polyurea lining inside a new manhole at a work site in the Rocky Mountain region of Park City, Utah, an area with high water tables.

CONTRACTOR SHOWCASE

Lifting the Lid on Infiltration

Rocky Mountain coatings specialist sees often overlooked sources of I&I

STORY Suzan Chin-Taylor | **PHOTOS** Kim Raff

With any collections system and municipal utility looking to reduce the burden on its wastewater treatment facility, pinpointing the source of inflow and infiltration is critical. As a trenchless technology rehabilitation contractor, Advanced Lining of Clearfield, Utah, sees some common and overlooked issues when it comes to addressing inflow and infiltration.

"Municipalities will address their collections system mainlines with either cured-in-place pipe (CIPP) or other trenchless methods such as bursting, or traditional dig and replace, with many starting to incorporate laterals as part of their cured-in-place (CIP) programs, but we're finding that manholes and lift stations are often overlooked," says Seth Huggins, co-owner of Advanced Lining. Huggins and his team have quickly recognized that these vertical structures are often some of the largest contributors of extensive I&I in their service area of the Rocky Mountain states of Utah, Idaho, Wyoming, Montana and Nevada.

ENVIRONMENT PLAYS A ROLE

Advanced Lining is the sister company of Advanced Pump and Equipment, which has been servicing lift stations, wet wells and wastewater treatment plants in the Rocky Mountain region for several decades. In the areas it operates water tables are high. There have been some recent anecdotal studies indicating that upward of 50% of the water that's being treated in local waste-

The team at Advanced Lining includes, from left, attendant Skyler Hanges, operations manager Tyler Garner, co-owner Seth Huggins, and applicator Austin Huggins.

ADVANCED LINING LLC
Clearfield, Utah

OWNERS: Matt, Andrew and Seth Huggins

EMPLOYEES: 6

SERVICES: Structural and protective coatings & linings

SERVICE AREA: Utah, Idaho, Wyoming, Montana, Nevada

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water treatment facilities is due to infiltration and not actual sewage. This is becoming a huge financial and operational drain on wastewater treatment plants, and they're finding themselves having to expand to meet increasing demand.

"It is exceedingly rare, if ever, that we come onto a job site involving manholes that do not either have the presence of I&I or show that I&I exists," Huggins says. "Although water tables do tend to drop throughout the wintertime, and may be dry of active infiltration, we can see evidence that during wet seasons it is highly active."

Most of the infrastructure that Advanced Lining deals with is on average 30 years old; however, it is not uncommon that some brick structures are upward of 80 years in age. The company is working to create an awareness in the market about the importance of addressing structures like manholes and lift stations — the verticals in a collections system — because of their contribution to the overall I&I issue. Ignoring those issues will only make it harder for municipalities to reach their mitigation goals.

Because of this, some client cities are realizing that infiltration will exist regardless of what they do, even in brand-new construction. They're deciding to deal with it proactively so they will not have to worry about the structure later in its life cycle. As a case in point, the company recently took on a project in Nevada encompassing the installation of five new manholes, a lift station and a wet well that included a requirement to be lined with a protective polyurea coating. It's a good thing the job called for the coating, too, because by the time the wet well had been placed — within a week of installation and just before it was due to be lined — it had already begun to experience active infiltration inside the structure. Advanced Lining crews were able to dry the structure and perform the lining before it went into active service, and the city's decision to be proactive was reinforced as a wise move.

"There can be tremendous sources of I&I, even in a brand-new system structure, so taking the opportunity at this stage is an efficient and relatively inexpensive thing for cities to consider as a way to seal current and future I&I from the system," Huggins says.

"With a wet well or lift station, because there's typically water present, you won't necessarily recognize the issue. But when you pump it dry and clean it, it's easy to see infiltration all over."

Seth Huggins

A MAJOR LEAK

In another job, officials from the City of Shelley, Utah, approached Advanced Lining to discuss an issue they were having with their wastewater

Austin Huggins (left) and Skyler Hanges record air quality data inside a new manhole using a GasAlertMax XT II detector by Honeywell Safety and Productivity Solutions.

treatment plant being overwhelmed in the summer. They believed that the source of the problem was probably infiltration, and that the plant couldn't handle the number of gallons coming in at its current capacity. Shelley was looking at a multimillion-dollar upgrade to its plant to address the capacity issues, but the officials decided to explore other options. In looking at some of the collections system's manholes, the city discovered there were several structures along a main trunk line, adjacent to an irrigation ditch, that were leaking more than 250,000 gpd of infiltration during peak summer months.

One particular manhole was 8 feet in diameter, 25 feet deep and situated in the middle of an alfalfa field. The structure was experiencing infiltration through all its joint seals, two inlets, the outlet and was constantly full of water. It was consistently leaking when the Advanced Lining crews inspected it during the summer months, so they waited until winter when irrigation season was over to assess the true levels of I&I and plan to effectively seal it.

Historically, this structure was the leading source of the infiltration, averaging 250,000 gpd of infiltration through it, as it was in a field that was receiving daily irrigation water. The manhole was also an intersection for a trunk main that services two adjoining cities and traverses to the local wastewater treatment plant. The incoming lines were 38 and 42 inches in diameter.

KNOW YOUR OPTIONS

Advanced Lining of Clearfield, Utah, is working to educate its service area about the various lining materials that are available to stave off I&I and offer structural rehabilitation for the region it serves.

There are a host of options available for coatings and linings in collections systems, whether they're elastomeric or rigid structural or something in between. Knowing how various materials will behave once they're applied is important for customers who are trying to decide what type of material to use on a given project, according to Seth Huggins, co-owner of Advanced Lining. There are many elements to be considered, including the environment.

