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Luke Laggis editor@cleaner.com

Don't Stop Learning

Regardless of your position, the only way to improve is to stay hungry for education

By Luke Laggis

ducation is the foundation of all success.

I went to college. That doesn't make me smarter than my friends or those of you who didn't, but it exposed me to a lot of new things and taught me a lot about how to learn. I can remember one of my friends at the time, a guy I'd been friends with in high school, talking about how stupid college was because I was spending all that money to listen to professors talk, while he was making money and getting a jump-start that would probably keep him ahead of me forever.

I can articulate my thoughts about that a lot better now. At the time, I just thought he was an idiot. What he didn't understand was that I was gaining foundational skills to build my future. He was learning how to do a job. Both are good, but the more you learn, the greater the opportunities you'll have.

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The fact that he couldn't see the value in education was frustrating.

I was spending money and he was making it, that's for sure. But I was paying to learn from some incredibly bright and talented people. Those opportunities are invaluable.

What I see more clearly today is those opportunities don't just come at universities. They're all around us. Opportunities to learn and grow are limitless, if you can recognize them and take advantage of them. That's part of what I learned in school.

It doesn't take a master's degree to clean a sewer lateral, but being a master of anything requires a wealth of knowledge. Education is the foundation of a better business and a better life. I can push a cable down a line, but I certainly couldn't tackle the job with any degree of skill or proficiency. If you're good at your job, you've spent a lot of time gaining the knowledge and skill to get where you are.

This month's Better Business column focuses on five ways to keep learning. Taking responsibility for your education is No. 1 on the list. That doesn't mean you need to go back to school, but you can still make learning a priority. There are always new skills, techniques and business strategies to master. All can improve your business. And there are so many easily accessible resources available. The internet holds a wealth of information. Your peers can be a tremendous resource. Who better to learn from than the people who've found success in your industry? Even this magazine is a great way to stay on top of industry developments, new technology and successful business practices.

My buddy ended up doing pretty well for himself. He parlayed his well-drilling experience into an opportunity in the oilfields. But he did so because he was good at his job and found ways to continue improving. Whether you're taking classes to improve your business acumen or combing through online trade forums for insight on technical issues you face in the field, education is the foundation of a better business and a better life.

I hope you see the value in education, and that we can play a role with these stories.

Enjoy this month's issue. **c**



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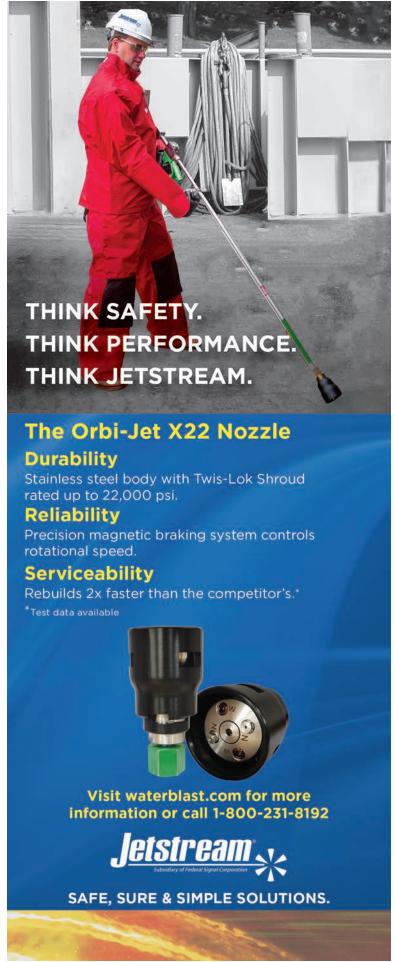


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Conquering the Company **Vehicle Conundrum**



and editor in Racine. Wisconsin

Watch out for the tax consequences of sending your service fleet home with your employees

By Erik Gunn

oes your sewer cleaning business have a fleet of company-owned service trucks?

Dumb question! Of course it does.

Do you cover a sizeable territory — larger than a small town, say? Chances are pretty good the answer to that is "yes," too.

And do some of your employees drive their service trucks home after work — at least sometimes — so that the next morning they can drive straight to the day's first job without stopping at the shop?

If your response is another "yes" — well, no surprise there. Especially if your business reaches beyond your city limits, or even crosses county lines, and if your workforce is just as far flung as your customers, that sounds like a commonsense practice.

TAX IMPLICATIONS

Say that your technician lives 15 miles away in the next town and the first customer on tomorrow's calendar lives in that very same community. Isn't it smart scheduling to send Frank to that homeowner right away with a fully stocked truck?

If your tech doesn't first have to drive to the shop, get his service truck, then drive back, he could be at the customer's home up to a half-hour earlier. It can be a great way to save your customers money and time, and help your business maximize the number of service calls you can make in a day.

Many contractors may take this practice for granted. If you're one of them, pay close attention: You need to make sure you're doing it right so that the IRS doesn't come back to bug you.

Yes, it's an obscure problem, but that doesn't make it any less real. As with many wrinkles in the tax code, what you don't know can hurt you.

On the bright side, careful but fairly straightforward recordkeeping can solve the problem without dropping the basic practice.

DEDUCTIBLE OR NOT?

Tax attorney Patricia Hintz, a partner at Quarles & Brady in Milwaukee, counts many small businesses among her clients, and small-business ownership runs in her family.

Hintz was explaining the broader tax issue of how company vehicles get used day to day when this specific subject came up. "Vehicles are a real hotbutton issue," she says. Company fleet vehicles are no exception.

Whether we're talking about a company-owned vehicle or a private vehicle that an employee uses on the job, issue No. 1 is this, says Hintz: The only taxdeductible miles are the ones driven for work. Commuting miles don't count.

A simple example: Suppose you, the business owner, drive a car owned by your company. During the day you drive it to meetings with clients, to check on your work crews at their job sites, and more.

All those on-the-job miles are legitimate business miles. They qualify for a deduction on your business federal tax return. (The same is true if you don't have a company car but simply make those trips with your personal vehicle; the only difference is that the deduction for the mileage would be made on your personal income tax return — not the one your business files.)

But some miles you drive every day aren't deductible — either in the company car or in your personal car: the miles you commute back and forth from home to work. IRS rules treat those as personal miles.

SERVICE COMPLICATIONS

See how this can get complicated with service fleet vehicles?

Suppose your next-town-over employee drives a service truck home from the shop at the end of every day, and drives back to the shop first thing every morning.

Those are commuting trips. Your company can't treat them as business mileage even though they're driven in your business service truck.

But remember — one of the reasons you and many service contractors permit employees to drive service vehicles home is so they can go straight to that first job — and, in all likelihood, home from the day's final job.

In that case, the very first leg of the day from the employee's house to the first customer's location should be counted as commuting miles and therefore not tax deductible for your business (the truck's owner). The same is true for the last leg of the day: The miles driven from the last customer to the employee's home are nondeductible commuting miles.

All the other miles in between, from the first customer to the shop to every other job of the day and to the last customer, are legitimate, deductible business miles.

So you need to make sure that your employee differentiates between those first and last nondeductible commuting legs and all the other deductible travel during the day in performing the job.

OTHER COMPLICATIONS

But here's another wrinkle: The gas that the tech uses to drive from home to work and back every day. If you're not charging the employee for it, that's a form of income that must find its way onto your employee's annual W-2 form come tax time.

You could charge it back to your employee, but do you really want to send a message that makes you, the boss, look money-grubbing? Psychologically, if for no other reason, it's better just to add it to the employee's income statement. It's probably easier to manage your records that way, too.

A bigger headache can arise when employees make personal use of the

company vehicle on their own time. If you don't capture those costs, they risk turning into a black hole. And once again, they need to be included in the employee's income statement.

Mileage records are essential for those nonbusiness uses, Hintz advises. Better yet, set strict rules on how employees use the vehicle off hours.

Still another complication involves on-call policies. For an employee who is on call overnight and so drives the service vehicle home, that might not count as commuting, Hintz notes. The key will be exactly how your on-call responsibilities are worded, among other things.

Ultimately, you'll need to consult with your lawyer and tax professional to draw up clear policies and procedures about how and when your employees take your service vehicles home.

Make sure there is clear recordkeeping and consistent application of the rules. And make sure you keep good records. Numerous smartphone apps can keep personal or business mileage records. If your techs use smartphones on the job, it's worth investigating which of these tools might best help your business easily keep records and transfer them to whatever form you need for your annual business tax return.

By taking care to cross those t's and dot those i's, you can reap the benefits of flexibility and efficiency that comes with enabling employees to take service trucks home for a legitimate business purpose.

And you can do so without getting tied up in tax knots. **c**

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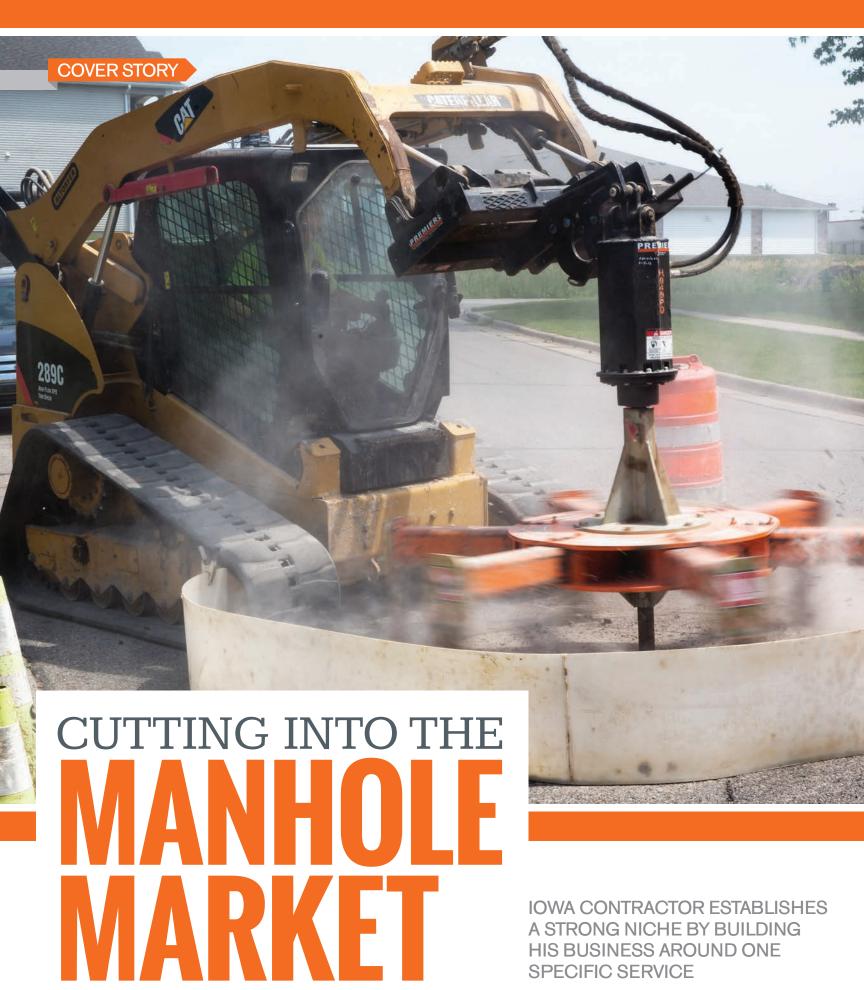
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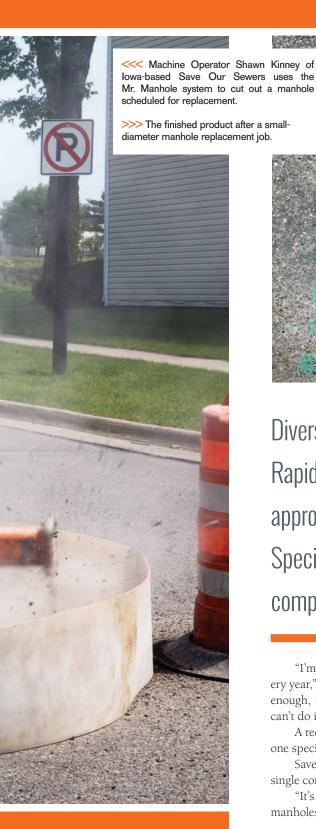


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IOWA CONTRACTOR ESTABLISHES A STRONG NICHE BY BUILDING HIS BUSINESS AROUND ONE SPECIFIC SERVICE



BY KYLE ROGERS

PHOTOGRAPHY BY SCOTT MORGAN



Diversification drives growth for many companies, but Cedar Rapids, Iowa-based Save Our Sewers has taken a different approach. The company focuses on one service, and does it well. Specializing in manhole rehabilitation hasn't hindered the company's growth. Instead, it's quite the opposite.

