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June 2008
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CAN'T BEAT HOMEMADE

Toms River Authority creates its own GIS as an aid to sewer service and maintenance

PAGE 26

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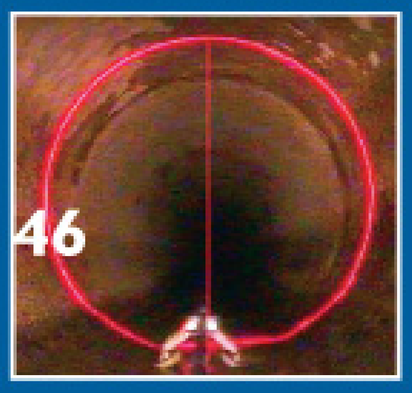

COVER:
The Toms River Municipal Utilities Authority outfitted a used military vehicle with a jetter and vacuum and uses it for cleaning sewers at manholes at off-road sites. The authority excels at innovative and effective practices in everything from sewer cleaning to GIS mapping. (Photo by Michael Sypniewski)

FEATURES

COLUMNS

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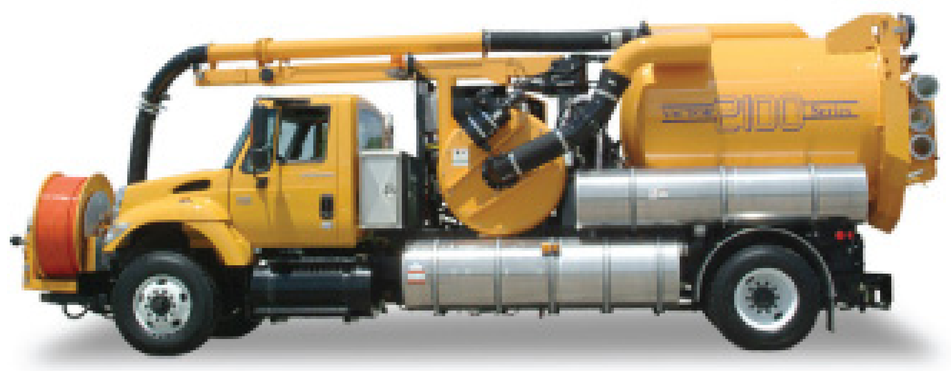

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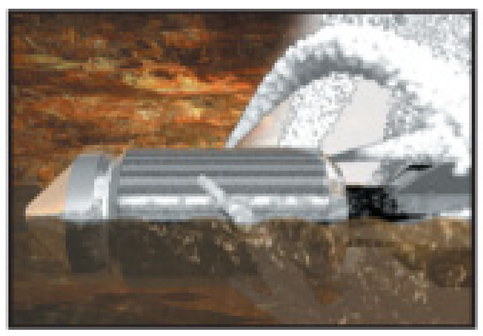
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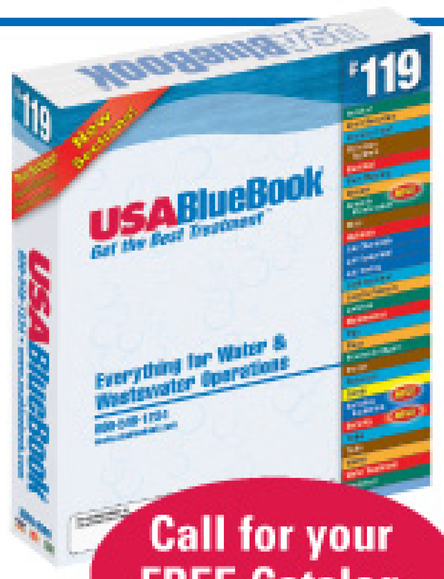

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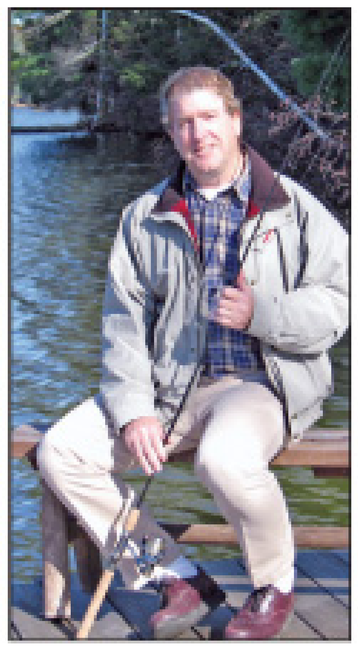

FROM THE EDITOR

Ted J. Rulseh

Who are some people underrated and under-appreciated in their jobs? Offensive linemen in football? Front office employees for sports teams? Nursing assistants in hospitals? Custodians in schools?

Yes, all of those. But how about sewer and water system maintenance technicians? Most likely, they come in near the bottom of the list when it comes to getting respect. Yet, respect is what they deserve, and plenty of it.

Who does the daily work that keeps the sewers flowing? Who is on the spot when a main break floods the streets at 2 a.m.? Who is there when a sewer blockage threatens to cause flooded basements?

Who maintains the valves and hydrants to ensure that water service is reliable and that capacity to fight fires is not compromised? Who handles or oversees the inspection and rehabilitation programs that help control sewer inflow and infiltration, conserve treatment capacity, protect water resources, and help keep treatment expenses down?

Moment in the spotlight

You know the answers, of course. But chances are the people who benefit from the work of these maintenance technicians have no real idea what they actually do and how essential it is to their communities.

Well, here is a chance to give some of these great people a bit of recognition. *Municipal Sewer & Water* invites you to submit a tribute to a member of your team, or an entire crew, for embodying the best attributes of their profession.

Maybe you want to recognize a long-time crew member in honor of his or her impending retirement. Or someone who, besides being a great technician, is an excellent communicator and educator — someone who in contacts with customers always leaves a positive impression of the department.

Perhaps the person deserving praise is a crew leader whose team consistently performs at a high level, and who has a knack for keeping high-quality, experienced technicians onboard.

Or you might want to honor a crew for one particular accomplishment — for successfully completing a major long-term project on time and with good results, or for exemplary response to a specific emergency.

It's up to you

This isn't a contest — we're not going to submit nominations to a panel of judges.

Nor is this an awards program — we won't be sending trophies, plaques or certificates. Instead, we will simply publish the tributes in this magazine, so long as you send us reasonably complete information and a good picture.

So, here's what to do. Send a write-up of perhaps 250 words that tells why the person (or crew) you want to recognize deserves to be honored. Be as specific as possible. For each person, provide not only the name but also the job title and how long he/she has worked for your department.

We'll also need a good-quality digital photo about 2 megabytes in size. Make it more than just a plain "headshot." For example, show the person or crew out in the field next to a piece of equipment they use often. Or take a close-up of the person actually at work on a project. Or, just use your imagination. In any case, make sure everyone's face shows up clearly.

You can e-mail your submissions to me at editor@mswmag.com. Include contact information so we can get back to you as necessary. We'll publish as many tributes as we can in future issues. All of us at COLE Publishing look forward to your submissions and to recognizing some truly deserving people. ✦

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FOCUS: WATER

IN THE PUBLIC EYE

A Kansas city and county make life easier for public employees, residents and businesses by making GIS data available online

By Jim Force

Let's say you need to know where water and sewer lines exist relative to property about to be developed on the edge of town. You could trudge down to the city engineering office and request drawings, possibly at a cost or a delay.

Or if you're in the City of Manhattan, Kan. (Riley County), you could punch up the information on your desktop from a public web site. Working together and sharing costs, the city and county have put 36 GIS layers on a web site (http://gis.rileycountyks.gov) to make it available to all city and county employees and the general public, as well.

"When we realized the cost of individual GIS software packages for all employees, it became apparent that the web site was the way to go," says Dan Oldehoeft, GIS coordinator for the city. Now everyone has access to a myriad of utility, zoning, property, floodplain, tax and other information, as well as aerial photographs of the entire area.

Open approach

Manhattan has come a long way since the area was settled in 1855. This fast-growing and progressive community was once recognized by *Money* magazine as one of the nation's top 10 places to retire.

When it comes to GIS, "Our approach is a bit different," explains Oldehoeft. "We started about seven years ago, before a lot of other communities were doing this. At first, we envisioned a private site, but it became obvious there was a lot of interest from homeowners and developers who wanted to see the data."