"In a situation where the ground doesn't move as much, such as warmer climates, a rigid product can be used, whereas we have found that polyurea and polyurethane products, dependent upon their formulation and properties, can be a better solution in climates such as ours. Not only can they offer structural rehabilitation, but having some flexibility that allows it to move with the ground during extreme seasons and freeze-thaw cycles is essential for a sustainable solution," Huggins says.

Also of concern for asset owners is adhesion. Because of the various substrates and their condition that may exist in sewer systems, having heightened awareness and understanding of material properties can be especially critical when considering a lining for lift stations or other vertical structures composed of steel or fiberglass. In these cases, linings that are not susceptible to shrinkage during curing are optimal.

"There are two primary things that I tell my clients to focus on," Huggins says. "The first one is if there is a chemical mechanical bond between what is being sprayed on the wall and what the wall is made of. All lining materials have pros and cons, so it is important for the asset owner to look at the properties of each to determine what is the best fit for their particular application."

Advanced Lining strives to educate its service area on the specific I&I rehab products and techniques it offers.

For more about the work Advanced Lining is doing, check out an additional story in the July issue of Cleaner magazine at www.cleaner.com.

Skyler Hanges (left) and Austin Huggins install a liner inside a manhole. The company also focuses on other overlooked sources of I&I, including lift stations and wet wells.

"We're finding that manholes and lift stations are often overlooked."

Seth Huggins

Shelley had been aware of the issue for some time and had tried lining the structure previously, but the attempt failed. Advanced Lining removed the existing liner and re-grouted the structure to fill some of the voids and gaps that were in the concrete. It then applied OBIC 1000, a spray-applied polyurea lining from OBIC LLC, and sealed the structure substrate all the way up to the chimney.

The following summer, the crews went back to visit the site to study how it was performing during the irrigation season. Upon inspection, the manhole was found to be watertight with no infiltration, and it remained that way for the entire summer season. A follow-up inspection was done the next winter, and there was still no sign of infiltration.

"The beauty of using these linings in these types of structures is that we can take active infiltration and stop it even when it only exists at certain points of the year," Huggins says. By lining this structure, the city is now saving over 1 million gallons per week of irrigation water from being treated. And that water is now available in the ground for the local farmers who are saving operational costs since their irrigation water is no longer being washed down the pipe.

A QUIET VILLAIN

In a collections system, manholes are often recognized as a source of I&I; however, Huggins has seen significant I&I in places that have often been overlooked as possible sources: lift stations and wet wells. As a rule, wet wells are at a low point, so they will always be deeper than manholes. And when water tables are high, there is always infiltration.

"One of the reasons I believe these particular structures do not necessarily get the attention is because there's always water present there, so I&I is not as obvious," Huggins says. "With a wet well or lift station, because there's typically water present, you won't necessarily recognize the issue. But when you pump it dry and clean it, it's easy to see infiltration all over."

Huggins says it's rare that he's performed an inspection or maintenance on a wet well and not encountered infiltration. He recommends that during regular maintenance and cleaning cycles for wells and lift stations, maintenance crews look at all seams that are stacking up to the chimney, as these seams are pain points for I&I and corrosion issues. The freeze-thaw cycle will create cracking, and when water tables are high, water will always find a way in. Using a lining to coat the walls of these structures could do a lot for eliminating I&I from these hidden culprits.

"I&I can be hiding in unexpected places," says Huggins. He advises his clients to consider the entire system and all its integrated structures as having potential weak points and to seek them out. "It's often a tedious process, chasing leaks, but just taking a few preventive steps and lining proactively, we are able to mitigate more I&I than imagined and save treatment dollars in the long run." **I&I**

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IN SAFE HANDS

A proactive approach with in-house safety audits is good for employees and business

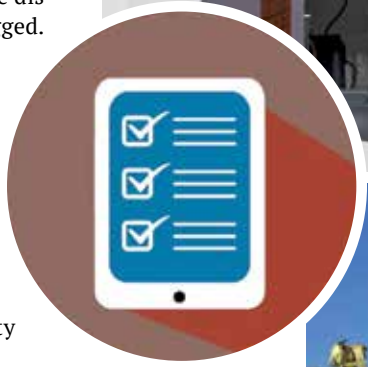
By Giles Lambertson

Ed Koch was the amiable mayor of New York City for 12 years. During his tenure, he was known for greeting his constituents on the street and asking them, "How'm I doing?"

Companies should develop a similar habit and openly solicit feedback from employees about whether safety programs are actually keeping them safe.

One mechanism for doing this is a safety audit. In an audit, a qualified person systematically examines a company's declared safety rules and regulations along with its day-to-day practices and determines if the two are in sync.

For example, if employees are required to wear hard hats in certain areas of a plant or work site but the examiner discovers the hats generally are not worn, the discrepancy between theory and practice is red-flagged. Red flags signal changes need to be made.



START INSIDE

Safety audits occur in three forms: internal, external and OSHA (sometimes jokingly referred to as eternal). The OSHA audit isn't necessarily the most important. The earliest identification and elimination of a safety hazard is always the key one. But OSHA is where the buck stops. Failure to be compliant with OSHA's preventive safety regulations leads to a citation or fine.

OSHA principally enforces regulations by conducting workplace audits or inspections. The inspectors look for violations of safe practices or the absence of safety equipment. The inspections can be conducted without giving a company prior notice, which seems furtive but keeps less ethical company leaders from playing games with employee safety.