"I'm now doing about 10 times the revenue I was doing in year one. Basically my business has doubled every year," says company owner Brad Steenhoek. "It's still kind of a new market and now that I've been in it long enough, I'm probably one of the lowest-cost operators out there with the highest capacity. A lot of people still can't do it at our prices because of how we're set up."

A recent job in Ames, Iowa, shows how much Steenhoek has been able to grow his business by focusing on one specific — but much needed — service.

Save Our Sewers has been doing work in Ames since 2010, but beginning in the fall of 2015, the city had a single contract that called for rehabbing 650 manholes, both on roadways and grassy areas.

"It's by far the largest we've taken on," Steenhoek says. "We'd done projects before where it was 100 to 200 manholes, but never 500-plus."

BRANCHING OFF THE STIMULUS

Steenhoek started Save Our Sewers in 2010, but he was already familiar with the industry, having sold utility products like concrete pipe and precast manholes going back to 2002. That background helped him notice the opportunity that arose when the American Recovery and Reinvestment Act was enacted in 2009. Municipalities geared up to spend the extra dollars on infrastructure rehab projects, and Steenhoek says he thought it was a good time to stop selling new products and establish a service business instead. At that time, he hadn't yet planned on developing a niche with manhole rehab specifically. He just knew rehab was the direction to go.

"Having worked with DOTs and various cities, I knew a lot of the work was going to be redoing existing infrastructure rather than building things from scratch, and that's why I got out of what I was selling. There was going to be more retrofit work than new projects," he says.



TO QUIT THEIR DAY JOB DOING SOMETHING
LIKE BUILDING HOUSES AND GET INTO THIS,
THEY'RE GOING TO LEARN A LOT REALLY FAST.
WORKING IN THE PUBLIC SECTOR IS
COMPLETELY DIFFERENT THAN WORKING
IN THE PRIVATE SECTOR."

Brad Steenhoek

The same month the stimulus package was signed, Steenhoek attended what is now called the Water & Wastewater Equipment, Treatment & Transport Show in Louisville, Kentucky.

"I truthfully went to Louisville trying to find something that was different than what everybody else was doing," he says. "I went to that show with a checkbook and line of credit, and determined what I wanted to do."

It was at that 2009 show that Steenhoek had his first exposure to the Mr. Manhole rehab system and realized that might be the niche he was seeking.

"Everyone has manholes and everyone has issues with them," he says. "Companies that are mainline rehab contractors typically do not do structural rehab work, so I knew manholes were pretty much a slam dunk. With the stimulus and all the mill and overlay work that would be occurring, there would be a big need for manhole rehab on the chimney area."

Following the show, Steenhoek spent several more months doing research, eventually purchasing the Mr. Manhole system and the rest of his equipment later in the year. By February 2010 he had incorporated as Save Our Sewers.

CHALLENGES OF NICHE WORK

Although Steenhoek knew there was a big opportunity in manhole rehab, there were still challenges getting his young company established.

"Having all your eggs in one basket and being a highly specialized contractor, the biggest challenge was that a

lot of my potential customers were self-performing this work with their own crews and equipment. My competition was basically my customers," he says. "I had to prove to them that I could do it better and at a lower cost than what they could."

Steenhoek spent a lot of time in the beginning on education, doing demonstrations of the Mr. Manhole method for municipalities and engineering firms to show them how reliable and cost-effective the system could be. Over time he gained a foothold in the market.

"There are a lot of municipalities now that have seen the Mr. Manhole tool, and they've seen the rebuild process and the materials that go along with it," he says. "It's sometimes the only thing they'll allow because it's a standardized process with good raw materials. There was no standardization with how a lot of these guys were doing it before. It was just find whatever you can in the back of your pickup truck, throw it on the ground and pour some concrete or asphalt around it."

ABOVE: The Mr. Manhole system makes a circular cut through the pavement around the manhole with a dry-cut saw that runs on a standard skid-steer or track loader.

>> RIGHT: Company President Brad Steenhoek cleans up the last bit of loose material around a manhole before raising it back up to grade.

SAVE OUR SEWERS

CEDAR RAPIDS. IOWA

FOUNDED: 2010 OWNER: Brad Steenhoek

EMPLOYEES: Six

SPECIALTIES: Manhole rehabilitation WEBSITE: www.saveoursewers.com



The Mr. Manhole process uses a dry-cut saw that runs on a standard skid-steer or track loader. It cuts a circle through the road surface surround-

ing the manhole frame and is able to cut from 44 to 58 inches — 28 to 72 inches with the aid of adapters — up to 48 inches deep. The cylinder strength of the ready-mix pour is all that is needed once the manhole is rebuilt.

"Round holes are a structurally superior design versus a square cut around these manhole frames and covers, and it uses less material and looks better," Steenhoek says. "You do the work and you pour it. There are no internal chimney seals, no epoxies or coatings. It kind of sells itself. Once an engineer sees it, it's an attitude of, 'Wow, where has this been? Why isn't everybody doing it this way?'"

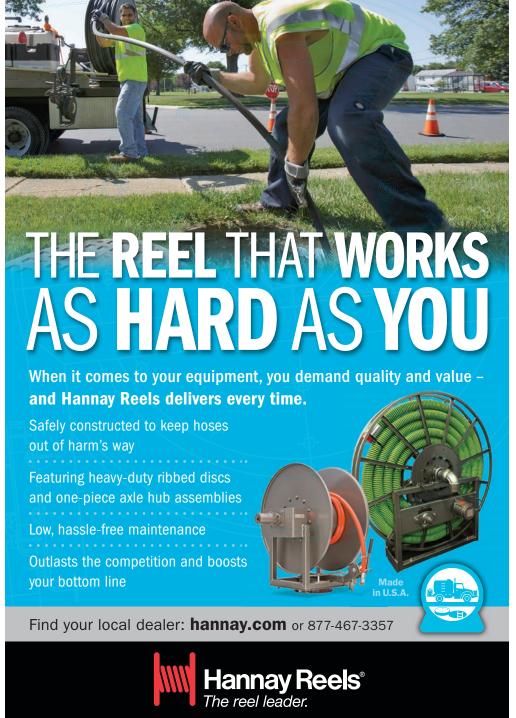
Since that initial startup and education phase, Steenhoek has largely relied on repeat business. He has established relationships with firms that regularly use him as they move among various communities to do projects.

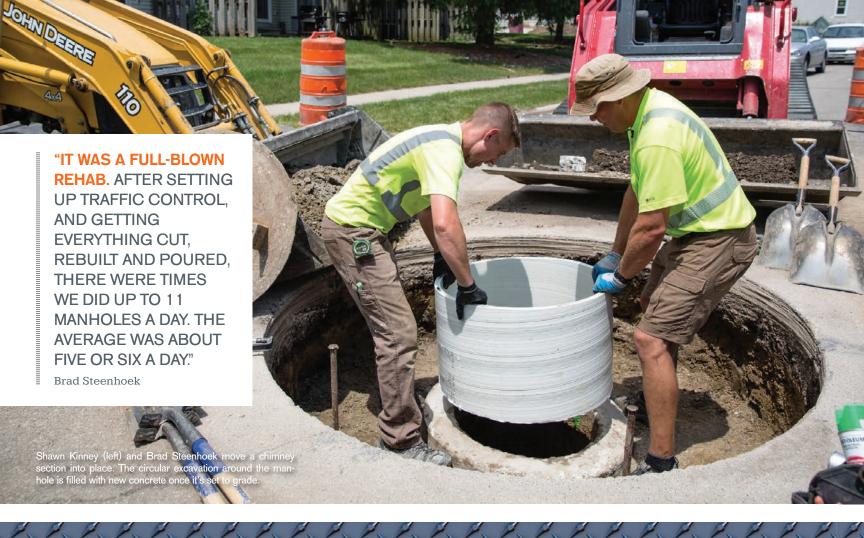


"They take the specs and just apply it to the next community," Steenhoek says. "It's been a sort of snowball effect where I started off small, but now I'm having a hard time just keeping up with the work that specifies Mr. Manhole."

Mr. Manhole isn't the only process Save Our Sewers employs, but Steenhoek estimates that it ends up handling about 90 percent of the company's workload.

"All of my men are PACP, MACP and LACP certified. When we open up the lid, we already know what's allowed in the project specs and then we can determine the best rehab method based on the NASSCO training we all have," he says. "The only thing consistent in this business is how inconsistent every manhole is put together. There are no two manholes alike."







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WORKING IN THE PUBLIC SECTOR

Establishing a business solely around public sector clients has also proven challenging in certain ways for Steenhoek.

"This is an emerging market but, like anything, there's a learning curve," he says. "If there are guys thinking they're going to quit their day job doing something like building houses and get into this, they're going to learn a lot really fast. Working in the public sector is completely different than working in the private sector. Having a good background with municipalities and utility work and utility products going in helped me a lot."

The primary challenge, Steenhoek says, is maintaining consistent cash flow.

"Getting paid can be hard when you're dealing with city councils and mayors. The cash is definitely slow. You're lucky to see your money in 60 days," he says. "It takes a large line of credit to operate off of, which is kind of scary. There are months where I have \$300,000 out there. I'm paying help, I'm paying suppliers, I'm paying bills, I'm paying for rooms and per diems. It is what it is. You get to the good summer months and you're running a lot of overtime and a lot of payroll. It doesn't take long to spend a couple hundred thousand dollars."

That's why Steenhoek says he's careful not to grow beyond what the current market climate allows. He borrows money, adds equipment, and hires more employees alongside the amount of work available to bid on. And he makes sure the company is in as good a position as possible to win those bids.

"The big thing is you don't want to lose opportunities," he says. "From the bid standpoint, you have to know the specifications and what the engineers are learning, and be able to adapt to all that."