Realizing no one on staff had the know-how required to create the web site, the city-county team hired ESRI to help. While the county hosts the site, ESRI remains involved, helping build new code when new layers of GIS data are added.

Startup costs were about $63,000. Grants from Project Impact and Core covered some of that. The two units of government split the remainder. The city and county continue to share operating costs today, paying for licensing and maintenance out of a technology fund generated from recording

City of Manhattan crew members Ken Hays (holding rod) and Tyler McCann record the location of a stormwater inlet using a Leica 1200 GPS. (Photography by Rod Mikinski)

> **"We started about seven years ago, before a lot of other communities were doing this. At first, we envisioned a private site, but it became obvious there was a lot of interest from homeowners and developers who wanted to see the data."**
>
> **Dan Oldehoeft**

PROFILE:
City of Manhattan and Riley County, Kan.

POPULATION:
Manhattan 50,000; Riley County 62,500

AREA:
City 18 square miles; county 610 square miles

INFRASTRUCTURE:
517 miles of water and sewer lines; 36 miles of storm sewers, plus 5.2 miles of open channel

EMPLOYEES:
30 (water and sewer)

ANNUAL BUDGET:
Water $11 million; wastewater $7 million

WEB SITES:
www.ci.manhattan.ks.us; www.rileycountyks.gov

Dan Oldehoeft (left), GIS coordinator for the City of Manhattan, and Peter Armesto, assistant public works director, water division, in front of Manhattan City Hall.

fees for real estate documents and deeds.

A city-county GIS steering committee monitors use and sets policy. John Cowan, GIS director for Riley County, maintains the site at his office. All GIS coverage and overlays are countywide. As city zoning, utility, and other information changes, Oldehoeft sends Cowan the new data for uploading.

"We update the site regularly, as data changes occur," says Cowan. "All data is reviewed at least once every six months, and zoning, parcel data, and utilities layers are updated more frequently as necessary."

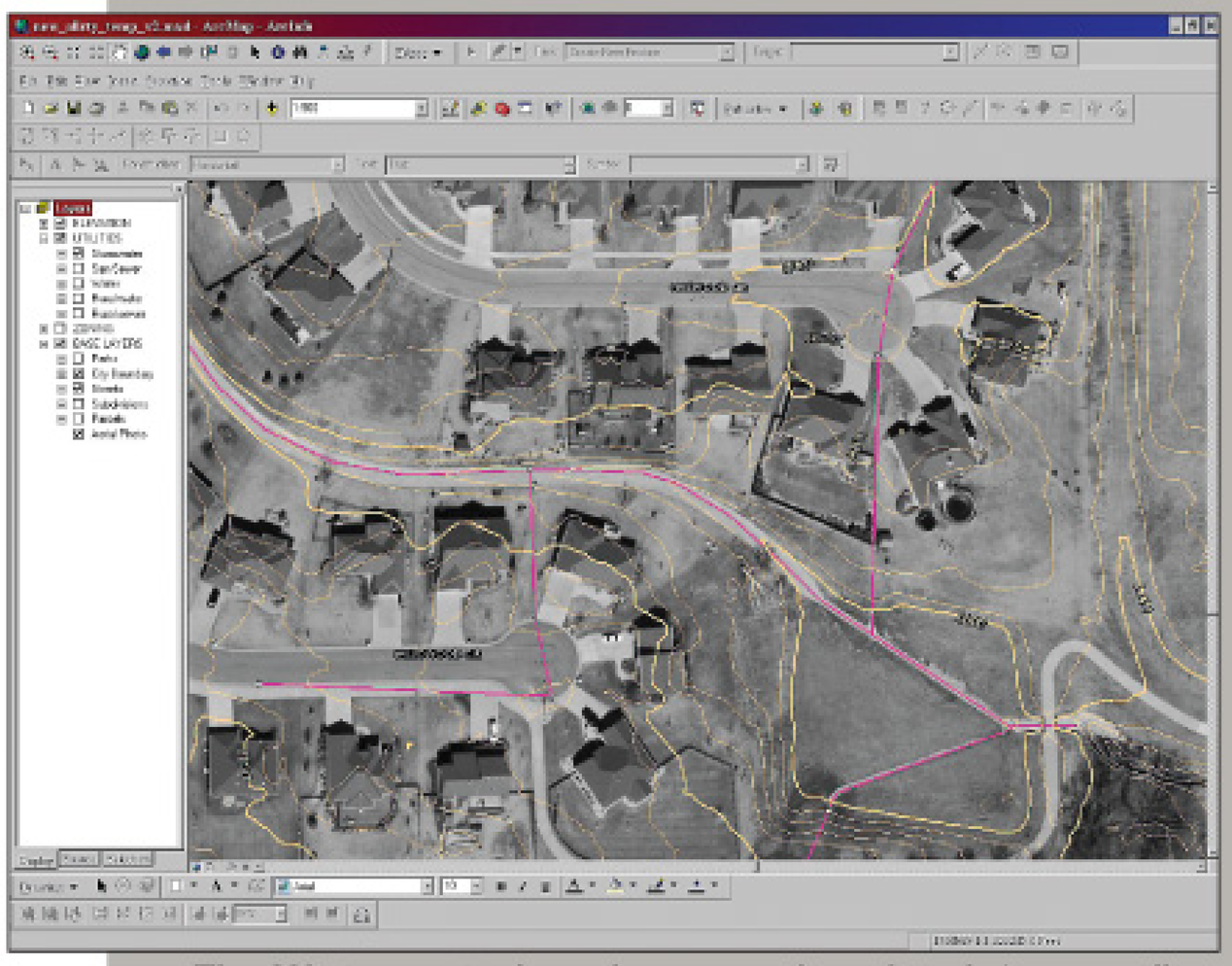
An analyst and technician assist Cowan (two intern positions are unfilled at the moment). Originally the team used in-house software, plus ArcIMS from ESRI, to deliver maps, data, and metadata to many users on the web. The team is considering a move to ArcGIS Server, an integrated server-based GIS that enables distribution of maps, models, and tools to others and lets staff query accurate, up-to-date data with minimal training.

Popular tool

The web site has really caught on with city and county employees. "Every day, every department uses GIS in some form," says Oldehoeft. The list includes public works, engineering, water and sewer utilities, and finance, all the way up to community development and even the city manager's office.

"The city manager uses GIS as a recruiting tool, sending out maps and information about schools, housing, and shopping to prospective employees," says Oldehoeft. Community development staff members often download and send property and utility information to companies and businesses thinking about locating in the community. And in a recent annexation procedure, aerial photos on the GIS site helped position a new water tank needed to supply a golf course in the annexed area.

Indeed, utilities comprise the biggest use of GIS: It includes data



The GIS stormwater layer shows open channels and pipes as well as inlet and outfall points. This neighborhood has a concrete-lined ditch that runs behind the houses and ends at a natural stream system (lower right corner). A portion of a hiking and biking path crosses a small bridge near this point. The 2-foot contour lines clearly show a square area of wetland in the lower part of the image. (Photo courtesy City of Manhattan Public Works)

LAYER ON LAYER

Employees and members of the public can access a multitude of information on the City of Manhattan/Riley County GIS site:

- Land: Streets, ownership parcels, land sections, subdivisions, city limits, Riley County, Fort Riley.
- Hydrology: Base flood elevations, 100- and 500-year floodplains, water features, 1993 flood, rivers and lakes.
- Utilities: Manhattan water points, manholes, water lines and sewer lines; rural water lines, sewer lines and water districts.
- Parks and recreation: public trails, public parks.
- Buildings: Schools, churches, public buildings.
- Agriculture: Soils, agricultural land uses.
- Jurisdictions: 2000 census blocks, county benefit districts, poll sites, urban area planning district, voting precincts, townships, school attendance zones.
- Zoning.
- Aerial photographs.

A PUBLIC BOON

Anyone, anywhere can access the Riley County web site and use the GIS tool. Consulting engineers, insurance companies, homeowners checking their property data, and residents looking for their assigned voting location are among regular visitors.

Some of the most active users are real estate developers like Jerry Petty of Grand Mere Development of Manhattan, where community growth is propelled by expansions at Kansas State University and the Fort Riley military facilities.