Ethical leadership, on the other hand, is not into games. "I like to tell people that a safety management plan should be part of your overall company management system. If management is committed to doing the right thing, employees are going to do things the right way. It becomes a common culture," says Kyle Irwin, founder of Irwin's Safety. The firm in Calgary, Alberta, teaches safety to company executives in western Canada and occasionally in the U.S.

While "doing the right thing" works the same on either side of the border, Irwin says the consequences of ignoring workplace safety are often more severe in the states. "We're more regulated in Canada. We have more government agencies looking into it. The day-to-day standards are higher.

A good safety program should be a cornerstone of your company. And the best way to be a safety leader, according to the experts, is to engage your employees constructively instead of confronting them like a "safety cop."

However, the risk of litigation is much higher in the U.S. If you are a company in the U.S. and make some bad decision in respect to safety, you're more likely to be litigated by the people affected by that decision."

Neither of these two scenarios — more rigorous day-to-day regulation or greater legal risk — is welcomed by company owners. The happy alternative is for a company to self-regulate at a responsible level and thereby create a culture of safety as a first line of defense against unsafe behavior and work conditions. Internal audits are the way to develop that culture.

Usually conducted by a company's safety manager, ongoing internal audits sometimes are informal, undertaken on the spur of the moment while passing through a workplace or visiting a job site. Or they are formal, with an inspection occurring on a day purposely set aside for it with a checklist as the inspection tool.

The list can be as long and detailed as your company wishes. Small companies that are just developing a health and safety program sometimes get by with a one-page checklist with a comments section at the bottom. The completed listing is filed for follow-up and future reference.

More rigorous internal inspections are longer and more nuanced. An informal short-form inspection might ask, "Is there a standby employee positioned outside the confined space to provide emergency assistance?" Whereas a more thorough inspection checklist might ask an additional question: "Is the standby employee trained and equipped to render assistance in case of an emergency?"

These internal audits sometimes catch dangerous situations and correct them. However, the hope is that they will discover few serious defects in safety and instead find areas where reasonably safe behavior can be made safer. The frequency of the internal audits and the fact that they are being conducted without coercion from outside entities makes them nonthreatening to a company and its employees. Therefore, they are less likely to cover up something unsafe.

"I like to tell people that a safety management plan should be part of your overall company management system. If management is committed to doing the right thing, employees are going to do things the right way."

Kyle Irwin

EFFECTIVE MANAGEMENT

Irwin notes that the attitude of the person doing an audit goes a long way in determining how effective it will be. "I really think the No. 1 requirement for being an effective safety manager is to know your workplace and understand the different roles in the company and the hazards of each role."

He gives the example of an engineer leaving his office two or three times a year to walk around a work site. "You wouldn't go up to him during his walkaround and talk to him about the need to wear a hard hat." Such a "gotcha" move would be officious. Rather, a safety manager should prioritize his time to deal with bigger workplace hazards.

Irwin recommends that safety leaders engage with employees rather than confront them. To effectively communicate the need for safety, a safety manager must first have a relationship. Failure to connect with people means the chance of influencing them is slim, he says.

"The attitude of the safety manager should not be 'I am here and I'm going to change things.' It should be 'I am here and we're going to learn things together.' It's the difference between being a safety cop and a safety adviser. If you're a cop, you ask, 'Where is your hat?' An adviser asks, 'Is there a reason you're not wearing your hat?' The attitude should be that the adviser is learning from the employees."

Seasoned employees might be expected to be most responsive to safety counsel, having been around long enough to witness the consequences of unsafe behavior. Unfortunately, longtime employees can be the least coachable. "With a lot of people in the older generation, when you say, 'Hey, we need to do this and this,' they become defensive. They feel like you're suggesting they weren't doing something right."

Once again, Irwin counsels engaging with the old hands so they understand their experience is respected. "You might say, 'We know what you're doing is working really well and you're not injuring yourself. But someone newer on the job might not be as capable and could get hurt. We'd like to try a more systematic approach to doing this.'"

A safety manager needs to be something of a diplomat, in other words. However, diplomacy won't always work. Irwin laughs about the time he confronted a longtime employee of a company working a railway project. "He was in a machine, and I walked up and said, 'You need to wear that safety belt because some government inspector is going to come along and see you not wearing it and throw you off the work site.' He looked at me, said, 'Back off!' and closed the door."

You can't win them all, even when you're president of a safety management company. The larger lesson, though, is that rules apply to everyone. Irwin adds that the most frequent violators of company workplace safety rules are not hidebound employees, but younger generation workers who seem disinclined to follow safety regimens created for their own good.

INSURANCE TEAMWORK

Insurance companies can play a role in auditing a company's safety. At Koberlein Environmental in Northeast Pennsylvania, insurance agents have become real partners in policing and encouraging safety. Company owner Chris Ravenscroft says a Penn National Insurance representative, Jerry Kozich, is particularly involved.

Kozich attends half the company's safety meetings. He also periodically performs impromptu external audits of work sites. "I get a call several times a year from Jerry who says he's in the area and would like to see a job. That's been very helpful. Some jobs he visits are being perfectly managed. Other jobs we need to do something a little different, things he's identified. We get on top of it immediately."

This working relationship between insurer and insured has persisted for 15 years. Ravenscroft believes it to be a valuable add-on feature of his insurance policy. "I've asked him if this kind of relationship is commonplace, and he says it isn't, mostly because businesses are uncomfortable working with an insurance company at that level. Some insurance companies simply don't offer the service. We feel it really adds value."

Ravenscroft is his own safety manager, though he obviously has other responsibilities. He also has various team managers who spontaneously walk around jobs, looking for safety issues. That commitment from the top down establishes a strong safety culture.