The cash flow situation has also made it important for Save Our Sewers to stay busy year-round despite providing a service that isn't always winter-

STAYING ON TOP OF CHANGE

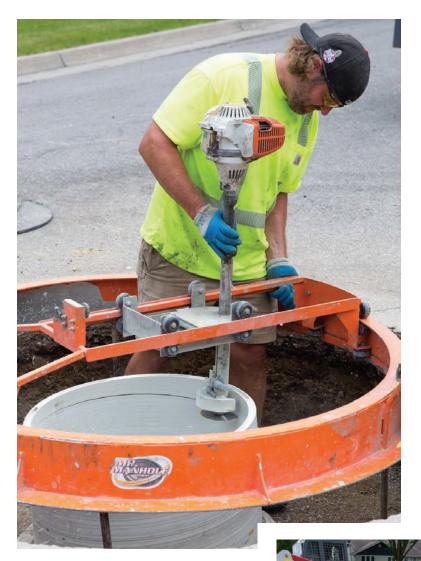
When Brad Steenhoek attended his first Pumper & Cleaner Environmental Expo (now the Water & Wastewater Equipment, Treatment & Transport Show) in 2009 in Louisville, Kentucky, he was specifically looking for something he could turn into a startup business in a largely untapped market. He found it in the Mr. Manhole rehab system.

Now Steenhoek has a strong and growing business with Save Our Sewers, but he still attends the WWETT Show every year with the same intent he had in 2009.

"The industry is changing so fast. There are so many different products and new tools out there. You almost have to go out there once a year just to keep current on all of it," Steenhoek says. "I go to the show to keep up to speed with the latest and greatest technology. We also do a lot of training through the show as well with the classes. A lot of the engineers at WWETT are trying to find solutions to their known problems, so you have to keep up on all of it."

Steenhoek and his crew members also keep up on confined-space entry training, their NASSCO certifications on PACP, LACP and MACP, and trainings through their primary vendors, Mr. Manhole and Cretex, to stay established as certified installers for those products.





ABOVE: P.J. Hachey cuts the top of a concrete chimney to the proper height before attaching the cast iron ring

>>>: P.J. Hachey (left) and laborer Max Rosener move the top of the new manhole into place with Brad Steenhoek watching.

friendly in Iowa. To do that, Steenhoek looks for opportunities to travel for work outside the usual service area (about a 250-mile radius around Cedar Rapids) where winter weather doesn't have as much of an impact on manhole rehab.

"It's usually January through March 1. That's normally when I look to travel, when there's snow on the ground," Steenhoek says.

For example, in February 2012, he spent two weeks in Geelong, Australia, because of his connections with Mr. Manhole.

"We were setting up installers over there and a distributor network, and got them going with equipment and training, and actually went out and did some work. Mr. Manhole handled the equipment side of things, but we were the ones who went over there and added the human element to everything," he says.

BIG PROJECT IN AMES

The Ames contract the company took on in October 2015 showcases how much Save Our Sewers has been able to benefit from focusing solely on manhole

"THE CIPP GUYS, ALL THEY WANT TO DO IS CLEAN AND LINE BETWEEN MANHOLES. AND THEY SUBCONTRACT OUT ALL THE VERTICAL STRUCTURE WORK, I REALLY DON'T WANT TO GET INTO THE MAINLINE LINING BECAUSE I DON'T WANT TO STEP ON THEIR TOES AND I DON'T WANT THEM GETTING INTO WHAT I DO." Brad Steenhoek

rehab. Aided by past experience using the Mr. Manhole method effectively in the city, Steenhoek was the choice when officials decided to do a large-scale project.

The contract called for 421 roadway manholes and another 100 in grassy areas. Thanks to a fairly mild winter that didn't have too many workdays missed due to snow or rain, Save Our Sewers had the contract wrapped up in May. And Ames extended the contract when Save Our Sewers came in under the bid amount because of savings on concrete use.

"Because of the savings of going circular versus a rectangle or square structure, we were way under on our concrete usage," Steenhoek says. "We saved about \$200,000, so they extended it from the original bid quantity and we did about 650 manholes when it was all said and done."

The complete project finished at the end of June, well under the yearlong timetable Ames officials wanted to adhere to. Save Our Sewers ran two threeman crews with Steenhoek working between them. The Mr. Manhole method was used, as well as other processes and systems like chemical grouting, the Pro-Ring from Cretex Specialty Products, and Riser-Wrap (GPT Industries). East Jordan Iron Works out of Michigan supplied manhole frames and covers.

"It was a full-blown rehab," Steenhoek says. "After setting up traffic control, and getting everything cut, rebuilt and poured, there were times we did up to 11 manholes a day. The average was about five or six a day."

THE FUTURE

Save Our Sewers doesn't currently have any plans to expand beyond the manhole rehab business. Steenhoek says he's still growing steadily with his sole service offering, and he also doesn't want current allies suddenly turning into competitors.

"The CIPP guys, all they want to do is clean and line between manholes, and they subcontract out all the vertical structure work," he says. "I really don't want to get into the mainline lining because I don't want to step on their toes and I don't want them getting into what I do."

In addition to the manhole rehab specialty providing Steenhoek a solid livelihood, he views it as his way to practice environmental stewardship.

"There's a lot of work out there between the EPA and the DNR, and all the water-quality studies that are going on basically from the Gulf Region up to the

Mississippi River watershed," Steenhoek says. "In Iowa, we have a huge nitrate issue with fertilizer runoff, so there's a big push to clean up the waters. It's the whole country, and we're trying to do our part to make it a better place." c

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A Productive Equation

Investment in custom-built vac truck adds up to better efficiency and higher customer satisfaction

By Ken Wysocky

nvesting in a custom-built vacuum truck dedicated primarily to just one customer might sound like a gamble to some drain cleaning contractors. But it made perfect sense to Greg Franklin, the owner of Franklin Sanitation LLC in Huron, Ohio — once he did the math.

The calculation worked like this: It usually took Franklin Sanitation four employees and two trucks to clean out clogged drainlines at the dozens of restaurants located at a large, 364-acre amusement park situated about 10 miles northwest of Huron. One truck pulled a trailer-mounted water jetter. The other was a vacuum truck that sucked up sewage emerging downstream from the jetting point.

But Franklin figured that using just one truck and only two employees would add up to significant savings for both his company and the customer. First of all, it would free up the other two technicians to service other clients and generate additional revenue. At the same time, he'd reduce expenses for the customer, creating incalculable goodwill. Moreover, if the unit had more vacuum power, the employees could work faster, no longer stymied by periodic losses of pressure and the subsequent wait for the system to build up vacuum again.

The solution came in the form of a customized vacuum truck assembled by Allied Tank. Built on a 2006 International chassis, the unit features a 2,500-gallon debris tank made by Progress Tank, a Demag pump, a 400-gallon water tank, a high-pressure water jetter made by US Jetting (4,000 psi at 18 gpm), 500 feet of 1/2-inch-diameter water hose, and 140 feet of vacuum hose.

The 4018 water jetter is typically a trailer-mounted unit. But Franklin wanted a high-pressure jetter mounted on the truck for two reasons. First of all, the toolbox jetters typically found on vacuum trucks are under-powered for the amusement-park jetting. Second, trailers are too cumbersome to work with, especially on the grounds of this major amusement park, with its tight quarters and throngs of customers.

"I've never gotten along with trailers that well," Franklin says. "They're a pain to hook up and unhook, so I asked them to mount the jetter on the



Franklin Sanitation's customized vacuum truck assembled by Allied Tank has provided profitability gains by allowing the company to serve one of its largest customers with a single truck and only two crew members, where it used to take two trucks and a crew of four.

OWNER: Franklin Sanitation LLC, Huron, Ohio

MACHINE: Custom-built vacuum truck on a 2006 International chassis

FUNCTION: Cleaning clogged drainlines

FEATURES: 2,500-gallon debris tank made by Progress Tank (owned by

Wabash National Corp.), Demag pump (500 cfm), 400-gallon water tank, high-pressure water jetter made by U.S. Jetting (4,000 psi at 18 gpm), 500 feet of 1/2-inch-diameter water hose, 140 feet of vacuum hose

WEBSITE: www.franklinsanitation.com

PRICE: \$130,000

truck. I also wanted a more powerful jetter because my guys are used to operating stronger jetters and they open lines more easily."

In most cases, a 500 cfm pump might be considered oversized for a 2,500-gallon tank. But it fits the company's needs to a T. "I was told it was overkill," Franklin notes. "But before, we'd have a lot of open-hose time because it would run out of vacuum and start sucking air. Now there's much less chance of the pump losing its prime. It almost never sucks air, and if it does, we don't have to wait very long to get the vacuum back. It's a pretty good-sized pump for that size tank."

In early March, Franklin Sanitation gets access to the park to clean all of the drainlines before the park opens. But despite that, clogs still occur nearly every day in the dozens and dozens of restaurants that dot the park grounds. "Once the park opens, I think those kids (seasonal restaurant workers) think the drains are a basketball hoop," Franklin guips. "We find straws and cups and everything you can think of in those lines. They take off the drain covers when they sweep the floors. ... It's easier to push stuff down the drain than put it in a wastebasket."

When the company first started servicing the food outlets' drainlines roughly 20 years ago, Franklin says "drain crud" would often back up into kitchens if the jetting was performed without vacuum. "Then we'd have to call two guys in from the field and have them bring in the tank (vacuum) truck. By that time, the park was usually open and there'd be a big mess in the kitchen. And no restaurateur likes it when you back up their sewer and make an even worse mess.

"Now we come in there and we're not afraid to remove the grease clogs and vacuum things up at the same time," he concludes. "It makes our work a lot easier, plus we cut the park's expenses."

But doesn't that mean the company is losing revenue? Not necessarily — call it addition by subtraction. "If you make your customers happy, they'll call you for more work," he notes.

In the 10 years since Franklin bought the truck for \$130,000, he says it has more than paid for itself. And when he replaces the truck, which is now reaching the end of its life cycle, he plans to configure the new one pretty much the same way. Why? One truck instead of two. Two employees on a job instead of four. Significant decreases in customers' expenses. It all makes sense if you just do the math. c

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5 Ways to Keep Learning

Education helps everyone benefit by reaching their personal potential and attaining company goals

By Walt Grassl

hink you know all you need to know about mainline inspections, vacuum trucks or CIPP lining? Many skilled people feel they don't have anything new to learn in their chosen field, but as soon as you start thinking that way, you start falling behind.

Having employees who will improve themselves over and above companysponsored training is critical to a business that wants to innovate and improve.

Eleven years ago, Ben got a summer job working in the mailroom at a local business before he started college. The company had been in existence for over 60 years and was run by Jack, a longtime employee and company legend who started in the mailroom. Three weeks into the job, as Ben was on his way from the basement to the top floor, the elevator stopped and who should enter but Jack. He smiled at Ben, introduced himself, and mentioned that he had started out in the mailroom. As they exited the elevator, Ben asked if Jack had any advice for him.

"Never stop educating yourself," he said. "In fact, come into my office and let me elaborate. I have 15 minutes before my next meeting."

Jack proceeded to share these five principles for continued education:

1. Take responsibility for your education.

You alone are responsible for your education. Whether or not it makes sense to invest in a formal education, there are free and for-fee learning opportunities available to everyone. The public library and the internet are two examples.