"Hardly a day goes by that I don't use it," he says, "and I use it just about every way you can imagine. Compared to others I'm aware of, the Riley County site is easy to navigate. It's extremely beneficial."

Petty finds the site much easier than the old practice of calling people, then going down to their office in hopes of finding maps and photos. "I introduced one of my real estate agent friends to the site, and he thanks me every time he sees me," Petty says. "We don't know what we did without it."

Petty and his firm rely on the site for property information like parcel ID numbers, parcel lines, land values, tax data, sewer and water utilities, and floodplain information. His biggest use, however, is aerial photography.

"As developers, we're always looking to the future," he says. "Good aerial photography helps us see how an area might be served by utilities, and we can see vegetation, drainage, and contours, and past land use practices."

on water and sewer mains and trunks, pipe diameters, valves, subsoil grades, water towers, hydrants, rights of way, and more.

"Street construction is a major application, since GIS shows where utilities are and what's available," says Peter Armesto, city assistant director of public works for water. "If a 6-inch line needs to be a 10-inch line, we can see that. If we're lining a sewer, we'll tag that in GIS, and we can see where we've been and what the next steps are."

Oldehoeft adds, "Anytime we draw up plans, we import data from GIS and build off that." Field crews use the system as well. They can download and print out maps and aerial photos of a project and take the documents into the field with them. They also have a computer and copy of the GIS software onboard. Working with that and a robotic camera, they can tag themselves at a manhole and then do the TV inspection work.

To keep things simple, Oldehoeft has made modifications to the software to enable field crews to access only the GIS layers they need. "We developed a stripped down tool that shows just the water and sewer lines," he says.

Dan Oldehoeft and Heidi Downie, GIS technician, discuss GIS data layer information.

"With GIS, our water plant operators can see the distribution lines and storage tanks, the pressure zones, and our four booster pump stations. That helps them develop an understanding of the whole system."

Peter Armesto

Training tool

Armesto uses GIS for training. "With GIS, our water plant operators can see the distribution lines and storage tanks, the pressure zones, and our four booster pump stations," he says. "That helps them develop an understanding of the whole system."

GIS helps the city identify and solve problems, particularly those bothering customers. The city used to get numerous "red water" calls — complaints about rust-colored water that would discolor laundry. "With GIS, we have been able to identify sources, map the problem areas, and then fix them," Armesto says. "We don't get those calls anymore."

GIS facilitates capital project requests and bid invitations. "It helps make the case when we can show the need to expand from a 2-inch line to a 6-inch line in order to serve a new development, and how it's feasible to hook up," Armesto says.

GIS can also supply prospective contractors with bid documents, maps, and aerial photos to illustrate the job. In another instance, GIS was instrumental when the city set up a hydraulic model of its water distribution system, and a flow model of its sanitary sewer collection system. "With GIS, we already had the base information in hand. That saved us time and money," Armesto says.

The city and county are not standing still with their GIS. They plan to add stormwater overlays next, and they are contemplating going to ArcGIS Server in the near future to distribute maps, models, and tools to others in the organization in a way that fits well into their workflows.

They are also starting to use ArcPad software for mobile GIS and field mapping applications. Pocket-sized, color-screen hand-held units allow field crews to catalog and record data, which is immediately transferrable into GIS.

Not easy going public

Oldehoeft and Cowan recount that it was not easy to convince city and county fathers to make the GIS information public, especially after the Sept.11 terrorist attacks. In fact, the debate delayed implementation of the site for nearly a year.

"We kept stressing how useful the site could be and that the payoff would exceed any risks in making the information accessible to the public," says Oldehoeft. "It helped that some other communities had started doing this without any problems."

In time, fears subsided, Oldehoeft and Cowan believe, and people now realize the importance and usefulness of the web site. "Like cell phones, you didn't see the value until you had them, and now you couldn't get along without them," Oldehoeft says. "The outcry would be even worse if we took the information down now."

Further, Oldehoeft sees how GIS has helped communications and teamwork within the city employee force. "No data is 100 percent accurate," he says. "But with this system, we've moved "from 70 to 75 percent accuracy to probably 95 percent accuracy. The field crews and others using the system help me make the data more reliable, and that makes their lives easier. We help each other." ✦

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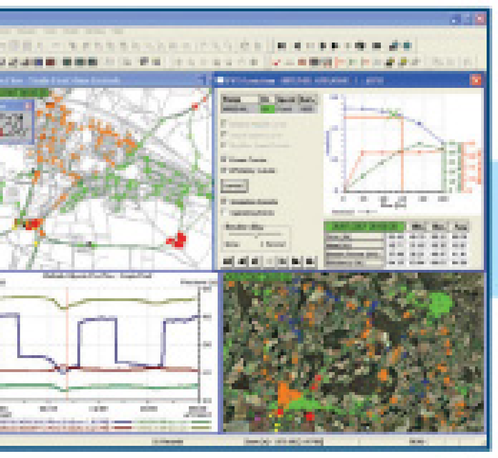

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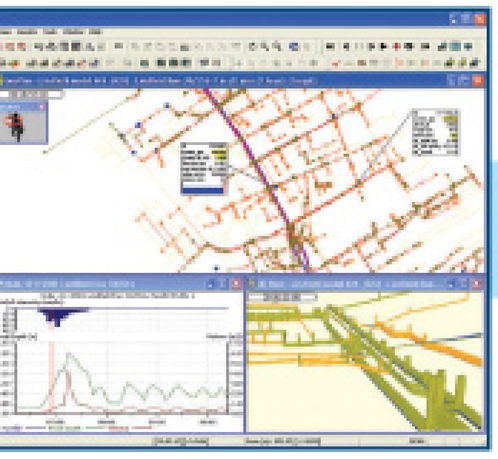

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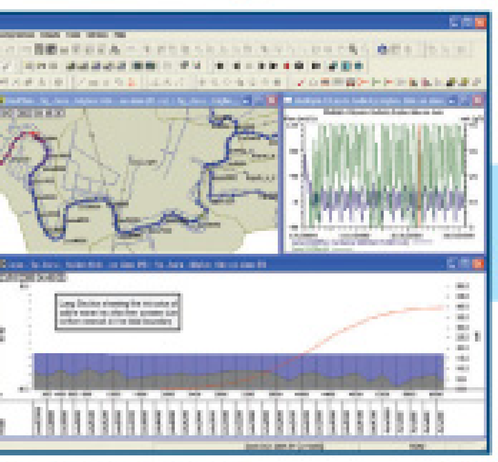

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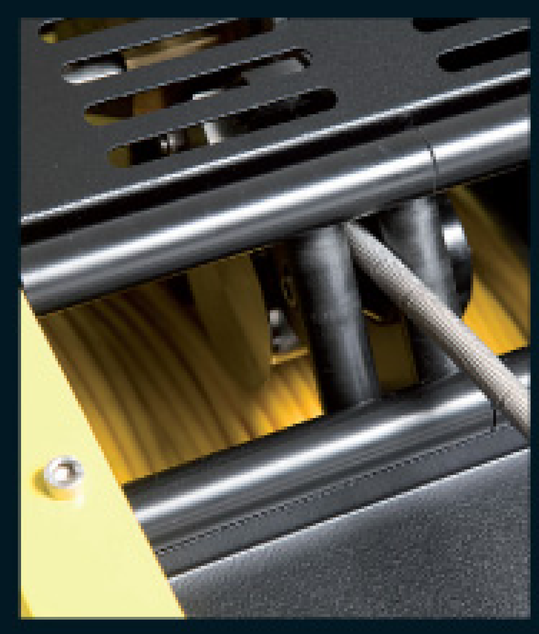

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CAN'T BEAT HOMEMADE

Toms River Municipal Utilities Authority takes the initiative to create its own GIS as a valuable aid to system service and maintenance

By Angus W. Stocking, L.S.

When Doug Terry talked with consultants about creating a geographic information system (GIS) for Toms River Municipal Utilities Authority, estimates came back at up to $1 million.

"For that, they would build us a system and hand us a disk, and we'd still have to buy the hardware and software," Terry says. "And unless we married the consultants, we'd have a lot of ongoing costs."

So Terry, director of operations for TRMUA, which handles wastewater collection in Toms River Township, N.J., led an initiative in which the township created its own GIS.