SAFETY PAYS

Safety is its own reward, but other benefits flow to companies that do safety audits. Irwin notes that, in Canada, annual internal audits are required to document compliance, and an external audit is conducted every two years by a certifying agency. It leads to public certification as a safe place to work, which tends to attract employees and business partners. The financial reward for certification is shaving of insurance premiums, typically by 10% to 20%.

Ravenscroft says a couple other benefits accrue to his wastewater management services company besides a lower insurance premium. One is a discounted rate on workers' compensation when the Pennsylvania Department of Labor certifies the company's safety committee. And because Koberlein has a documented lower-than-standard rate of lost-time injuries per hours worked, business partners are pleased.

"Some of our larger clients — energy companies and utility customers — feel good about working with a company that's exceeding the safety standard. This is another way we receive the benefits of having a safe company." I&I

UTILITY SPOTLIGHT

PHOTOS COURTESY OF HILLSBOROUGH COUNTY

When I&I isn't mitigated, it leads to situations like this, where a faulty manhole boot allowed infiltration to pull sand into the manhole and caused a depression in the road. The Hillsborough County Field Maintenance Services Division often uses dewatering headers at excavation sites to speed up repairs due to the area's high groundwater table.

THE FORESEEABLE FUTURE

A retiring I&I veteran passes the baton, shares mitigation strategies

By Traci Browne

Rich Cummings is one of the industry's most passionate advocates for inflow and infiltration (I&I) mitigation. Slated to retire this fall in Florida from his position as director of Hillsborough County Field Maintenance Services Division, one of his goals is to help ensure the county remains positioned to fight leaks.

After two decades of leadership, he'll pass the baton to Chris Jones, the current pump station operations section manager at Hillsborough. Both Cummings and Jones say Hillsborough is moving toward a One Water system — a system that "envisions managing all water in an integrated, inclusive and sustainable manner," according to the US Water Alliance. Currently, Cummings' department, water resources, is responsible for water, wastewater and reclaimed water. The public works department is in charge of stormwater. However, Cummings says he wouldn't be surprised to see stormwater conveyance fall under the purview of water resources at some point, as it currently manages the maintenance for the pump stations. A One Water system makes a lot of sense for many reasons, but especially when dealing with I&I.

Cummings and Jones both agree that I&I is a major problem for Hillsborough, and their colleagues at the wastewater treatment plants are concerned as well. Part of the problem is that Hillsborough experiences aggressive weather systems that many areas in the country do not. A tropical depression can sit on top of the area, dumping several inches of rain for hours, and will often wreak havoc on the power grid as well. Cummings says it's similar to pouring five gallons of water into a one-gallon bucket. A major storm can cause flows at the treatment plants three times the normal rate for several weeks. Then it can take another month to get the biologicals back under control. When the flows are at their worst, plants will experience foam and odor problems in addition to sanitary sewer overflows (SSOs) because they cannot handle the capacity.

> **"We learned some hard lessons, and necessity is the mother of invention."**
>
> Rich Cummings

So, when those storms let loose, Cummings has to get creative. For instance, when Hurricane Irma blew through Hillsborough, his department pulled together its mobile high heads and deputized its renovation and rehabilitation contractors to work alongside the county crews on a pump-around. The teams went from lift station to lift station trying to keep ahead of the storm. Once they cycled through all the stations, they started over again at the beginning until the stations could manage on their own.

"We learned some hard lessons, and necessity is the mother of invention," Cummings says.

Hillsborough is not under a consent decree, but that doesn't stop Cummings from worrying about SSOs. This constant attention might be why the county's SSOs are decreasing despite the fact that Hillsborough is seeing tremendous growth with 650 to 850 new homes coming online each month. Cummings knows because he is counting every one of them.

One of the best ways to eliminate SSOs is by reducing I&I, and Cummings, like many utility leaders experienced with I&I, sees its mitigation as a job that is never finished. Hillsborough has funded a systematic I&I program to go through every one of its basins on a continual cyclical process. Each basin can take up to a couple of years to perform groundwater level monitoring, flood level management, manhole inspections, smoke testing and flow monitoring — and it's worth repeating.

"If given the opportunity, the situation will revert back, so you have to go back to areas that you already inspected continually," Cummings says.

He admits, however, that funding a comprehensive program like that is not easy when there is only so much money in the budget. "We have been lucky compared to some communities. We had plenty of room in our wastewater treatment plants for many years, so we didn't necessarily have to do anything. But now we have a couple of plants that are on the upper edge of

"Ragging reductions and floatable reductions get news coverage, but you hardly ever read anything about I&I."

Rich Cummings

what they can handle, so we have to transfer flows around to try to meet those capacities."

For his part, Jones will be seeking capital improvement plan funding for a low-pressure sewer SCADA system. And while there's never enough money, Cummings says their leadership understands how critical the situation is, and he thinks Jones will be successful.

Smoke testing is one cost-effective way the Hillsborough County Field Maintenance Services Division looks for I&I in its sewer system.

VETERAN ADVICE

Municipalities often get themselves into trouble ignoring I&I. As long as the plant has the capacity, there's no incentive to investigate the root cause of I&I and how much it contributes to the flow. The lack of incentive leads to a lack of funding, and then nothing gets accomplished. Cummings says part of that is because I&I isn't a particularly sexy news item.

"Ragging reductions and floatable reductions get news coverage, but you hardly ever read anything about I&I," he says.

It's a critical issue for Hillsborough because its highest elevation is about 160 feet, and it goes all the way down to sea level. During the wet season, the groundwater table is so high that it sits above the pipes. That water is going to find its way into any crack, break or imperfection.