Another invaluable source of education is people. Spend time with those who can do things that you can't. It may mean volunteering to stay late to observe someone, shadowing more experienced employees, or finding a mentor.

You can also learn by taking on challenging projects or tasks that are above your skill level. Discuss help you will need to be successful and your boss may reward your initiative by providing an experienced staff member to oversee your on-the-job training.

You can learn pretty much anything if you work hard at it.

2. Don't expect entitlements.

Time in service should be no guarantee of advancement in a successful business. It is what an employee learns with his or her experience that determines the value of the service time. In other words, if you put in your time, you are guaranteed nothing.

As your time with the company grows, seek lateral transfers or increased responsibility without necessarily a corresponding increase in title or pay. Realize you are making yourself more valuable to your employer, and view growth assignments as an investment in yourself.

Although we live in a time of an increasing sense of entitlement, we must all take care of ourselves.

3. You can't rest on your laurels.

Many employees feel that they do not have anything new to learn, and they become complacent. They decide they don't need to put in any more effort and stop striving for success. When you reach a goal, celebrate your success, but then identify your next goal and begin to take action. When you stop moving forward, you are actually falling behind all the others who continue to move forward.

4. Stay current.

You need to stay up to date with industry trends by reading industry literature and blogs. If you are seeking or moving into a management position, read leadership books and blogs. New trends are frequently entering the workplace. You have a choice: be aware of and lead the change, or try to catch up — or, worse, resist the change.

Joining industry and trade associations is another way to become educated on current trends.

5. Respect generational differences.

A big issue in many industries is getting several generations to work well together. Each generation has different learning and working styles. You have several options for handling this reality. The first is to do nothing since it's your fellow employee's responsibility to get with the program. Or you can leave it to the business' leadership to implement a program that will fix the problem. The better choice is to educate yourself on the differences between generations, the issues these differences bring to the workplace, and things others are doing to address the issues.

You can use this information to change how you interact and, to the extent you can, help your company improve its processes.

What happened with Ben?

Ben took Jack's advice to heart. After graduating from college, he got a job with another company in another field. His education did not stop when he left school. He subscribes to industry and management blogs, has joined his industry association, seeks out challenging assignments and develops relationships with other successful employees at his company. He has been identified as a high-potential employee and is one of the youngest employees at his level. Ben's future is bright. It's amazing what a chance encounter in an elevator can do. c

ABOUT THE AUTHOR

Walt Grassl is a speaker, author and performer who hosts the radio show, "Stand Up and Speak Up," on the RockStar Worldwide network. For more information, visit www.WaltGrassl.com.

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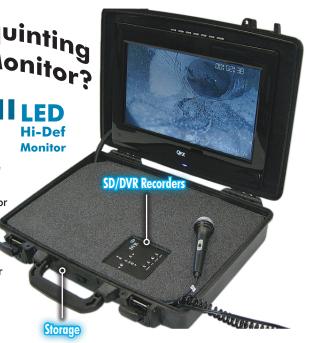
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BY MARIAN BOND

PHOTOGRAPHY BY JULIA RENDLEMAN

ENRICHING THE GULTURF

A FOCUS ON CREATING A GOOD CULTURE AND EXPANDING IN A CONTROLLED, THOUGHTFUL MANNER HELPS FAMILY BUSINESS PROSPER

amie Miller, vice president of Miller's Septic Service, has set high standards and lofty goals for the company his grandparents formed in 1973. He is also reshaping the culture and management style of the Gloucester County, Virginia-based company in order to perform at a higher level, expand the customer base, and take care of their employees.

Located in the historical area around Jamestown, Richmond and Williamsburg, Miller's Septic Service serves a mix of rural and urban homes, some on septic systems and some on city sewers. The customer base is heavily residential, and while commercial work represents only 25 percent of the client base, it makes up a larger portion of revenue.

The company does a lot of work for the College of William and Mary, and the military, as the Army, Navy, Air Force, Marine Corps and Coast Guard all have major facilities in the area. Miller says they cover about half the state, including the Northern Neck, Middle Peninsula, Virginia Peninsula, the Southside of Hampton Roads area of and all around the surrounding region of Richmond. They travel a radius of about 75 miles.

The area is among the oldest in the country, and historic structures stand next to newer developments, with everything from Orangeburg and terra-cotta pipes to cast iron and asbestos cement in the ground. Infiltration problems are common, and they frequently find bad joints and broken pipes, particularly in those older systems. Roots are another regular problem, thanks to the abundance of maple and weeping willow trees in the region.

GEARING UP

"The year 2002 was an interesting time in our business," says Miller, who came on board full time in 1999. "I was able to buy into the company from my grandmother, Udell Miller, and we formed the company as a corporation. We began looking at new technologies and recognizing the opportunities for growth, which allowed us to expand on drain cleaning and grow the plumbing services.

"We had a jetter installed on one of our pump trucks, which was an immediate plus for us. Prior to this we had snaked sewer lines and did some minor flushing, and snaked drains inside the house."

The company is currently running a 2000 Vac-Con on an International chassis with a three-stage blower. They also have a Spartan trailer jetter that produces 3,000 psi/15 gpm. Two of their three pump trucks now have jetters, which are essential for both drain cleaning and septic work.

In addition to the Vac-Con and the three pump trucks, Miller's runs 10 service vans, primarily Chevrolet and GMC. Miller says they usually get over 200,000 miles on service vans, and he has one in service with over 300,000 miles that's still running very well.

For excavation they have a Kubota and a John Deere 120.

"We have a small jetter on one pump truck from Abernethy, and we have a pump truck by Lely with their jetter," he adds.

"Jetting gives so much more capability for cleaning drains," he says. "You're not just clearing the line with a snake; with the jetter you clean the line. We also have the capability to pressure wash and clean the drainfields. When we are asked to camera a line we







SO MUCH MORE
CAPABILITY FOR
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YOU'RE NOT JUST
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THE JETTER YOU
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Jamie Miller

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Service manager Kevin Blasing (left) shows plumbing apprentice Hunter Gardner (center) and pump truck driver David Allsop how to properly inspect a wastewater line.

want to clean it first. Running a snake through, whether a push or electric snake, does not really clean and you won't get a good picture of the problem when you use the camera."

The company does a small amount of work in larger sewers, but usually they sub out larger inspection projects.

For residential and small commercial work, the Miller's

crew relies on RIDGID SeeSnake cameras. The customer base is familiar with the concept of CCTV inspection and typically understands when there is an additional charge for putting a camera in the line or jetting. The camera is essential for inspecting lateral lines and finding tanks. Additional charges depend on the conditions and issues on each job.

The company does dig-and-replace sewer line work, and when pipe bursting or relining are called for they act as a general contractor and sub the specialty work out. They also install septic systems.

When it comes to pipe bursting and relining, Miller is content to continue subcontracting that work because he doesn't want to blur the company's focus. He wants to concentrate on sewer and drain cleaning, and grow more into plumbing and electrical, as well as HVAC.

"I want to be a full home service company," he says. "I see pipe bursting and relining as more specialty and an area that would require a lot of attention. I don't see it as a profit center. Plus, we have companies nearby who specialize in those technologies, and do not offer any of the basic services we provide. Additionally, we are able to come in and do some of the excavation and plumbing work on certain jobs. In those situations we will work on occasion for that contractor. However, we typically retain our customer and act as a general contractor. It all depends on the job and arrangement."

Some of their drain cleaning vans carry plumbing equipment and tools. Miller wants to up that level of inventory as they move forward, but sewer, drain cleaning and septic work still create the biggest demand on a daily basis.

He plans on expanding the plumbing part of the business, which now represents approximately 25 percent of revenue. At this point in time they offer a full service list including installation of new faucets, showers, toilets, water heaters, and other service work as they evolve and expand.

"Outfitting for plumbing is something we need to improve," he says, adding that they have a warehouse and can also access wholesalers for any supplies or equipment they need.



Michael Johnson jets a wastewater line at a residential property in Weems, Virginia.









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A LIFE OF SERVICE

As the third generation of the James Miller family, Jamie Miller has the challenge of maintaining the company's image and reputation while staying open to change and growth to meet a modern-day business climate and culture.

After working in Miller's Septic Service for years as a youngster, and joining full time in 1999, Miller developed a vision of growth, and he has been determined to stay on subject and develop a true profit center, while relying on subcontractors for certain services that fall outside the company's focus.

After 16 years striving for his goals, Miller is finding dayto-day satisfaction in being able to help people who are having difficulty.

"It's good to make money," he says. "Everyone wants that. But I want us to contribute to the livelihood of our employees. I have come to realize and understand that the reason I was put on earth was to serve my family, my employees and customers, but it has taken a while to figure this out. I've spent a lot of time in these last two years soul searching what I'm here to do and it is to help people."

Miller has been talking regularly with a mentor and in a group to reach a better understanding of who he is and what he wants to accomplish. His vision is to grow the company to a \$50 million firm, providing a full stable of services that can meet the customers' every need.

"This is to provide more than just a job for my employees," he says. "I want to build a way for them and their families to get ahead in this life and provide that higher level of service for the customers. We want those customers to love us for what we do for them."

A HIGHER GOAL

Miller says the company weathered the recession fairly well. The company actually grew over that period but stopped spending money on major purchases unless it was essential.

With all that in the rearview, Miller has set his sights on growing the company into a multimillion-dollar firm providing a full menu of services, from sewer and drain cleaning and repair, to plumbing, HVAC, electrical, septic and general contracting.

"TWO YEARS AGO I WOULD HAVE DESCRIBED MYSELF AS A DICTATOR. WITH EXPERIENCE I BELIEVE I HAVE BECOME A BETTER LEADER. AND THAT FITS INTO MY VISION OF GROWING THE COMPANY." Jamie Miller

The company currently has 30 employees, with 20 technicians working in the field. In most cases, the technicians specialize but can cross over if the workload dictates.

"My pump truck drivers will do drain cleaning, and our plumbers will do drain cleaning, and some can do electrical," Miller says. "Because we are so diversified we need to be able to move them around as required. Some of our installation guys can do service work on occasion."

In the hiring process they do the standard drug and background checking, and Miller believes they have learned how to recruit and hire more successfully.

"One industry comment says you 'hire slow and fire fast.' I'm not saying we always act that way, but it is something we are starting to do more," he says.

Training is primarily in the field, and will be from 60 days up to six months working with one of their more experienced technicians, depending on the candidate. They take into consideration the experience and capability of the new hire.



Kevin Blasing (left) and David Allsop trace the lateral line from a cleanout outside a customer's home.

Sometimes the candidate will be hired for a specific portion of the work, but they will sometimes find more talent in a different area that may be better for the technician and the company.

SHIFTING GEARS

Miller says he is re-evaluating their company culture and would like to give his technicians more authority in the field to make those on-the-spot determinations.

"Early on I think it was probably a failure of mine because I didn't give enough authority," he admits. "Now we are working on that point. We are doing up-front pricing, which gives the tech in the field the authority to make more decisions on the work site. We are going to support them, but not micromanage.

"We are putting in place a better way to let our technicians know how they are doing. Not with a formal review but with a scorecard for each employee where we can highlight what is expected and how that individual is performing in their areas of expertise. It will give a different kind of job description with some key performance indicators. This is something just coming together for us. Still in the planning stage."