By hiring a GIS director and training existing staff in CAD conversion and GPS location, the authority built a system that meets today's current needs and provides a GIS foundation for the entire township — all on a slender budget.

The system supports and streamlines basic functions like regular pipe inspection, root control, cleaning and maintenance. And it has been so beneficial that other township departments are taking advantage of it, achieving cost savings of their own.

Converting from paper-based asset management to digital tools has already paid big dividends, and Terry envisions even more in the years ahead.

Blazing the trail

"Everyone's afraid of the cost of GIS, and we were too," says Terry, whose agency serves 41 square miles of land and 12 square miles of water with 54 employees. Some 450 miles of mainline sewer, with 44,000 connections, feed up to 7 mgd into the authority's wastewater collection system.

What has been known as Toms River Township since November 2006 was established as Dover Township by royal charter in 1768 — before the United States became a nation. With a population of 95,000, Toms River is the seventh most populous municipality in New Jersey, and the fastest growing.

Like many utility agencies, TRMUA had a large file room devoted to paper plans, and staff members were starting to get nervous. "We had impeccable records and filing, but those things fade," says Terry. "We had several people using materials daily, staff members and others, and it was inevitable that they would get torn and illegi-

Toms River staff member Michael Tesch works a laptop computer with GIS software to locate a service pipe for a home, while Mark Baranyay uses a handheld GPS unit. Both are line maintenance operators. (Photography by Michael Sypniewski)

PROFILE:
Toms River Township Municipal Utilities Authority, Toms River, N.J.

FOUNDED:
1949

POPULATION:
95,000

AREA SERVED:
41 square miles

EMPLOYEES:
54

INFRASTRUCTURE:
450 miles of mainline; 44,000 connections

ANNUAL BUDGET:
$20 million

WEB SITE:
www.townshipofdover.com

ble. Our entire town system was in that room, and if we lost those plans due to a fire or some other calamity, we'd be dead in the water."

It was time to put the entire system into a GIS. Terry, having an independent streak, believed TRMUA could build an effective system without outside help. "I'm convinced that anyone can have a system that will serve their needs, at a low cost, if consultants aren't involved," he says.

"We had impeccable records and filing, but those things fade. We had several people using materials daily, staff members and others, and it was inevitable that they would get torn and illegible."

Doug Terry

Getting going

Terry bought a variety of software from ESRI Inc., on which the GIS is still based. The company worked with him on exchanges and price breaks to make sure he ended up with the right tools.

Then it was time to hire a GIS expert. Hiring the right person for a critical job is always daunting, but Terry had a plan. "I said, 'Let's see if we can find someone who is working for a consultant,'" Terry recalls. "I figured if we found someone who had been working in a cubicle, maybe someone who had been traveling a lot, they would jump at a job near the beach where they could stay put for a while."

It was an unconventional strategy, but it worked. Terry hired Len Bundra, who had been in 22 cities in 12 years setting up GIS. "Len in my opinion is one of the best," says Terry. Bundra was intrigued by what TRMUA was trying to accomplish.

"My background is 12 years in consulting, and I've built many systems as part of a consulting firm," he says. "And in all that time, I have to say, I never saw an agency or city of any size that wanted to do it all themselves. It's a novel approach. And for me personally, it's satisfying to be able to say, 'I built that.'"

Doug Terry, director of operations, Toms River Municipal Utilities Authority.

Building the maps

Parcel base mapping came from Toms River Township in the form of 193 AutoCAD drawing files. Bundra turned these files into a GIS base map, eventually creating 52,118 "parcel polygons" based on the AutoCAD drawings. With the polygons created, he moved ahead with linking the parcels to a relational database.

Because they were based on tax assessor information, and not surveys, the CAD drawings were not especially accurate, and they were not geo-referenced — there had been no attempt to align the drawings with real-world coordinates.

Bundra had two methods to align the maps more accurately. Since he had access to recent, high-quality orthophotography, he was able to "rubbersheet" (stretch proportionally) the base maps to match features like fence lines and road intersections. And since Toms River crews were getting started with GPS location, he could also put precise coordinates on features like manholes and cleanouts. The entire system is in place now with sub-meter accuracy, or better.

Meanwhile, Terry sent two staff members to a three-day course to get training in the necessary CAD techniques. After that, they learned on the job, converting sewer plans to GIS drawings. Since TRMUA has been around since 1949, that was a huge task, and one many agencies delegate to sub-contractors.

Line maintenance operator Mark Baranyay operates a GPS unit at a manhole.

Dion Smith and Mike Cucinotta, line maintenance operators for Toms River Municipal Utilities Authority, use the company's off-road military vehicle with jetting and vacuum capability to clear out a sewer line.

TOUGH TRUCK FOR TOUGH JOBS

A special cleaning vehicle built by Toms River Municipal Utilities Authority turns residents' heads and has field crews jockeying to see who gets to use it.

It's built to clean lines in some of Toms River's wooded areas. "A lot of our mains are in the woods, along easement lines that are overgrown," says director of operations Doug Terry. "There aren't really roads, just trails. It's a hostile environment for our street equipment, which we didn't want to destroy, and we needed something better than a four-wheel-drive vehicle, because they get stuck."

So Toms River built its own rig. "The truck was purchased at Clark's Truck Equipment in Virginia," says Terry. "We traded them some other military surplus equipment that we owned and were able to get the truck for $6,500. "We added about $2,000 in paint and accessories and welded the brush guards.

The deck-mounted high-pressure cleaner is actually a trailer-mounted unit without the trailer. It was installed by Jet-Vac Inc. in New Jersey at a cost of $62,000. The unit carries a 700-gallon water tank, 600 feet of 3/4-inch hose, and a pump system that can deliver 40 gpm at up to 2,000 psi.

"We didn't feel the need for a vacuum system," Terry says. "It would have added cost, and we couldn't have handled the overall weight and size on the military chassis we used. We can always collect the debris downstream with one of our combination cleaning units, once it enters an accessible manhole."

TRMUA deployed the vehicle in December 2007 and used it through the winter with good results. "The thing can't be stopped, and we've had no breakdowns." says Terry.

Here again, Terry had his own ideas. "We didn't want to send them out to India and have them gone for two months, and we didn't want to copy that many plans either," he says. "We felt it was best to do it right here."

The two staff members worked side-by-side, and had a friendly competition during the conversion. In about a year, they mapped and brought into the GIS 9,405 manholes, and they applied 65,835 attributes derived from plans. This was a huge jump start for the GIS.

By working with GPS information and the rectified base mapping, Toms River got a useful, accurate system early on that became a sound foundation for later work. Staff members also filed about 42,000 sewer triangulation plans, all ultimately scanned, converted to PDF files, and attached via the GIS to relevant features. That made a wealth of knowledge available at the click of a mouse.