Public sentiment is something that many utilities struggle with when it comes to funding. However, as a result of several water-related environmental disasters, Florida's infrastructure problems made national news last year. Therefore, Hillsborough citizens are well aware of the value provided by their water/wastewater utilities.

Cummings thinks that if he were to ask Joe Public what was worth spending money on, it would be keeping water clean. "The bottom line is everybody has to have water to drink."

Still, you can't expect customers to be happy about paying for everything that hasn't been taken care of in the past 25 years or more in one fell swoop. That's why Jones warns against getting into a situation where SSOs and consent orders trigger a huge rate increase.

"We've witnessed this happening throughout the country. Smaller, systematic and continual rate increases will get you where you need to be versus a huge hike. We must be good stewards of our communities," he says.

Outgoing director Rich Cummings (left) and incoming director Chris Jones discuss water/wastewater strategies for Hillsborough County's future.

And then there are times you try to do everything right, but instead the fix causes more problems. For Cummings, that lesson came in the form of pipe liners.

"Initially, we thought it was going to mitigate our I&I, but we didn't see a major reduction," he says.

It turned out in their case that the existing host pipes and host laterals could be damaged during the lining work, particularly with lateral reinstatements, so the crew had to remedy that.

Laterals are the bane of many municipalities' I&I existence, and high on Jones' wish list for future funding are lateral repairs. He is currently investigating different lateral lining techniques and says the fact that so many vendors are calling on him these days is a sign of a lateral repair trend. It seems to both Jones and Cummings that towns have done all the work they can do on the main lines, but with the I&I problem remaining, they're now considering the laterals.

Cummings says 50% of Hillsborough's I&I comes from those laterals, but it's a tough nut to crack because most of them are on private property. It's not a problem if the leak is at the point of connection, but if it's farther up the line, you have to talk to the property owner. Knowing that it's a problem that needs to be addressed, he is looking toward other utilities that have figured out creative ways to get onto the private property to make the needed repairs.

TOOLS OF THE TRADE

Everything from labor-intensive, creative, no-cost techniques to the latest in gadgetry and materials can help you solve your I&I problems. While Cummings loves technology, he's happy to keep some of the tried-and-true, old-school methods around as long as they're working.

For example, "Operation Pop-Top" is a trick Cummings learned from an old friend who ran the Jacksonville, Florida, collections system. Cummings was able to narrow down the source area for SSOs — one to three manholes out from the pump stations — using the GIS "Previous SSO" layer. The only

problem was that Hillsborough has over 840 pump stations.

Over the course of the week, Cummings sent crews out to pop the tops on the targeted manholes and look inside. They were checking for problems like liquid levels over the bench or excessive debris on the bench.

While some counties are lucky to have the money to invest in smart sewers that alert them when there is a problem with liquid levels, Cummings has around 38,000 manholes. He says a technical solution is expensive, but it's still worth exploring the advantages of technology. For now, "Operation Pop-Top" is a low-budget quick fix, and it's one way Hillsborough is reducing SSOs.

Crews use whiteboard notes and paint to mark sources of I&I discovered via smoke testing. Here, a broken cleanout plug (left) and an electrical utility box (right) are marked for repair.

"More things are coming at us — new equipment, new methodologies that are smarter, faster and better. We are better prepared for the future than we've ever been."

Chris Jones

On the high-tech side of things, Cummings and Jones are both big fans of InfoSense's Sewer Line Rapid Assessment Tool (SL-RAT). The SL-RAT is two components, a transmitter and a receiver. The transmitter sends active acoustic transmission through the pipe. The receiver listens and interprets the signal to tell you whether there is an obstruction and just how bad the situation is.

Cummings says the decision to adopt technology like the SL-RAT is a pretty simple one as the pair of units were just around $25,000 and could process 70,000 linear feet of pipe a week.

A worker sets up smoke testing equipment at a manhole.

"This could tell me in less than one and a half minutes whether or not that system was good to go or wasn't," he says. "There's nothing else out there that is even close to that."

Currently, Cummings and Jones have their eyes on the horizon with artificial intelligence as they try to get their heads around the benefits machine learning and AI can provide for the utility.

But while everyone loves to talk about cool new technology, Cummings reminds us that equally as exciting are the new materials being developed. Everything from new piping materials and joining materials to thicker, better tracer wires. "Anything that gives you a competitive advantage is something worth investigating," Cummings says.

He recently started working with Romac Industries couplings and likes them for many reasons, including the fact they're restrained couplings and are American-made. They also cost less than traditional couplings, and the Romac couplings have just two bolts, which means it takes one-fifth the amount of time to join two pieces of pipe, according to Cummings.

For Jones, technology has other added benefits. "Technology is also allowing us to use our personnel to benefit us in other areas of need," he says.

Cummings adds that it's the most exciting time he's experienced in his career with regards to new technology. "More things are coming at us — new equipment, new methodologies that are smarter, faster and better. We are better prepared for the future than we've ever been."

READY FOR THE NEW GUARD

As passionate as Cummings is about this industry, he's not worried about getting bored once he retires. He is an avid surfer, motorcyclist, martial artist and gardener. He also knows Hillsborough is in good hands when Jones takes over. "He'll keep some of the things that are worth keeping and get rid of some of the things that need to go."

One initiative that Jones aims to keep is the basin project. He will continue to cycle through all the basins and do a comprehensive I&I study on all of them. He admits it's an expensive proposition, but that is his goal.

He also wants to focus on employee development because, as he puts it, the employees are the future of the utility. Jones started in the industry by working his way from the ground up with much support from his leaders, and he wants to pay that forward.