Miller says that he is evolving as a leader and owner.

"Two years ago I would have described myself as a dictator," he says. "With experience I believe I have become a better leader, and that fits into my vision of growing the company.

"I have come to the conclusion that you don't have to be so heavyhanded, and that will in the end give the individual employee more confidence in their ability and themselves." c

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Show Your Credentials

Pipeline certification can provide a good boost to both your knowledge base and your business' bottom line By Doug Day

ince first implemented in 2002, the Pipeline Assessment Certification Program has become the accepted method for municipalities, contractors, consultants and manufacturers to record and track sewer pipe defects, assess condition of infrastructure, and plan for sewer rehabilitation or replacement. It is also being used as a benchmarking tool in stormwater systems, dams and levee pipe systems.

PACP was developed by the National Association of Sewer Service Companies with assistance from the Water Research Centre in the U.K. to provide a consistent and standardized sewer pipe evaluation method and a management tool for the collection of CCTV data. "PACP is very widespread now," says Lynn Osborn of LEO Consulting, technical director at NASSCO. "Many municipalities and sewer districts require it for the CCTV of their sewers"

Jim Aanderud, president of Innerline Engineering in the Greater Los Angeles area, was one of the first to be certified in PACP. While he no longer maintains his certification, the company has eight staff members who do. He says around 80 percent of their pipe inspection customers require PACP and that is increasing every year.

Aanderud says it's a lot different than the days before PACP. "Every operator would see an observation in the pipe and make their own judgment about what to call it," he recalls. "You might have 10 people with 10 different opinions about how to name it, so it didn't necessarily make any sense to the end user. Now, I can send two different operators to the same job on different days and they're going to be labeling things similarly. And if the client brings in a different contactor, there is similarity in the information and reports."

NASSCO Executive Director Ted DeBoda adds that PACP is used throughout the U.S., taught by the Canadian Standards Association and CERIU, the Quebec urban infrastructure organization, and is now being taught in South America.

"PACP is a foundational component to NASSCO's mission to set standards for the assessment, maintenance and rehabilitation of underground infrastructure," says DeBoda. "Certification is an important step in the career of operators, engineers and anyone involved in assessment of underground infrastructure. Many, if not most municipalities, specify PACP for doing CCTV inspections of their pipelines, as well as manhole inspections and lateral inspections. The assessment and rehabilitation of manholes and laterals is a natural progression once the mainlines are addressed. We're also seeing a lot more inspections of laterals as part of cross-bore inspections that are being done throughout the U.S."

CERTIFIED SOFTWARE

There are 14 data collection programs and five asset management software systems certified by NASSCO, allowing contractors to work on any PACP project without requiring them to purchase and learn project-specific software. "There was a time when if you wanted to work with a particular client, you had to have that particular software package, which is very expensive," says Aanderud. "Through standardization, we're able to work for most any customer

CONTINUED >>

"Going through PACP training, you're exposed to pictures of all the different anomalies that can be found in a pipe, so when you come across something new, you're able to call it out correctly. It's really raised the game when it comes to operators, their knowledge, and their ability to provide the information as accurately as possible."

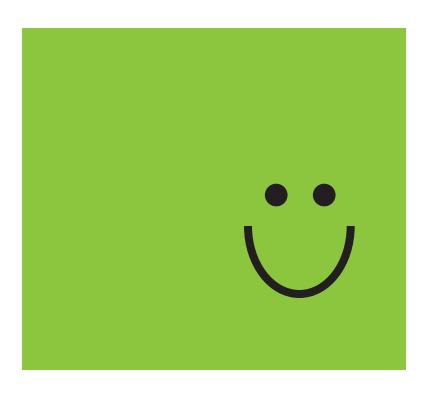
Jim Aanderud

BECOMING CERTIFIED

Since 2002, more than 25,000 people have been certified for PACP. Aanderud adds that the training provides a higher value beyond using the program correctly in that it exposes operators to all the things they may find in a pipe. "You used to learn through experience," he says. "Going through PACP training, you're exposed to pictures of all the different anomalies that can be found in a pipe, so when you come across something new, you're able to call it out correctly. It's really raised the game when it comes to operators, their knowledge, and their ability to provide the information as accurately as possible."

The PACP training is a two-day course, and is a prerequisite to MACP and LACP, which are generally offered on the third day. All three classes include a comprehensive exam. Certified users have their name and certification numbers entered into a database accessible through www.nassco.org for owners and inspectors to ensure operators have current certifications. Courses are held regularly with more than 100 trainers across the U.S. and Canada who will travel to a site to conduct the sessions as needed. "Eventually, we're going to get as much of that online as possible," adds Osborn. The recertification modules, required every three years, are already online.







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with the software we choose because, with PACP, we can integrate the data with their system."

PACP documents four areas of defects:

- Structural defects where the pipe is damaged or otherwise defective
- Operation and Maintenance types of foreign objects found in pipes that may interfere with the operation of the conveyance system
- Construction features and conditions associated with the methods used to construct and connect to pipes
- Miscellaneous general features and defects that are not described by or included in other categories

PACP provides condition grades for defects, which can be readily incorporated into any asset management program. The most recent version provides a new appendix that provides the steps to develop a risk assessment based on condition grades (likelihood of failure) and consequence of failure, which helps municipalities make the best use of their capital expenses.

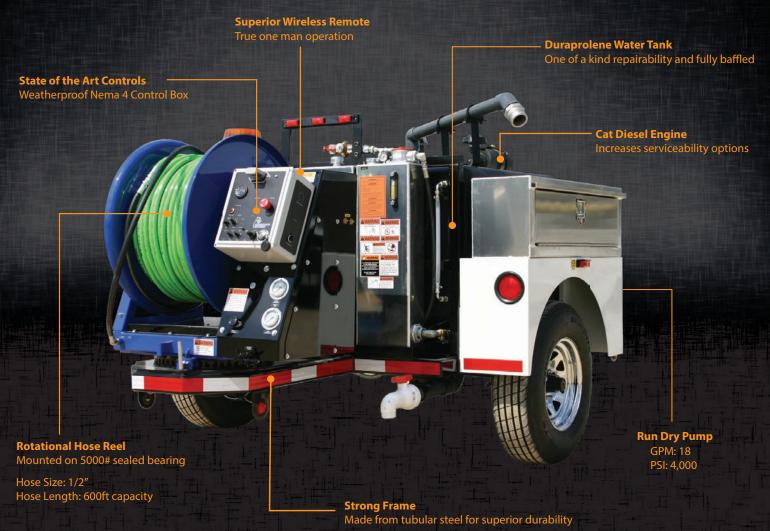
"The operator records the observations about things like service connections, offset joints, roots and broken pipe in a standardized manner, that's the key," adds Osborn. "A common way cities use it in their sewer assessment is for their capital program for rehabilitation or replacement. They also use it for the development of a comprehensive preventive maintenance program. They may put sewers that have significant grease or roots on a more frequent cleaning schedule. Because the data is standardized, you can search the database for defects like that."

You can learn more about PACP, certification and class schedules in the U.S. and Canada at www.nassco.org $\boldsymbol{\varepsilon}$





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It's Not **Worth Your Life**

Trenching deaths more than doubled in 2016, and contractors are still taking chances

By Doug Day



ever again" he wrote on his Facebook page after a trench in which he was working collapsed in May. A month later, he was dead — killed in a trench cave-in.

He was one of at least 23 workers who died in trenching accidents in 2016, compared to just 11 in each of 2014 and 2015. OSHA released the troubling statistic in mid-November, with still a month-and-a-half left in the calendar year. "There is no excuse," said Dr. David Michaels, OSHA's assistant secretary of labor. "These fatalities are completely preventable by complying with OSHA standards that every construction contractor should know."

According to local media reports, the 33-year-old victim in Ohio posted "Never again ain't worth it" on his Facebook page after the first incident on May 10, 2016. On June 15, he was killed when a sewer line trench that had collapsed earlier the same day gave way again. Despite the earlier cave-in, no cave-in protection was provided. OSHA issued the company two willful and two serious safety violations with a proposed penalty of almost \$275,000.

The citations state that the 60-foot by 12-foot-deep trench had no protection against cave-in; the walls were not property sloped, shored, benched or protected against collapse; and spoils had been placed within two feet of the trench. After the trench had collapsed earlier, workers were sent back in to dig out the caved-in soil from the trench. It later collapsed again, trapping the victim under 8 feet of dirt. His body was not recovered until several hours later. He is survived by a girlfriend and his five children.

Michaels calls the number of deaths "an alarming and unacceptable trend that must be halted." The dramatic increase in deaths comes as OSHA has a national emphasis program directed at trenching and excavation, which it lists as one of the most hazardous operations in the construction industry.

"It is truly sad that so many trench collapse fatalities are still occurring despite availability of a wide variety of shoring systems and trench boxes," says Tony Simunac, sales manager for Pronal-USA, which manufactures and sells the SmartShore inflatable trench shoring system. "The easier the system is to use, the more likely the crews will use it." **c**

RULES ARE CLEAR

OSHA's Trenching and Excavation Safety fact sheet summarizes the requirements for trenching operations:

PROTECT YOURSELF

Do not enter an unprotected trench! Trenches 5 feet (1.5 meters) deep or greater require a protective system unless the excavation is made entirely in stable rock. Trenches 20 feet (6.1 meters) deep or greater require that the protective system be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional engineer.

PROTECTIVE SYSTEMS

There are different types of protective systems. Sloping involves cutting back the trench wall at an angle inclined away from the excavation. Shoring requires installing aluminum, hydraulic or other types of supports to prevent soil movement and cave-ins. Shielding protects workers by using trench boxes or other types of supports to prevent soil cave-ins. Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes due to weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench), and other operations in the vicinity.

COMPETENT PERSON

OSHA standards require that trenches be inspected daily and as conditions change by a competent person prior to worker entry to ensure elimination of excavation hazards. A competent person is an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary or dangerous to employees, and who is authorized to take prompt corrective measures to eliminate or control these hazards and conditions.

ACCESS AND EGRESS

OSHA requires safe access and egress to all excavations. including ladders, steps, ramps, or other safe means of exit for employees working in trench excavations 4 feet (1.22 meters) or deeper. These devices must be located within 25 feet (7.6 meters) of all workers.

GENERAL TRENCHING AND EXCAVATION RULES

- Keep heavy equipment away from trench edges.
- Keep surcharge loads at least 2 feet (0.6 meters) from trench edges.
- Know where underground utilities are located.
- Test for low oxygen, hazardous fumes and toxic gases.
- Inspect trenches at the start of each shift.
- Inspect trenches following a rainstorm.
- Do not work under raised loads.