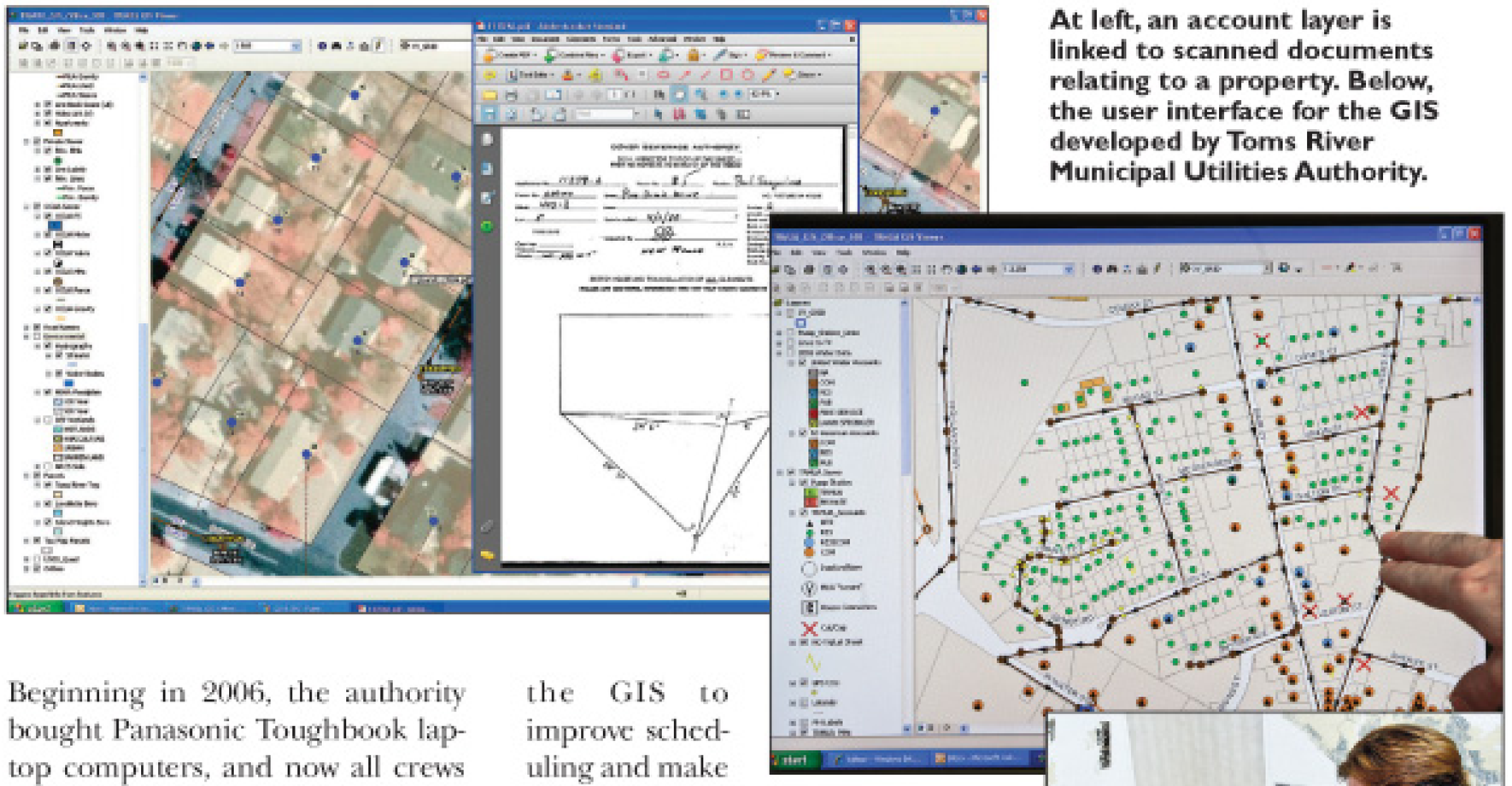
Location, location, location

As in real estate, location is critical to a useful GIS, and many communities hire surveying firms or other specialists to locate features like manholes, cleanouts and pumps. Toms River, on the other hand, purchased two Trimble GeoXT handheld receivers. Two staff members, who usually worked a CCTV truck and are "pretty savvy," according to Terry, started using them, essentially training themselves.

They went right to work locating manholes and other features, and because they got started while the GIS was being created, TRMUA was able to use their work to verify and correct the GIS from the beginning. One advantage of doing the work in-house was that staff members largely knew where the features were and could drive right to them.

The receivers worked so well that the authority bought two more within a few months. TRMUA now has four. The units are loaned out to other agencies. The fire department, for example, is tying fire hydrants into the GIS, and the police department is experimenting with tracking car locations.

Crews now consistently use GPS to locate cleanouts as they are uncovered and to tie in new installations, densifying the GIS.



At left, an account layer is linked to scanned documents relating to a property. Below, the user interface for the GIS developed by Toms River Municipal Utilities Authority.

Len Bundra, IT/GIS director for Toms River Municipal Utilities Authority, in his office.

Beginning in 2006, the authority bought Panasonic Toughbook laptop computers, and now all crews who need them are equipped to use the GIS in the field, using a custom ArcReader GIS application developed by Bundra.

At present, crews use the GIS by way of downloaded information, but soon Toms River will have a community-wide WiFi set up for municipal use, and crews will access the system wirelessly.

> **"My background is 12 years in consulting, and I've built many systems as part of a consulting firm. And in all that time, I have to say, I never saw an agency or city of any size that wanted to do it all themselves. It's a novel approach."**
>
> **Len Bundra**

How it's used

The GIS is seeing constant and expanding use. It's hard for Terry to estimate savings because, "There's just so much we don't do at all anymore."

For example, all the township's sewer inspection footage — two camera crews are at work every day — is stored digitally using Granite XP survey software from CUES Inc. and is accessed via the GIS. That saves many hours of manually filing, retrieving, and viewing tapes.

Seeing the amount of inspected area graphically also helps staff to schedule camera work. "Before, we had no idea" says Terry. Time is also saved when outside consultants and engineers come to the office looking for files.

A work order management program is to be deployed in 2009, but even without it managers use the GIS to improve scheduling and make better use of repair budgets.

Work is organized by queries, which identify critical pipes. For example, a simple query based on as-built attributes can identify all pipes that are below mean sea level and so more at risk for corrosion. Queries like this help Toms River stay ahead of ongoing programs like root control and inflow and infiltration (I&I control).

The sky is the limit when it comes to future uses. Terry contemplates tracking trucks to save time on emergency response, deploying work order management systems, simplifying billing, and other advanced uses. He's also happy with the system as it exists right now.

Independent by nature

Terry is proud of the agency's independence, which shows in areas other than GIS. For instance, "We may be the first municipality to do our own cured-in-place-pipe refurbishment," he says. "At least, I haven't heard of any others."

Going it alone has been good business for Toms River. The agency has not raised rates in 25 years and carries no debt. It is generally considered more efficient to use contractors for specialized tasks, but that hasn't been the case here.

In fact, the simple, cost-effective foundation laid, using in-house talent and a "can do" attitude, has proven so valuable that other agencies, like the tax assessor's office, the school district (New Jersey's fifth largest), and the police and fire departments, are taking advantage of it.

The go-it-alone approach may not be for everyone — it takes considerable time and effort, and a lot of confidence. But the Toms River Municipal Utilities Authority is proving that an independent approach can be extremely effective. ✦

MORE INFO:

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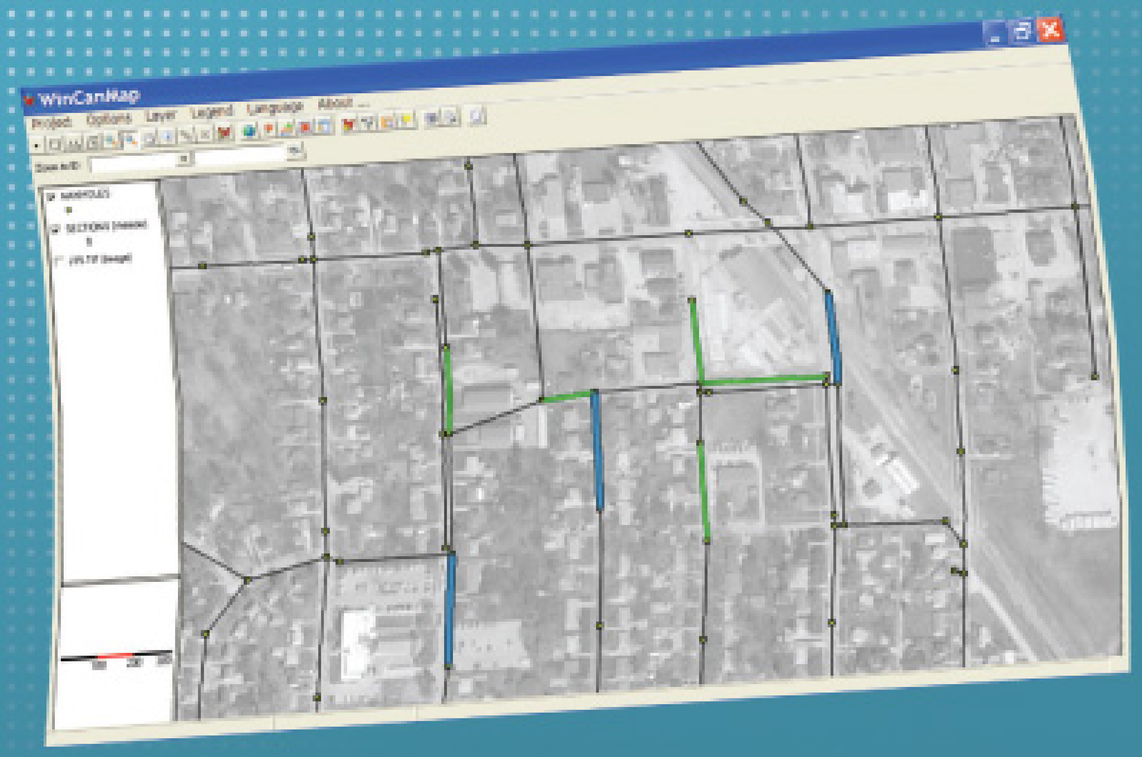