"We're making great strides in many areas, whether it's the new technology, or the potential for rate resolutions that will fund all the programs that we have to have and are currently planning for. But at the same time, we must continue to prioritize employee development to ensure a high performing workforce. The employee is the backbone of the utility," says Jones.

Cummings likes Jones' focus on the rank-and-file employee. "First-line supervisor is the hardest job. You've got the people above you going at you, and the people below you going at you, and you're catching it from the guys that you're supervising. It's just a lot of work."

Jones is grateful to Cummings and others for laying a great foundation, and he likes the direction that future planning is going for Hillsborough.

"It's just continuing to carry that torch and making sure that we continue to make great strides in advancing our utility into the future," he says. "We have a real bright future that will show telling signs in the next few years. We've got this One Water project with a new water and wastewater treatment facility, booster pump stations, pipelines, and we're getting ready to move into that phase where some of the items are actually under construction.

"But 10 years down the road, everything's going to look a lot different. And that's because of the work that's being done now." **I&I**

A CRASH COURSE

Upcoming I&I elimiNATION event promises presentations from several industry experts

By Tim Dobbins

A half-day event at the Music City Center in Nashville, Tennessee, will put inflow and infiltration on center stage as industry experts address the root causes and expand on real-world mitigation solutions.

The event is called I&I elimiNATION, and it's set to take place July 12 from 1 to 5:30 p.m. CDT. It's intended for municipal stakeholders, consulting engineers, regulators, technology and service providers, contractors and anyone else who wants to learn about the effects of I&I and ways to prevent it. Attendees can look forward to presentations from several industry experts offering multiple perspectives on the topic.

"The people who speak in the front half of the day really identify the causes and the consequences," says Don Rigby, moderator and event coordinator. "There's then a panel for the second half of the sessions, which are those who are providing the tools and the toolbox for fixing I&I. It's going to be interactive, from a pretty educated and challenging resource."

Among the list of notable speakers is George Kurz, an independent expert presenting the application of a 10-step approach for detection, targeting and rehabilitation. He'll also present results from research that measured I&I in more than 500 collections systems across nine states.

Also presenting at the event will be:

- **Tony Conn,** who will provide perspective from an asset owner in Illinois where I&I reduction is ingrained into every collections system improvement, including injection grouting prior to cured-in-place pipe (CIPP) lining and two-year testing to validate new technologies.
- **Robert O'Dette,** who will present the application of NPDES permit language unique to the state of Tennessee relative to self-imposed moratoriums as well as discuss the costs and consequences of I&I using evaluation metrics including project life cycle cost analyses.
- **Jim Shelton,** who will provide an engineer's viewpoint to give insight on the importance of selecting the proper technologies that work together — and the manner they are implemented — to seal out I&I for a definable timeline, all while considering the overall cost versus benefits.
- **Britt Babcock,** a representative from **Avanti International,** who will discuss the usefulness of injection grouting to seal leaks, stabilize soils and eliminate infiltration in collections systems.
- **Lee Haessig,** a representative from **Cretex Specialty Products,** who will offer a look into a wide range of devices used to mitigate I&I in existing manholes as well as prevent it in new ones.
- **Jeremy Sukola,** a representative from **Madewell Products,** who will talk manhole restorations as a cost-effective way to make a reduction in overall system I&I, and also as a way of providing structural reinforcement.

- **John Manijak,** a representative from **Michels Corp.,** who is scheduled to wrap up the day with a discussion of CIPP lining for mains and laterals. He will talk about what CIPP is, the different types of installation techniques and when it is needed.

Sessions will be video recorded and posted online at a later date for those not able to attend in person, according to Rigby. "There is video production behind this thing thanks to a number of sponsors," he says. "And as long as we can get this on video, there are opportunities to bring people together in their own offices and homes, and we can go way beyond however many people are there live."

"I would like to see municipalities and the engineering community come together, learn together and leave together with actionable ideas."

Don Rigby

The goal of the event is simple: to share information among industry professionals and to establish relationships between those who take care of collections systems and the ones who make and repair them.

It's all about team learning. "I'm a big fanatic about team learning," Rigby says. "I would like to see municipalities and the engineering community come together, learn together and leave together with actionable ideas. At the end of the day, I feel like if we get the right feedback, if we move the needle, then it's all worth it."

The cost to attend the live event is $25, or for $195 attendees can also participate in the Underground Construction Technology trade show July 13-15. To register, visit www.uctonline.com/ii-conference-elimination. I&I

By Craig Mandli

FEATURED PRODUCT

SUPERIOR 5-E ELECTRIC SMOKE BLOWER FINDS FAULTS, ODORS, LEAKS AND INFLOW

When testing laterals, building plumbing, or pumping or inspecting septic tanks, smoke testing is a quick and effective way to find plumbing faults that lead to odors, leaks and inflow. **Superior Signal Company's Superior 5-E Electric Smoke Blower** easily connects to any clean-out, port or vent to smoke test the entire system in just a few minutes. The Superior 5-E Electric smoker gently pushes smoke throughout a system to find cracks or leaks and quickly identify problems. Made in the U.S., the durable Superior 5-E Electric smoker is competitively priced and comes complete with 8 feet of industrial grade hose. Used with Superior Smoke Candles, this cost-effective solution is ideal for hard-to-find odors, leaks and other faults in commercial, residential and municipal facilities.

732-251-0800; www.superiorsignal.com/ii5

PROCESS SUCCESSFUL IN REHABILITATING DETERIORATED MANHOLES

PROBLEM:

Hydrogen sulfide is a corrosive compound which, over time and combined with heavy inflow and infiltration, deteriorates manholes. That was the case for several manholes in Richmond, California.