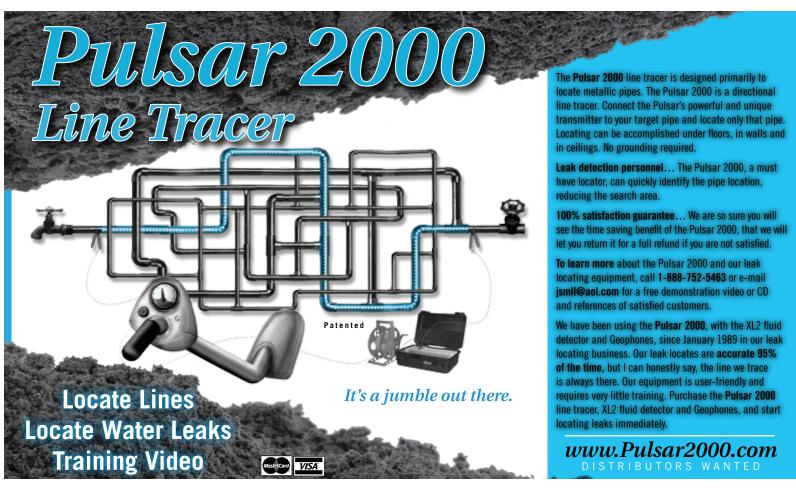


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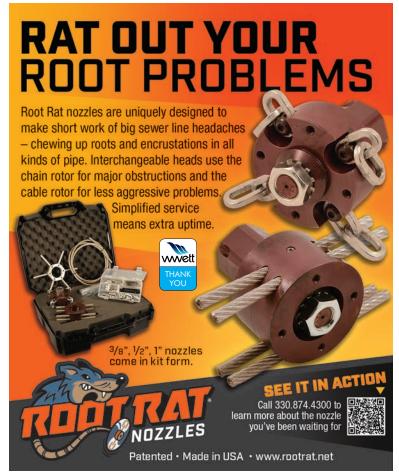












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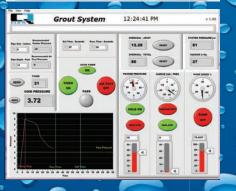












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Chemical and **Mechanical Root Control**

By Craig Mandli

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hp motor comes standard, and 3/4 and 1 hp motors are also available. A custom-designed and manufactured gearbox ensures higher quality, lower cost and parts availability. The heavy-duty, fully adjustable safety clutch keeps cable and tool breakage to a minimum and provides overload protection. A fold-down handle allows for easy transportation, storage and use in crawl spaces. A carry handle helps with balance and easy transport. 800/833-1212; www.electriceel.com.



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75 feet of 1/4-inch cable. Both reel options are lightweight and keep splatter contained. Drain plugs empty water from the drums, helping prevent rusty cables. 877/244-0556; www.duracable.com.

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The Gorlitz Model GO 68HD heavy-duty electric drain cleaning machine is available in two different versions, either with an open steel reel or enclosed polyethylene drum, and can be outfitted with an optional power feeder. It comes with a standard configuration of 150 feet of 11/16-inch



hollow-core cable, which should reach most blockages with a single reel. Its overall weight is 185 pounds, and adding a loading ramp and electric winch to any vehicle makes transportation quick and simple. It is designed to clean pipes from 3 to 8 inches in diameter. 877/446-7548; www.gorlitz.com.

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The Lateral Cleaning Launcher from Logiball guides a 1/2- or 3/8-inch hose and nozzle into the lateral connection from the mainline sewer. Winched in tandem with the CCTV camera, the 0- to 90-volt DC motor is



used to rotate the guiding arm and nozzle into the lateral connection. Rotation controls commonly use existing multiconductor cables and tractor controls. With the pump turned on, the back jets propel the hose into the lateral for cleaning and cutting roots. Laterals have been cleaned as far as 70 feet from the connection. 800/246-5988; www.logiball.com.



PICOTE SOLUTIONS MILLER

The Miller drain cleaning system from Picote Solutions can clean cast iron drains and sewers 1 1/4 to 10 inches in diameter. Three different sizes of cleaner are available, and when used with Circular Cyclone for fragile pipe or original stainless steel grinding

chains, it allows fast and efficient cleaning of soft blockages, scale and calcium buildup, tree roots, concrete, lead and failed gaskets, and imperfections in pipe. 219/440-1404; www.picotesolutions.com.

RIDGID K-7500 DRUM MACHINE

The RIDGID K-7500 Drum Machine has cable that spins at 200 rpm and fits 3- to 10-inch lines. The main drum holds up to 100 feet of 3/4-inch or 125 feet of 5/8-inch cable. A 600-watt universal motor and gearbox bear down as the cutter engages obstructions and includes audible and visual signals for the operator. The inner drum and ball bearing distributor arm work with the motor and gearbox system to reduce the chance



of cable flip-over inside the drum. The main and inner drums won't rust, split or dent while the powerful AUTOFEED advances and retrieves cable up to 22 feet per minute. It has a narrow profile and handles that adjust to desired height to ensure balanced transport. 800/769-7743; www.ridgid.com.

CUTTING NOZZLES

ENZ USA CUTTING BALL

The water-driven Cutting Ball nozzle from Enz USA moves easily around curves in 4- to 6-inch PE, steel or concrete pipes while safely removing roots and mineral deposits, resulting in no damage to the pipe. The cutting ball works without impact, but has the ability to switch to a vibrating nozzle. This nozzle is



equipped with a hard metal front blade for pipes that are more than 50 percent clogged. The side blades are self-sharpening and maintain their sharpness over their service life. The cutting ball operates with controlled rotation speed and is capable of running on recycled water. It is leakage free. 877/369-8721; www.enzusainc.com.

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HYDRA-FLEX SWITCHBLADE

The **Switchblade** static, 0-degree nozzle from **Hydra-Flex** has the impingement and stream quality to allow operators to dig fast and use less water, providing greater efficiency on the job site. Designed for durability, this heavy-duty, high-impact nozzle operates at up to 3,200 psi and is constructed with stainless steel

housings and tungsten carbide wear surfaces. The nonconductive urethane coating on the nozzle body works to extend the life of the nozzle while protecting the safety of the user and sensitive underground assets. A range of flow rates and spray patterns are available for different applications such as potholing and trenching. 952/808-3640; www.hydraflexinc.com.

NOZZTEQ LUMBERJACK

The Lumberjack cutting nozzle from NozzTeq is a low-torque, high-speed cutter for use with high water pressures. It is effective at cutting roots, but is also commonly used to cut grease, tuberculation, protruding laterals and other buildups. Because it's low-torque, it's unlikely to cut through host



pipes. The bearings are sealed, grease-lubricated, water-cooled, and largely maintenance-free; water-cooled bearings don't need additional lubrication and last a long time. The cutters rotate at a minimum speed of 10,000 rpm with flow rates from 10 to 250 gpm at varying pressures. They operate in pipes from 3 to 48 inches. All models clean with chain links, with optional cutting blades for severe blockages. All models come with a propelling jet housing, and some have tow rings. 866/620-5915; www.nozzteq.com.



ROOT RAT

Root Rat cutting nozzles are used with jetters from 11 hp to large truck-mounted models. The cutters are made of hardened stainless steel and come with a toolbox with two interchangeable rotors — one with cables and the other with chains. The combination kit includes extra chain, cable and bearings. They need no repair or rebuilding other than bearing

replacement, which can be completed in less than two minutes for under 10 in parts. 800/288-7873; www.rootrat.net.

SOUTHLAND TOOL INSERT NOZZLE GUIDE

The Insert Nozzle Guide from Southland Tool grabs and locks the end of hose where the nozzle is so the operator can put it where they want. The sewer or duct might be submerged, blind, raised or dropped. Once the technician



has the nozzle securely attached in the jaws, they can lower the hose and nozzle into the manhole to the depth needed. At that point they just direct the end of the nozzle into the sewer line and insert it. At this point they can open the water flow so that the nozzle will take off in the line once the guide jaws are opened. With a slight tug on the rope they will open the jaws and release the hose and nozzle. 714/898-4862; www.southlandtool.com.

STONEAGE WGR SWITCHER

The WGR Switcher from StoneAge provides the ability to run a single sewer jetting tool in either pulling or cleaning mode, without removing the nozzle from the pipe. When the pump is idled down and brought back to pressure, the tool will



switch the water flow between two different patterns of jets. This allows the tool to switch between pulling and cleaning, reducing the time and water usage required to make multiple runs with different nozzles. The pulling/flushing jet pattern directs maximum power to the rear jets to pull or flush debris backwards. The cleaning/descaling jet pattern directs power to the side jets for cleaning deposits and cutting roots. The two-tools-in-one unit navigates pipes 8 to 36 inches in diameter and handles pressures up to 5,000 psi at up to 100 gpm. 970/259-2869; www.stoneagetools.com.



USB-SEWER EQUIPMENT CORPORATION TURBO CHAIN CUTTERS

Turbo Chain Cutters from **USB-Sewer Equipment Corporation** are made of tempered stainless steel and offer continuously adjustable guide skids. The chain retainer is driven by a

high-performance turbine to remove roots, grease and mineral deposits from 4- to 48-inch sewer lines. With an optimized 3-D hydromechanics design in conjunction with ceramic nozzle inserts, the cutters use recycled or clean water. They can also be used as barrel cutters with diamond bits for smooth removal of protruding laterals. Heavy mineral deposits can also be removed with carbide bits attached to the specialized chain. 866/408-2814; www.usbsec.com.

JETTERS



AMAZING MACHINERY BOSSJET MAX

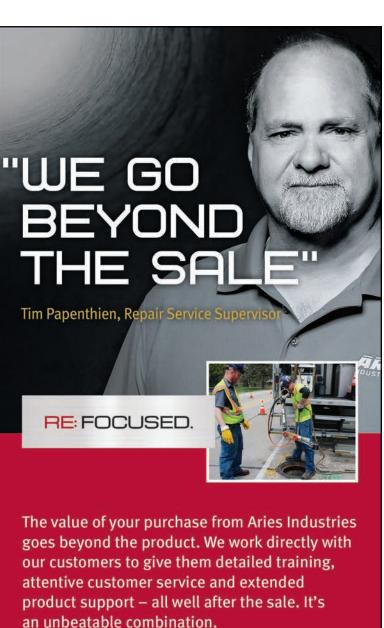
BossJet Max jetters from Amazing Machinery offer versatile hose reel configurations: no reel, a fixed reel or a 360-degree stainless steel pivoting reel, and a mounting bracket for an optional remote hose reel for indoor jetting. They come with Honda, Kohler, Yanmar or Vanguard engines, with or without electric start. Pump options include Cat, A/R

and General, with pressures up to 4,200 psi and flow rates up to 5.5 gpm. The frame is powder-coated 1.5-inch tubular steel, which wraps around the engine and pump for protection. Each unit comes with a laser nozzle and washdown accessories with 50 feet of leader hose. 800/504-7435; www.amazingmachinery.com.

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AMERICAN JETTER 51T SERIES

The 51T Series by American Jetter offers a wide range of power to 80 hp and flows from 8 to 18 gpm up to 5,000 psi. Consistent power is provided by a 40 hp Kohler gas engine or 80 hp using the dual-engine option. Low-water shut-off prevents pump damage if



the optional 600-gallon tanks run low. Standard hose-reel speed control allows for precise cleaning in both directions. The wireless remote option allows for water on/off, engine shutdown and hose reel control. The heavy-duty square tubing trailer offers standard electric brakes on both axles. 866/944-3569; www.americanjetter.com.