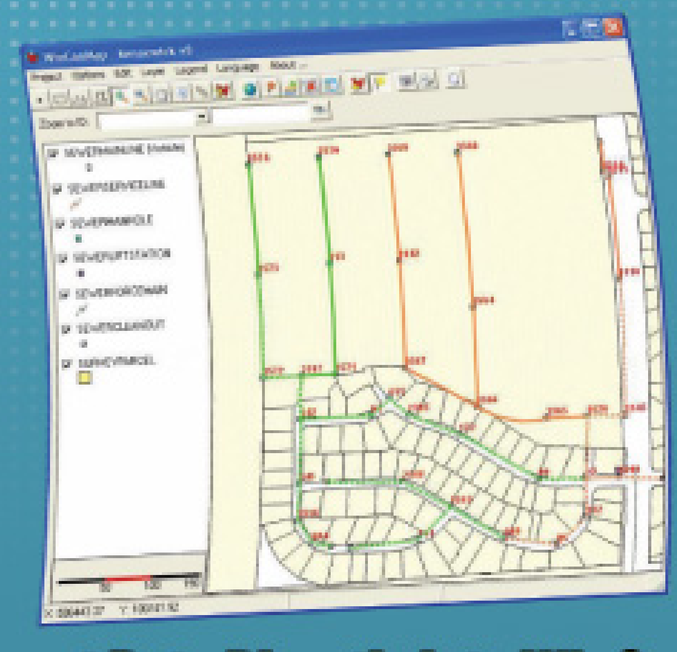

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MAP IT, MANAGE IT

Frank Wineinger of Precision Measurements Inc. locates structures with GPS and e-mails the points back with their coordinates. (Photos by Bobby Thigpen Sr.)

Newport News builds a digital model of its stormwater and sanitary systems for improved inventory, maintenance, and hydraulic modeling

By Dan Heim

Newport News lies at the end of the Virginia Peninsula, bounded by the James River, York River, and Chesapeake Bay.

But it's the water that flows into the city that concerns Steve Land, administrator of the Department of Public Works Wastewater Division. Most stormwater runoff is conveyed in open channels, and drainage from other up-peninsula cities moves through Newport News on its way to the bay.

"In a large event, we've got water flowing to us from several sources," notes Land. "It even crosses I-64, the backbone of the peninsula. So we need to coordinate our efforts with other cities, as well as the Virginia DOT." The impact of hurricanes Floyd (1999) and Isabel (2003) supplied more incentive to improve infrastructure, organization, and response. The majority of Newport News lies less than 80 feet above sea level.

To Land, the solution was obvious. His division was still using printed maps, had no computer database of assets, and was sharing its limited resources between sanitary and stormwater. GIS mapping was the logical first move.

The city has mapped its sanitary sewer system and is starting the long process of mapping stormwater assets as well. Among the benefits, a thorough inventory will help the city build a stormwater system maintenance program and cost-justify the equipment and staff resources that requires.

Preliminary work

The Wastewater Division split its original combined wastewater system in the 1970s, using mostly federal funds. The city created separate divisions for sanitary sewers and stormwater in 2005. Before that, the Wastewater Division handled all water work. "We had about 140 people working in our division," Land explains. "I decided it was time to reorganize

PROFILE:
City of Newport News, Va., Department of Public Works, Stormwater Operations Division

POPULATION:
180,000

AREA SERVED:
70 square miles

ANNUAL PRECIPITATION:
48 inches

INFRASTRUCTURE:
Four pump stations, 425 miles of pipe, 180 miles of open channel, 17,500 catch basins; manholes still being counted

EMPLOYEES:
65

OPERATIONAL BUDGET:
$3.8 million

WEB SITE:
www.nngov.com/engineering/misc/eng-swm

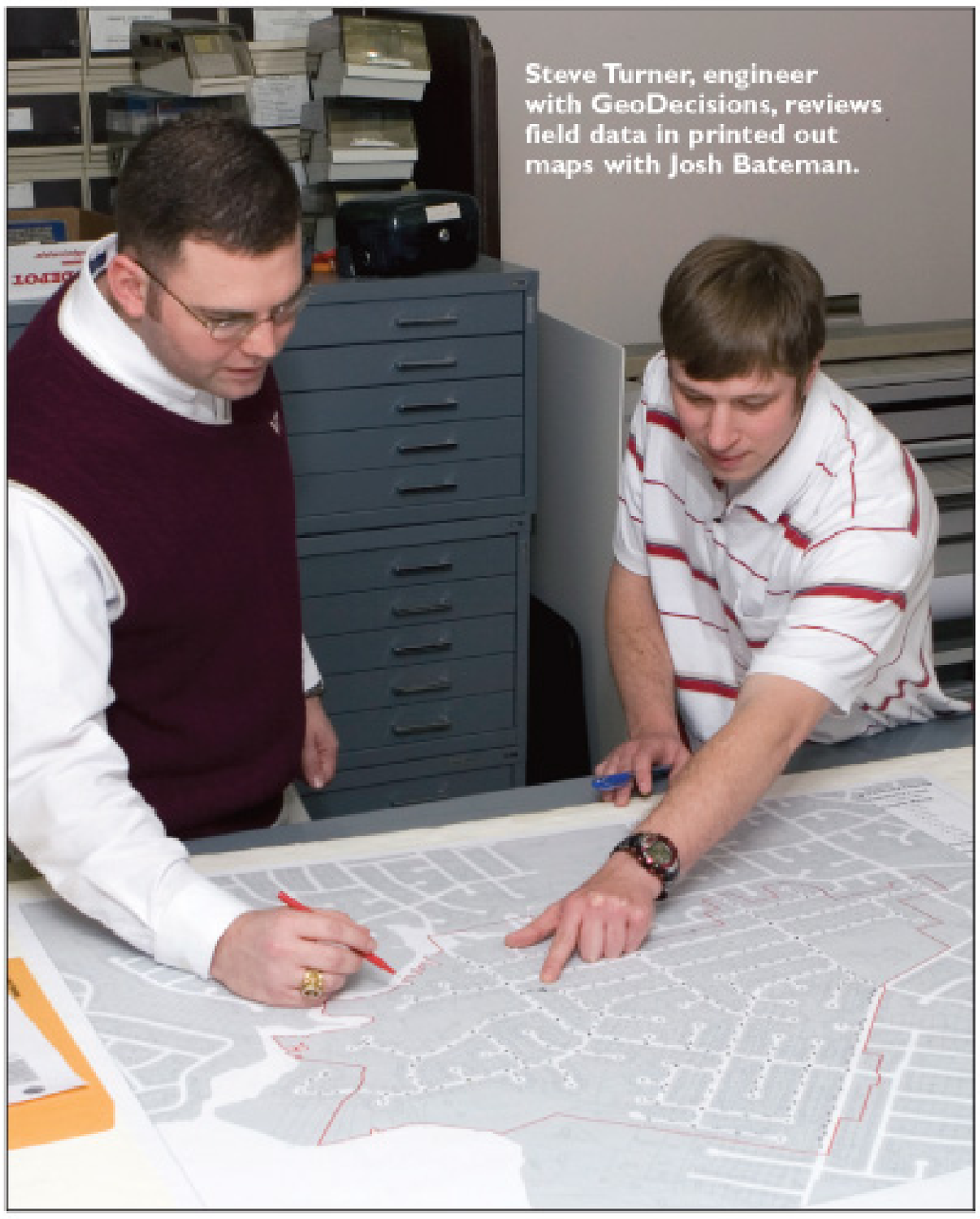
THE 'NEWS' IN NEWPORT NEWS

The first time people hear about Newport News, most wonder about the "news" part of the city's name. In fact, even residents wonder about it.