SOLUTION:

Before the epoxy liner could be installed, extensive surface preparation and repairs were needed. The entire surface of each wall was resurfaced using hydraulic cement. In manholes where bricks were missing, they were replaced by filling in the areas with micro-silica cement. Furthermore, any severe leaks were injected with grout. At this point, H & R Underground was then ready to apply **Epoxytec's CPP Sprayliner.** Using a Graco XP70 plural pump set at a ratio of 1:1, it sprayed CPP Sprayliner at 150 mils thick.

Result: In total, seven manholes were rehabilitated over the period of one week. The expertise of H & R Underground, specifically its attention to detail in addressing each manhole's individual needs, allowed for successful rehabilitation in a timely manner.

877-463-7699; www.epoxytec.com

INSIDE DROP SYSTEM ELIMINATES COSTLY EXCAVATION

PROBLEM:

Sewer drops have traditionally been constructed outside of the manhole, a technique that has proven troublesome over time. Outside drops are expensive to construct, requiring excavation down to the manhole invert elevation. Outside drops are difficult to access for inspection and cleaning, leaving them prone to clogging and failure. A failed outside drop, such as one recently encountered by a municipal utility crew in a Midwestern city, can lead to infiltration into the manhole.

SOLUTION:

The **RELINER/Duran Inside Drop System** was designed to control flow using simple, cost-effective components inside the manhole for easy installation. The system consists of a marine-grade fiberglass drop bowl that is bolted to the manhole wall. Stainless steel pipe support brackets are used to attach the drop pipe to the manhole wall. The drop bowl does not touch the incoming pipe and protrudes minimally into the structure. A flexible coupler is used to connect the drop pipe to the drop bowl, and a bend is installed at the pipe base in the manhole invert. An optional force line hood is available for high-velocity applications.

Result: The system is easy to install and allows the drop to be cleaned and inspected from above. The system can be used for main line, service connection and wet well drops, and it worked effectively in the Midwestern city. They accommodate internal drops ranging from 4 to 24 inches in diameter in a variety of different structure sizes.

800-508-6001; www.reliner.com

MANHOLE RISERS A GOOD FIT FOR TOWN PRONE TO FLOODING

PROBLEM:

Fairhope is a small city, just 15,000 residents, situated on the cliffs and shoreline of Mobile Bay in Alabama's Gulf Coast. Infrastructure maintenance can be a challenge here for all the usual reasons, and one unusual one – the city has a history of devastation and flooding by hurricane, including Hurricane Frederic in 1979 and Hurricane Katrina in 2005. But the city doesn't have a problem keeping manholes at grade after roadway resurfacing projects — not in recent years anyway.

SOLUTION:

For 15 years, Fairhope has been specifying the **American Highway Products Pivoted Turnbuckle Manhole Riser.** The risers are sturdy, flexible rings made of galvanized steel, and they can be ordered in precise diameters to match any manhole, and in precise (increments as fine as a 1/4-inch) thicknesses to precisely match paving lifts. The "pivoting turnbuckle" is an adjustable linkage that allows the risers to be set loosely in an original utility rim, then expanded with a Phillips screwdriver (used as a lever) to seat tightly and securely.

Result: At-grade risers are better for roads in many ways, compared to concrete ring replacement. They don't set low, so water doesn't collect around the manhole lid causing excessive infiltration, and they don't set high, so vehicle tires don't jar the lid and rim continually. And since risers are usually set just before paving runs, the newly raised manhole is surrounded by new, contiguous pavement, and that prevents water and freeze/thaw damage in the pavement around the manhole.

888-272-2397; www.ahp1.com

LEAK DETECTION INVESTMENT LEADS TO SIGNIFICANT DECREASE IN NON-REVENUE WATER LOSS

PROBLEM:

Privately owned and over 200 years old, the Belle Vernon Municipal Authority serves a population of just over 6,000 residents. It encompasses the Pennsylvania regions of Belle Vernon, North Belle Vernon, and parts of Rostraver and Washington townships. The water plant was decommissioned, and Belle Vernon Municipal Authority began purchasing water from another municipal authority in September of 2016. The Belle Vernon Municipal Authority services an infrastructure comprised of steel, cast iron and plastic with portions dating over 100 years old. Given the aging infrastructure, it is not surprising it was faced with non-revenue water loss as high as 50% with flows as high as 0.700 mgd. The water bills coming from the authority it was purchasing its water from were as high as $65,000 per month.

SOLUTION:

With the help of 540 Technologies, Belle Vernon Municipal Authority decided to address its non-revenue water loss through leak detection and invested in two key leak detection devices from **Fluid Conservation Systems.** Superintendent Guy Kruppa and Leak Detection Lead Foreman Rich Saxberg started with 55 **Permalog+ units** to cover the majority of the service area. When paired with the **FCS Patroller device,** these easily deployable, acoustic logger units continuously monitor leakage and transmit an "alarm" when a potential leak is located. In February of 2020, they added to their inventory by also purchasing the **TriCorr Touch Pro,** an easy-to-use, robust correlator designed to provide the best performance in traditionally difficult leak detection conditions such as plastic or large-diameter pipes.

Result: By utilizing these devices, Belle Vernon has decreased its non-revenue water loss to 13%, which saved it over $36,000 by the end of 2020's fourth quarter. Its daily flows are now averaging .326 to .360 mgd and its water bills are now averaging $22,000 a month. Following its AWWA Water Audit, the authority is focused on apparent losses, replacing old meters and mapping the assets in the water system through GIS.