GAPVAX MC ADVANCED SERIES

The GapVax MCAdvanced Series combination jetvac's display screens (one inside cab/one outside) will control

hydraulics, blower and water pump operations with a complete complement of gauges. All body functions, boom and hose reel functions, vacuum break, throttle, area and safety lighting are wirelessly controlled, while maintaining proportional boom and hose reel control. The job card feature allows the user to keep track of blower and water pump hours, and logs the time on each job. Specs include a 5- to 12-cubic-yard debris body and stainless steel water tank with a capacity of up to 2,000 gallons. Vacuum pump options range from 3,500 to 5,000 cfm with up to 27 inches Hg. The boom is an 8-foot front-mounted, telescopic design with dual lift cylinders, reaching 26 feet with 180-degree rotation. 888/442-7829; www.gapvax.com.

GENERAL PIPE CLEANERS TYPHOON

The Typhoon trailer jet from General Pipe Cleaners blows away blockages in big lines and long runs, delivering 12 gpm at 2,500 psi to blast lines



clean of grease, sediment and debris. A 200-gallon holding tank carries enough water to handle remote applications where access to water is limited. A 690 cc Honda engine powers the pump with Vibra-pulse to help slide the nozzle around tight bends and propel the hose down long lines. Its high-performance nozzles incorporate fluid mechanics that increase thrust, pulling power and cleaning power without needing to increase water flow or pressure. Two hose reels — a jet hose reel with 400 feet of 1/2-inch hose with variable-speed electric rewind, and a water supply hose reel carrying 150 feet of 3/4-inch hose — are mounted at the rear of the unit. Engine controls, including an hour meter, are mounted within easy reach in the lockable toolbox with slide-action doors just below the reels. 800/245-6200; www.drainbrain.com.

HOT JET USA HOTJET III

The HotJet III from Hot Jet USA offers an output of 20 gpm at 3,850 psi (with an option to run at 35 or 70 hp with either hot or cold water), cutting roots with either a custom root-cutting



tool or a Warthog nozzle in pipes up to 24 inches. It provides the option to run 300 feet of 3/8-inch line or 500 feet of 1/2-inch line, depending on the size of line the operator is cleaning. The 3/8-inch line is effective in cleaning up to 12-inch pipes and the 1/2-inch line is effective in cleaning up to 24-inch pipes. 800/213-3272; www.hotjetusa.com.



NLB CORPORATION 225 SERIES

The 225 Series of water jet units from NLB Corporation improves productivity for pipe cleaning and similar applications, maximizing contractor flexibility and reliability. These dieselpowered triplex plunger pump units are

easily convertible to any of seven operating pressures (up to 40,000 psi) and flows from 6 to 82 gpm. They offer a choice of heavy-duty diesel engines from 200 to 350 hp. Units are available with an UltraGreen package and environmentally friendly Tier 4 Final engines that comply with the latest EPA emissions regulations and can reduce operating costs. 800/227-7652; www.nlbcorp.com.

SEWER EQUIPMENT 747-FR2000 ECO

The 747-FR2000 ECO jetter trailer from Sewer Equipment includes frames made of fully welded steel tubing, maximizing strength and corrosion resistance. Its Durap-



rolene water tanks are fully baffled to eliminate surging during stopping and turning with a load of water. Once on the job, the standard rotating safety hose reel allows operators to position the trailer in the safest possible manner while simply rotating the reel, complete with NEMA 4 watertight control panel, to conveniently face the access point. The ECO operating system allows the engine to run at 33 percent lower rpm than traditional designs, saving operating costs on fuel and creating a safer work environment for operators. They are built with Caterpillar engines and F.E. Myers pumps as standard equipment. 877/735-4640; www.sewerequipment.com.

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WATER CANNON 16T55

The 16T55 turnkey jetter package from Water Cannon is road-ready with an onboard 200-gallon water tank capacity and customizable jetter hose up to 500 feet. It includes a two-wheel road-ready commercial jetter trailer, electric-rewind high-capacity hose reel that can hold 500 feet of 3/8-inch or 350 feet of 1/2-inch hose, poly toolbox, lights,



front jack with wheel, safety chains and aluminum fenders. The jetter includes a Honda GX690 twin-cylinder electric-start engine, V-belt drive, trailer-mounted skid, and 15-gallon EPA- and CARB-approved poly fuel tank. Its TS-Series General triplex plunger pump supplies 8 gpm at 3,500 psi. It has a pumpmounted jetter pulse valve, foot valve with 8-foot jumper hose, and three jetter nozzles — the Penetrator, Flusher and De-Greaser/De-Icer. 800/333-9274; www.watercannon.com.

ROOT CHEMICALS

DUKE'S ROOT CONTROL RAZOROOTER II

Diquat-based Razorooter II control herbicide from Duke's Control is registered by the U.S. EPA for controlling nuisance tree roots in sanitary sewer line collections systems, and received a classification of "evidence



of noncarcinogenicity for humans." In 2014, the EPA further approved an amendment of labels to lower the signal word from "warning" to "caution." Crews insert a hose from manhole to manhole, preparing to fill the affected sewer pipe with herbicide. The foam is released, compressing against pipe surfaces and penetrating cracks, joints and connecting sewers. Roots are killed on contact, decay naturally and slough away. Application is designed to prevent root-related stoppages for two to three years. 800/447-6687; www.dukes.com.



LENZYME/TRAP-CLEER FOAMING ROOT CONTROL

Foaming root control from Lenzyme/ Trap-Cleer has double the active ingredient dichlobenil of previous solutions and a latex base that helps it stick to roots longer. It is easy to apply and provides a slower foaming

action designed to coat the entire pipeline and eliminate fast-foam-over messes. 800/223-3083; www.lenzyme.com.

OLVIDIUM OBLITIROOT

Oblitiroot foaming sewer line root control from Olvidium uses the maximum amount of active ingredient dichlobenil allowed by the U.S. Environmental Protection Agency. It comes in two pouches which, when combined, create a sticky foam with a latex base that can be applied through the clean-out or in the toilet bowl. The latex makes it stick to pipes and roots, which causes the dichlobenil vapor to remain in the line to kill roots longer. 855/782-4531; www.olvidium.com.



ROOTX ROOT CONTROL

RootX is registered with the EPA to kill pipeline roots. It can be used by drain cleaning professionals as an effective tool and profitable add-on service. The foaming action lifts the root-killing active ingredient to the top of the pipe, where 90 percent of the root growth occurs. It also sticks to the top of the pipe and roots to keep blockages caused by root regrowth

from occurring for up to 12 months. The simplicity allows drain cleaning professionals to bring on an additional service at minimal cost. 800/844-4974; www.rootx.com.

ROOT CUTTERS

ARTHUR PRODUCTS CNT-R-KUT ELITE

The Cnt-r-KUT Elite from Arthur Products is a rotating mechanical tool designed to symmetrically clean pipes. Equipped with interchangeable chain and cable on the same rotor, the cutter operates at 2,000 to 10,000



psi. The lightweight, flexible centering device, engineered from an aerospace elastomer, allows the unit to navigate the contour of the pipe. Advanced jet porting uses both rotor sidekick jets for optimizing rotational force and rear thruster jets for propulsion maximization. It is available in 3/8-, 1/2- and 1-inch NPT. 800/322-0510; www.arthurproducts.com.



MYTANA MFG. COMPANY HSC1

The HSC1 high-speed cutter from MyTana Mfg. Company offers high-speed, low-torque power for reinstatement, descaling, cutting, overshoot cleanup, collapsed liner removal and root cutting. Various tools are provided, and safety features include an air-actuated foot switch with guard, GFI protection and a design that has a telescoping handle, making it easy to maneuver. The machine is lightweight and operates at 1,750 rpm. It is suitable for 2- to 6-inch

pipes and offers a 70-foot range with a lightweight flex shaft. 800/328-8170; www.mytana.com. c

Chemical and **Mechanical Root Control**

By Craig Mandli

DRAIN CLEANING MACHINE CONQUERS TOUGH ROOT MASS IN RESIDENTIAL BASEMENT

PROBLEM: A homeowner from Manistee, Michigan, called in about a sewer line backup that resulted in water and sewage in the basement. Salmon Sewer & Plumbing responded, and the technician found an enormous amount of roots in the line causing the blockage. The roots were so large and the clog was so bad that the technician knew it would be a difficult job.



SOLUTION: The technician knew the Spartan Tool Model 1065 drain cleaning machine was tough enough to conquer these roots. The unit has heavy-duty power for 3- to 10-inch lines up to 250 feet. The outer drum keeps dirt contained for customers' peace of mind while the independently rotating inner drum prevents cable kinking and buckling, yet allows quick torque buildup. The Dial-A-Cable power feed allows for quick cable changes, and feeds cable in and out automatically.

RESULT: The technician pulled roots from the line both in the basement and the outside clean-out. Once the root mass was removed. the water receded and the line ran clean. "I've used many other machines in the past that never would have gotten this out of there, but the Spartan 1065 pulled it right out," says the technician. "The right cable and machine really do make that much of a difference." 800/435-3866; www.spartantool.com.





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PRODUCT SPOTLIGHT

Red Dawg nozzle allows jetting in tight spaces

By Jared Raney

Many operators run into problems jetting small-diameter pipe, so PipeHunter has developed a series of smaller nozzles to work in tight spots: the Red Dawg Low-Pro Line.

"Customers liked our approach on our other nozzles so much, they asked us to meet this need for 3/4-inch systems. We ended up expanding the options for 1/2-inch and 1-inch jetting systems," says Stan Stoneman, marketing director for Red Dawg Nozzles from PipeHunter.

"The Low-Pro is the smallest of the Red Dawg family. It also features our newest M6 insert design," Stoneman says. "This was a key addition to our nozzle kit lineup to make sure we cover more needs."

The Red Dawg Low-Pro Nozzles, made of hardened carbon steel, feature three forward angled jets and six 30-degree rear-facing jets. They are targeted at cleaning pipe walls, with minimal features to prevent hang-ups and easily enter lateral clean-outs.

All jets are replaceable, constructed from 17-4 stainless tool steel with a tapered inner transition that improves stream quality, compared to the more standard process of drilling out set screws.

"This nozzle really meets a specific need. We have many operators that only have a 3/4-inch system at their disposal; this made tackling clean-out issues tough," Stoneman says. "These nozzles won't hang



up when put in a tight spot. Most drilled nozzles have a large step on the rear port that can tend to hang. We radiused this as much as we could with the Low-Pro."

The company takes pride in all-American design, testing and manufacturing at its Pearland, Texas, headquarters.

"Designed by sewer cleaning experts, we use carbon steel for our nozzle bodies, not stainless steel. We are the only nozzle manufacturer that plates our nozzles with the Black Oxide QPQ Salt Nitrile treatment process, ensuring that nozzle bodies are treated inside and out," Stoneman says.

"Red Dawg Nozzles is an American-made series of nozzles designed, tested and proved by our staff," Stoneman says. "We have been manufacturing our own jetting and vacuum equipment for more than 30 years now. We feel this experience leads up to a different line of thinking than just a nozzle manufacturer. We can consider the whole scope of an operator's job because we understand the equipment side as well." 800/373-1318; www.pipehunter.com





MYTANA MANUFACTURING'S INSPECTION SYSTEMS

MyTana Manufacturing's line of inspection systems are built for durability and exceptional image clarity. Monitors are daylight-readable, LED backlit, and enhance the clarity and wide-angle view of the camera. All-steel-frame construction and durable pushrods have been factory and field tested to make sure the camera holds up in harsh operating environments. Five different units cover inspection of 1 1/2- to 12-inch lines with pushrod lengths of 100 to 400 feet. The camera heads have 512 Hz transmitters built in for locating trouble spots, including cast iron pipes. Smaller NG2 systems and larger units with the CBX17 Control Box have a 64GB internal drive and two onboard USB ports. Record to either location, or both at the same time. Image examples can be viewed at www.youtube.com/videomytana. 800/328-8170; www.mytana.com.