Historians disagree about its genesis. Some believe it can be traced to Capt. Christopher Newport, and the fact that his long-delayed supply mission to the Jamestown colony was first spotted at this location. This was around 1610, while Jamestown was weathering its "Starving Time" ordeal. Capt. Newport's arrival was certainly good news.

Others believe the original name was "New Port Newce." Sir William Newce and his brother Capt. Thomas Newce had both recommended the site for the first English settlers in 1621. With its favorable location on a peninsula in Chesapeake Bay, and with a growing trade in Virginia tobacco, its future as a successful port city was virtually guaranteed. Hence, "New Port Newce."

Newport News was incorporated in 1896 after 15 years of explosive growth driven by the construction of shipyards, railroads, and coal piers. At that time, the population was around 18,000. Today, Newport News is Virginia's fifth-largest city.



Steve Turner, engineer with GeoDecisions, reviews field data in printed out maps with Josh Bateman.

Stormwater coordinator Curtis Hartsfield (front) and Eugene Whitaker conduct a CCTV inspection of a storm sewer.

and sharpen our focus."

Land started with the Wastewater Division in the 1990s, after a tour with the U.S. Army Corps of Engineers. Combat engineering honed his leadership and problem-solving skills, providing valuable tools for his current position. The need for an accurate database of system infrastructure was clear.

"GIS is a very powerful tool, but we needed to find a contractor with a good reputation and solid data skills, someone who could work tightly with our municipal crews and ensure the level of quality and detail we wanted," Land recalls. That contractor was GeoDecisions, a subsidiary of Gannett Fleming Inc., based in Camp Hill, Pa.

GeoDecisions' initial work focused on the sanitary sewer system. GeoDecisions personnel gathered and input field data and also located and inspected some 8,000 manholes with 0.15-foot accuracy. They logged standard features and attributes for all major assets in the sanitary sewer system.

As the database grew, the division began adding stormwater infrastructure to the model. The first step was to divide the stormwater system into defined drainage areas, enabling computerized maintenance scheduling. Now, nearly eight years into the project, the sanitary system is completely mapped (except for laterals, which will be added later), and the focus is shifting to stormwater mapping.

Stormwater mapping is more complex because of the variety of assets included. In addition to pipes and pumping stations, the model includes everything from ditches to lakes. "If it impacts drainage, we'll need it in the system," Land says. He expects stormwater mapping to be complete by 2010-2012, provided funding continues.

"As we go through the mapping process, we find a lot of things we didn't know were out there," Crockett says. "We're also discovering errors in recorded pipe sizes and locations, some off by as much as 10 feet. It's like an inventory process right now, so we're just really learning the details of what we'll need to manage."

Just finding some of the assets has been a challenge. Over the years, private and commercial encroachments into the right-of-way have buried assets under concrete, asphalt, plants, fences, swing sets, and other structures. "Whenever that happens," says Crockett, "we let them know they're out of compliance. We tell them what they need to do, and we give them a reasonable amount of time to fix it. We'll work with them on this since it's to everybody's advantage to get it right."

"As we go through the mapping process, we find a lot of things we didn't know were out there. We're also discovering errors in recorded pipe sizes and locations, some off by as much as 10 feet. We're just really learning the details of what we'll need to manage."

Eddie Crockett

Birth of a division

DPW's Stormwater Operations Division is the new kid on the block. "We didn't exist before 2005, even though many of our operations were already being done by the Wastewater Division," says Eddie Crockett, division administrator. "So all we had to start with was a bunch of printed maps." Crockett took over where Land left off, inheriting Wastewater's still-growing digital mapping program.

In their spare time

The GIS mapping project keeps the team busy, even with GeoDecisions handling all the field data acquisition. If an asset can't be located, Crockett's team has to pull out the maps and help find it. Plus, they have an existing stormwater system to maintain.

With some 180 miles of open channel conveying the bulk of stormwater runoff, regular maintenance routines are essential. The larger channels, up to 60 feet wide and 20 feet deep, comprise about a third of the system. Many of the channels transport runoff from other cities farther up the peninsula. Newport News, located at the end of the peninsula, sometimes must deal with other peoples' problems.

"Having an accurate inventory of assets allows us to justify requests for more personnel and equipment to maintain what we have. Bottom line is, GIS modeling takes us to a whole new level of doing the job we're hired for."

Eddie Crockett

The stormwater division has two 1,500-gallon-capacity Vactor combination units and a single CCTV truck, but can borrow additional equipment from Wastewater as needed. When a division is only two years old, lack of internal resources can be a burden. "We need to finish our system inventory first," explains Crockett. "Then we can justify the cost of adding maintenance resources.

"We don't even know what we have yet, so we can't plan a regular maintenance schedule. We can be reactive, but not proactive. Once we know what we've got, we can be a lot more effective."

The stormwater division focuses routine maintenance on areas known for problems with debris accumulation and overflow. "But," notes Crockett, "as things stand, when a large storm hits, pretty much everybody in DPW switches over to stormwater support activities. We need to get beyond that, and digital mapping is our ticket."

Support from the private sector helps. A public education program, HR (Hampton Roads) Storm, disseminates useful information about disposal of waste, use of fertilizers and pesticides, and other practices that affect water quality. Compliance is good. Volunteers from Scout troops and other community organizations often help with cleanup programs along the James River and Chesapeake Bay.

Top photo, Rausaan Knox (left) and Jeffery Tigar of the Newport News Stormwater Division vacuum debris from a stormwater structure. Lower photo, Claiborn Phillips and Josh Bateman inspect a structure in the field.

Digital details

The Wastewater Division GIS mapping system is the brainchild of GeoDecisions. Their proprietary software, G²SmartMapping 4.0, was developed specifically for field data acquisition of features and attributes in sanitary and stormwater conveyance systems. It includes GPS location and mapping and integrates seamlessly with ESRI ArcGIS software, providing flexible display options and data transfer. But that's not all it does.

Mohamed Kacem, senior project manager at GeoDecisions, explains, "The software has nine quality-control measures built in. Things like field checks of auto-populated data, attribute transfer validation, and topology rules checking ensure the database is self-consistent." In simple terms, it allows assembly of an accurate hydraulic model that can be used for system simulation, proactive maintenance, and planning for upgrades and expansion.

G² acts like a "quality control filter" between field data acquisition and the GIS that displays the data. The user interface provides map overlays of everything from pipes to ZIP codes to ocean storm surge contours and is available to all municipal agencies. G² has provided essential support in areas as diverse as emergency response, crime analysis, and fire rescue.

Building the model

With only a fraction of the stormwater infrastructure mapped, there's time to fine-tune the process. Components are being added on a priority basis — the most troublesome items are first to be logged. Deciding which features and attributes to record is important, and getting it right the first time means not having to go back and do it again.

Stephen Williams of the Department of Engineering recalls, "When we first starting logging system assets, we didn't look far enough ahead. As our management concepts evolved, we found

we needed additional attributes, so now we need to go back and get that data."

One crucial part of the model is soil, which includes a mixed bag of sand, loam, clay, and rock. The water table is high and can create "running sand," a geological stratum that flows like horizontal quicksand. If a basin or ditch is part of the system, underlying soil attributes must be recorded.

In addition to the physical locating components of the system, the topological connectivity of G^2 allows hydraulic modeling of system perturbations, such as storm surges, precipitation, and new development. To enable this level of modeling, the system must be calibrated by monitoring actual effects of both natural and induced events.

Extracting value

The Wastewater Division was the first to see major benefits. Williams notes, "During the mapping process, we found assets we didn't know we had. That had a huge impact on our quality assurance level. You can't manage what you don't know."

Stormwater ultimately ends up in Chesapeake Bay, a major resource for commerce and recreation. Beach closings are frequent along the bay, signaling problems that need attention. "Chesapeake Bay is all about a way of life," notes Crockett, "and GIS modeling will go a long way toward helping us ensure that continues."

Newport News was the first city in Virginia certified by the American Public Works Association (APWA). The certification recognizes commitment to high standards of performance, progress in emergency planning, and cross-agency collaboration. Procedures are in place for natural events up to a Category 3 hurricane, roughly equivalent to a 500-year "regular" storm event. This level of event would put the city into what Crockett calls "recovery mode," but such plans are essential for public safety.