513-831-9335; www.fluidconservation.com

(continued)

SATELLITE-COMMUNICATION NETWORK ENABLES QUICK EMERGENCY RESPONSE

PROBLEM:

After a drunk driver collided with two power poles in El Segundo, California, over 4,000 residents experienced power outages. Not only were residents out of power, but seven sewer lift stations were off grid. A major sewer spill in the nearby Pacific Ocean could lead to an environmental disaster.

SOLUTION:

SmartCover alerted El Segundo sewer operators with level measurements. These **alarms** allowed the city to prioritize which lift stations were critical for response. Generators and emergency pumps were then allocated to the most-needed stations. Shortly after power was temporarily restored, on-call employees were notified that another outage was detected. Other segments of the electrical distribution system were overloaded and left nonfunctional. Field crews had no access to the internet due to the power outage. Decisively, they used their smartphones to their advantage, accessing SmartCover's website to track water levels at the stations. In response, three staff members shuttled generators from station to station. The online satellite-based monitoring system enabled the employees to see which stations were in need of immediate support.

Result: The strategic decision to invest and implement SmartCover technology using a satellite-communication network enabled the city to effectively respond to an unexpected infrastructure emergency, successfully restore power to residents and back up its sewer lift stations.

760-291-1980; www.smartcoversystems.com

LARGE WATER SYSTEM CONTROLLER SEEKS LEVEL MEASUREMENT SOLUTION

PROBLEM:

The largest water system controller in Melbourne, Australia, came to Hawk Measurement Systems to help provide a level measurement solution that would assist with the water system's emergency shutoff valves. The application consisted of a tank filled with hydraulic oil (bottom of tank) and nitrogen (top of tank). The nitrogen is inserted at the top of the tank to push the oil in the line and keep the hydraulic actuator functioning properly. The system acts as an accumulator with capacity to shut off valves in the event of an emergency shutdown. As the oil level in the accumulator drops, so does the pressure. Nitrogen in the tank is initially set up with the typical operational level of hydraulic oil systems. As the system is closed, there is no need to add more nitrogen afterward.

SOLUTION:

Hawk Measurement Systems' Magnetic Level Gauge with Chamber along with the **Centurion Guided Radar Level Transmitter** was the level measurement solution to this difficult application. The level transmitters were installed to measure the level of hydraulic oil in the chambers, and they also supplied the analog output. The magnetic level gauge was selected because it provides real-time measurement for level and interface. The transmitter was selected because it's suitable for level interface measurement of liquids, sludge, powders and granules. The technology is not affected by pressure, temperature, viscosity, vacuum, foam, changes in the dielectric constant or coating of the probe.

Result: The water system controller was extremely satisfied with the outcome and the technologies and services provided.

888-429-5538; www.hawkmeasurement.com I&I

NASSCO DEVELOPS NEW SEWER SERVICE GUIDELINES

Specifications provide process standards for the sewer service industry

By Sheila Joy

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

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

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

In August of 2020, NASSCO published *Rehabilitation of Sewers Using Fiber-Reinforced Polymers*. This performance specification guideline provides guidelines and performance requirements for the rehabilitation of gravity sewers using internally bonded fiber-reinforced polymer composite systems.

In an update from the 2010 version, the new *Smoke Testing Inspection in Sewer Pipes* document provides guidance on smoke testing inspections to confirm system connectivity, identifying gravity sewer system defects that allow inflow and infiltration, locating cross-connections between storm and sanitary sewer, and locating sources for odor complaints. It also provides a permanent record of the defects, including type, location and severity.

NASSCO committees are also finalizing the following additional specification guidelines, which will be made available on www.nassco.org in the coming months:

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

All of these specification guidelines are (or will be) made available to the industry for free download. Visit nassco.org/resources/guideline-specs to browse, download and utilize these important resources.

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

Among the latest specification guidelines from NASSCO are recommendations for safely using styrene-based resins in cured-in-place pipe, which was also the topic of recent research by the Trenchless Technology Center at Louisiana Tech.

If you would like to be involved in the development of NASSCO specification guidelines, visit nassco.org/get-involved/join-a-committee.

ABOUT THE AUTHOR

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What is your primary service?

❍ Cleaning - Industrial/Waterblasting ❍ Hydroexcavation ❍ Industrial/Commercial/Municipal Services
❍ Consulting/Engineering ❍ Dealer/Distributor/Manufacturer ❍ Government/Municipal
❍ Location/Leak Detection ❍ Rehabilitation/Relining/Bursting ❍ Sewer/Drain Cleaning
❍ Sewer System Installation/Repair ❍ TV/Video Inspection
❍ Other _____

Which types of sewer, storm & water repair, maintenance & inspection do you perform monthly?

❍ Jetting ❍ Manhole Rehabilitation ❍ Treatment ❍ Pipeline Rehabilitation & Relining
❍ TV Inspection ❍ Repair/Replace Excavating ❍ Vacuum Truck Service

What is the approximate population of the area in which you provide service?

❍ 0-10,000 ❍ 10,001-50,000 ❍ 50,001-100,000
❍ 100,001-200,000 ❍ 200,001-500,000 ❍ 500,001+

How many vehicles do you currently have in service?

❍ 1-5 ❍ 6-10 ❍ 11-15 ❍ 16-20 ❍ 21+

What is your annual equipment budget?

❍ $0-$50K ❍ $50K-$100K ❍ $100K-$200K ❍ $200K-$300K
❍ $300K-$400K ❍ $400K-$500K ❍ $500K +

If municipal, what percentage of your sewer and/or water work is done by private contractor?

❍ None ❍ 1-20% ❍ 21-40% ❍ 41-60% ❍ 61-80% ❍ 80%+

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