R.S. TECHNICAL SERVICES' RST HELIX MANHOLE INSPECTION SYSTEM

R.S. Technical Services' new RST Helix manhole inspection system can be deployed from a CCTV vehicle, pickup truck or ATV and is capable of scanning a 10-foot manhole in under one minute. The Helix has six high-resolution cameras that capture panoramic images of every surface as well as six active 3-D sensors that record spatial data points for precision measurements. Once the Helix reaches the bottom of a manhole, it returns and automatically transmits scan data to software where it can be reviewed in the office or in the field. 800/767-1974; www.rstechserv.com.

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HI-VAC'S COMBO HYDRO The new Combo Hydro from Hi-Vac Corporation is a hybrid of Aquatech

sewer cleaners and X-Vac hydroexcavators, and comes with a powerful 27-inch Hg blower. It has a large-capacity water pump for sewer cleaning that runs 80 gpm at 2,500 psi and hydroexcavation water flow of 20 gpm at 2,500 psi. Equipped with a 400,000 Btu boiler, the heated enclosure for the water pump and all water components enables the Combo Hydro to work in cold conditions. 800/752-2400; www.hi-vac.com.

COXREELS OFFERS NEW OPTIONS FOR V-100 SERIES REEL

The V-100 Series reel from COXREELS features improved O-ring sealing for greater vacuum consistency and performance, and a new swivel-retention system that strengthens the frame and prevents separation of the swivel under excessive lateral loading. The swivel also allows for the connection of a 2-inch hose in addition to the 1.5-inch hose, making the reel more accessible to home and light commercial applications. The V-100 Series is available in either a 35- or 50-foot model. 800/269-7335; www.coxreels.com.

WATER CANNON HEAVY-DUTY FOOT VALVES

Heavy-duty, floor-mounted, foot-controlled valves from Water Cannon allow control with hands-free operation of the sewer hose in demanding applications. The valves feature pedal- and valve-protected housing, heavygauge steel construction for durability and stability, and inlets/outlets positioned to keep the hose out of the way during use. The valves handle pressures from 4,000 up to 7,250 psi and flow rates from 4 to 21 gpm. 800/333-9274; www.watercannon.com.

CUES WIRELESS 3-D SPIDER SCANNER

The SPiDER wireless, color manhole scanner from CUES can calculate its position in the manhole shaft by using sensor data to measure its incremental motion. It weighs less than 30 pounds and can be hand-carried to easements or other difficult-to-access sites. The processing computer and battery supply are integrated into the scanner, which allows portability. The SPiDER also provides live video stream and recorded video that can be used for I&I studies. 800/327-7791; www.cuesinc.com.

VT HACKNEY SPRINTER VAN SHELVING PACKAGES

VT Hackney released a line of aluminum shelving for select Sprinter van models. Standard kits are available for quick delivery and installation, but modifications can be requested. The shelving is lightweight and adjustable for storage trays or tools. Driver- and passenger-side kits can be purchased separately or as one package with top shelf storage for ladders and pipe. 252/946-6521; www.vthackney.com. c













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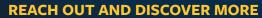
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The Recycler option for AllJetVac combination sewer cleaners eliminates the cost and time needed to refill water tanks. Instead, the AllJetVac vacuums water from the sewer line, puts it through a five-step filtering process and then re-uses the same water to jet sewer lines. It's a "Green That Works" advantage that increases productivity and saves millions of gallons of processed water each year.



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INDUSTRY NEWS



Bill Martin, Fluidmaster vice president of sales (far left), presents a donation to Operation Rise and Conquer for the Adaptive Sports Center. Also pictured, from right, are Fluidmaster President Todd Talbot, U.S. Army Spc. Steven Baskis, and Bill Erfort, member services manager of the American Supply Association.

Fluidmaster donates \$25,000 to Operation Rise and Conquer

Fluidmaster recently presented a \$25,000 donation to Operation Rise and Conquer at the American Supply Association meeting in New York City. Operation Rise and Conquer works with wounded or disabled veterans to regain confidence by offering outdoor activities such as rock climbing, skiing, snowmobiling, off-road biking, horseback riding and rafting.

Michels adds sewer and catch basin cleaning

Michels Pipe Services recently purchased eight Camel 1200 wastewater recycling sewer and catch basin cleaning trucks to become the largest owner of the equipment in the U.S. Business Development Manager John Manijak, who has more than 17 years' experience in the municipal sewer cleaning industry, will coordinate the expanded services from Michels' regional office in Montgomery, Illinois. c



Iohn Manijak





Every day is Earth Day."

"I'm fully aware of the conditions our technicians work in, and I do consider them to be my most important asset. Our policy is that when we walk away from a home, or any other project, we know that the line is open and flowing, and what the problem was to begin with, and where we might need to go next for a resolution."

> Teri Marinello **An Original Environmentalist**

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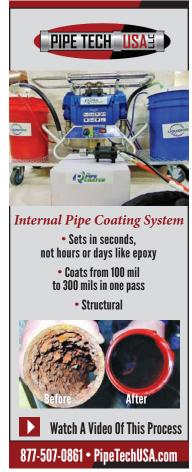


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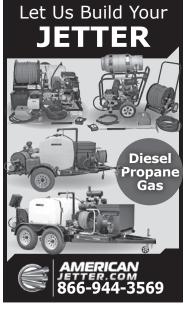
















so much infiltration into the sewer system,

sewage treatment plants can be flooded. And if this overflows into the bay you have a problem. There are huge fines for dumping sewage into the bay, and a lot of cities have been going through inspecting and even doing grants for homeowners to upgrade their sewers."

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Relocate to Amarillo, Texas. 35-year old plumbing business with over 1,400 repeat service customers on QuickBooks. Business appraised, real estate appraised. \$700,000 received on new commercial work in 2016. Will stay short time for transition. Bobby Hollabaugh, 806-236-0727 (C03)

CATCH BASIN CLEANERS



NEW Vacall AS-13D catch basin/ sweeper mounted on a 2017 Freightliner M2-106. 700 transportation miles. Stainless steel body, stainless screens, full power boom with 12" intake hose, power door locks and open. Camera system, gutter broom, super sweep blower. \$280,000. Unit lists for \$306,000. FOB Wallingford, CT.

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COMPUTER SOFTWARE

FreeServiceReminderSoftware.com, FreeServiceDispatchSoftware.com, FreeRouteManagementSoftware.com. (CO3)

DRAIN/SEWER CLEANING EQUIPMENT

Two (2) Vactors for Sale: Vactor 2112 Plus, PD 16" vacuum, 12-yard debris tank, 1,500-gallon water tank, 80gpm/2,500psi, 800' of hose on reel, mounted on a 2012 Kenworth chassis. Vactor 2100 Plus builtup same way on 2013 Kenworth chassis. 803-465-1351 (C03)

2006 Sterling Camel hydrovac, 41,000 miles - \$130,000. 2004 Sterling Camel hydrovac, 46,000 miles - \$45,000. Pictures upon request @ cdscar@aol.com. 916-747-3819 (C04)

Used and rebuilt cable machines in stock: RIDGID K-7500, K-40, K-60, K-1500, Spartan #1064, #300, #100, Electric Eel model #C machines. The Cable Center: 800-257-7209. (CBM)

JETTERS-TRAILER



Xtreme Flow Trailer Jetter Hot/Cold! Model# HJ2TA8536, tandem axle trailer, 35 hp Vanguard 10 gpm @ 3,850 psi, 325-gallon water tank, 300' hose, General Pump. List \$36,995. On sale for \$32,995. Fully loaded!

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1998 US Jetting 40/20 pump has a knock in it. Engine has less than 1,500 hours. On skid.

2004 700-gallon PipeHunter sewer cleaning machine, John Deere diesel Engine, Giant pump, 18gpm @ 4,000psi, 500' x 1/2" sewer hose. \$18,500 OBO. Call for more info 281-770-6714. (C03)

\$6,000.740-336-0931

2013 SECA 747FR2000, ex-municipal unit, excellent shape. 700-gallon capacity, 600' hose reel, 40gpm @ 2,000psi. Priced under \$30,000. Call Joe 312-208-6373 for information. (C03)

Aquatech SJ600E, ex-municipal trailer jet, 600-gallon water, 35gpm @ 2,000psi. \$3,500 OBO. Call Joe 312-208-6373. (CO3)

1997 Sewer Equipment Model 747 jetter trailer, 2,381 hours, 500' of 3/4" hose, \$17,500. Contact Matt 618-566-3003. (C03)

2014 Spartan Warrior trailer jet 18gpm @ 4,000psi, 87hp turbo diesel, 500' of 1/2" hose. Remote & counter. 380 hrs. \$30,000. ericsorg@rotorooterservices.com 570-336-1088 (C04)

2007 Pipe Hunter 38T44 with 80hp John Deere-driven Giant LP301 pump, 4,000psi @ 25gpm, 335-gallon water tank. (Stock# 4313V) www.VacuumSalesinc.com (888) VAC-UNIT (822-8648) (CBM)

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608-835-7767, WI

2002 Vactor Ram Jetter Truck Model V6015, Sterling L7500, 76k miles, 6,725 hours, 7,677 vacuum hours, CAT diesel engine, automatic, single axle. \$39,500. Call Matt 618-566-3003. (C03)

2006 Sewer Equipment of America 747-FR200: 1,462.1 hours. New pump at 1,214 hours 40gpm/2,000psi. \$25,000. More info visit www.mahoneysequipment.com or call 314-550-4618. (C03)

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JET VACS

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2001 Freightliner Jet-Vac truck, Vactor 2110-36, Roots 824 PD blower, 10-yd. debris body, 100gpm @ 2,000psi water pump, 46k rears, 20k front axle, 66,794 miles, air-ride suspension, C-10 CAT 350hp, HD4560 Allison. \$46,875

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Vac-Con V390LHA combination unit with Roots 827 blower, 1999 International Model 2554 cab and chassis. (Stock #3918C) www.VacuumSalesInc.com, (888) VAC-UNIT (822-8648). (CBM)

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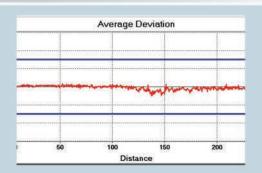
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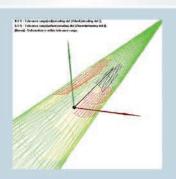
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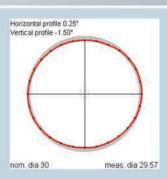


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Honda model WP40X, 8 hp, 4" with hoses. Honda 4 hp, 2" pump with hoses. The Cable Center: 800-257-7209. (CBM)

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level	bar (psi)	l/min (gpm)	n	Dia. mm (in.)		mm (in.)	m/s (in./sec)	
20/30	2000 (30000)	17.9 (4.7)	1	0.8 (.031)	-	75 (3)	0.5 (20)	No penetration
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