Future payoff

The total cost for system mapping (sanitary plus stormwater) is expected to be between $2 million and $3 million, but it will be money well spent, says Crockett. "We should have done this years ago, but sometimes it's tough to convince people to spend that kind of money," he says. "Ultimately, having this data allows us to move from being reactive to proactive.

"Currently, when we want to locate something, we need to pull out a full set of drawings, and you can imagine how labor intensive that is. Once we get this stuff into a digital layer, we can go to a computer, pull it up, highlight an area, and see exactly what assets we've got. It gives us new capabilities once we've got this stuff on a computer."

When the entire system is mapped, tasks like maintenance scheduling, emergency response, and planning for expansion become far easier. Simply knowing the pipe sizes, what they are made of, and whether they are round or elliptical makes the routine task of stocking parts less a matter of guesswork.

"Having an accurate inventory of assets also allows us to justify requests for more personnel and equipment to maintain what we have," Crockett continues. "Bottom line is, GIS modeling takes us to a whole new level of doing the job we're hired for." ✦

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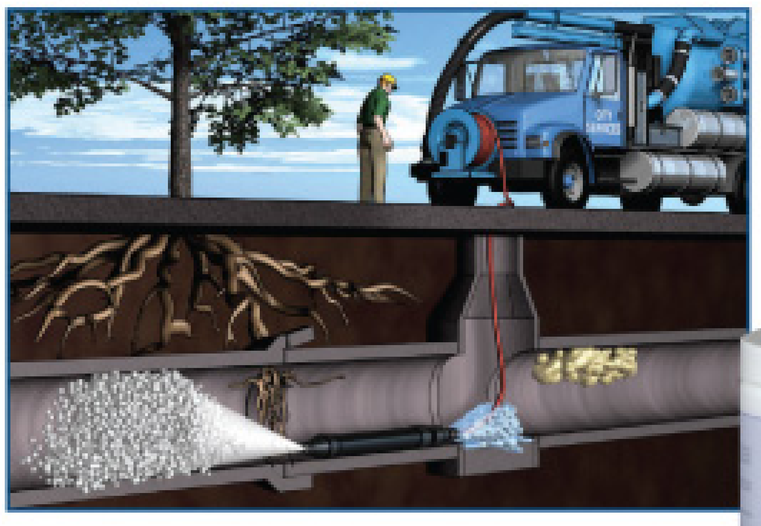

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ON THE BEAM

Laser profiling is gaining recognition in North America as a valuable tool for measuring newly installed pipes and sewers scheduled for rehabilitation

By Peter Kenter

Laser profiling is a relatively new technology that uses a laser beam to scan the interior of a pipe and accurately determine its ovality, alignment, diameter and capacity.

It's not the type of information collected on an ongoing basis. Instead, laser profiling is usually conducted just once before handover on pipe projects where the contract specifies the roundness of the installation.

Now required on government projects in just two states, laser profiling continues to gain acceptance as one criterion by which to judge a pipe installation. It also has potential as a tool for measuring pipes scheduled for rehabilitation, such as by cured-in-place pipe lining.

Municipalities and contractors that want to use the technology need to understand how laser profiling is developing as more and more jurisdictions specify it.

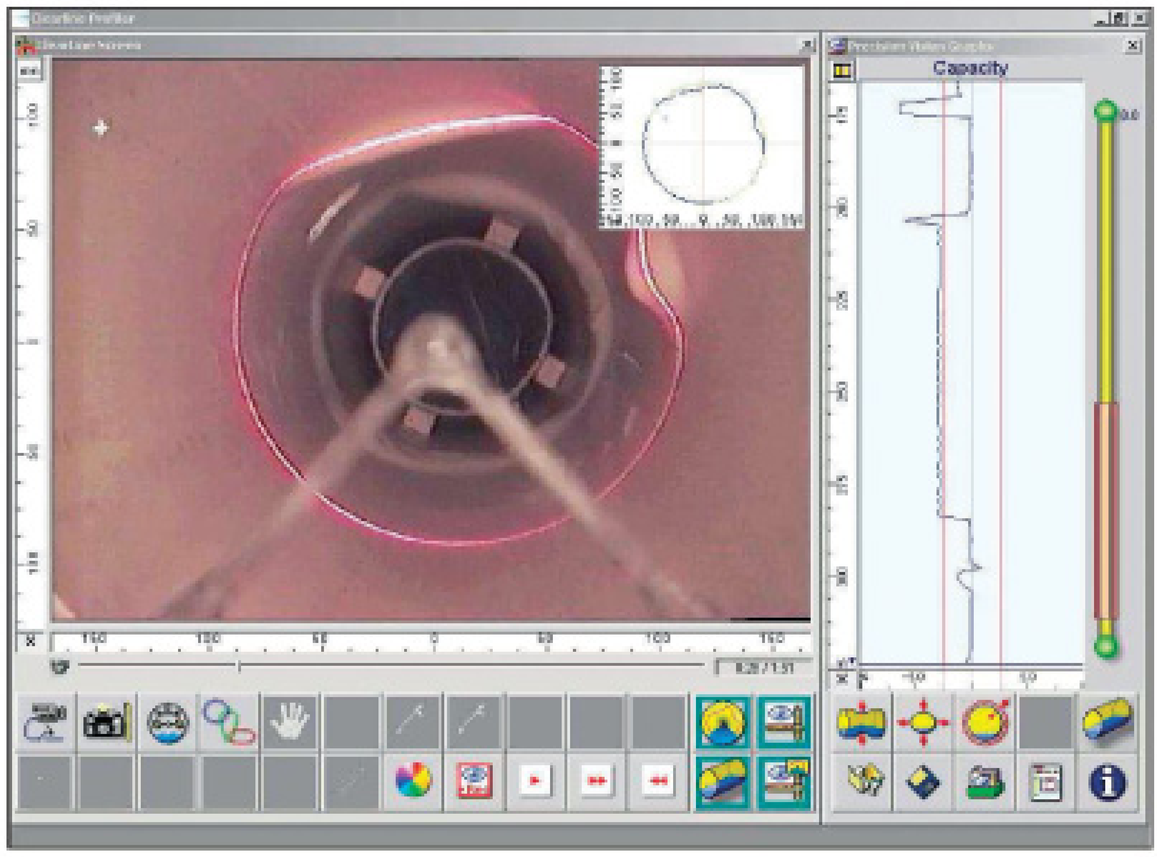
Deadly accurate

A laser profiler is essentially a CCTV camera inspection unit with a slim laser probe mounted to the front. The laser projects a ring of light around the pipe interior, while software processes the information it receives from analyzing the ring.

While a television image helps to estimate the dimensions of a pipe, a laser profiler provides hard data and dead-accurate readings within a fraction of a percentage point. And while the position of a CCTV unit is estimated by the length of cable fed into the pipe, the laser profiler can determine its own location within inches. Laser profiling devices now range in price from about $25,000 to $80,000, but prices are declining as the technology becomes more widespread.

"It's only been on the market in North America for a year or two, and people are just starting to see the benefits of the technology," says Gerry Muenchmeyer, technical director with the National Association of Sewer Service Companies (NASSCO).

"Initially, we've seen the sale of quite a few units in Florida, where any project under Florida Department of Transportation (FDOT) auspices is laser profiled for ovality before being handed over to the owner. The test applies equally to concrete pipes or flexible PVC pipes that might collapse beyond acceptable tolerances if trenches are improperly backfilled."



A laser profiler with video camera is shown inside a pipe with defects. (Photos courtesy of CUES Inc.)

The technology was promoted to the FDOT Pipe Advisory Group (PAG) at an October 2005 presentation by Orlando-based laser profiling equipment manufacturer CUES Inc. and Pipeline and Drainage Consultants of Lexington, Ky. FDOT moved quickly to include the technology in specifications on all projects with pipe diameters from 8 to 48 inches let after July 1, 2006.

The Arizona DOT has a similar mandate, insisting that 10 percent of all pipes on construction projects be scanned before project handover.

"If you want to design a liner to rehabilitate that length of pipe, you can take every defect into consideration. Afterward you can profile the liner and determine within a reasonable tolerance how thick the liner is and how well it fits into the existing pipe."

Gerry Muenchmeyer

NASSCO

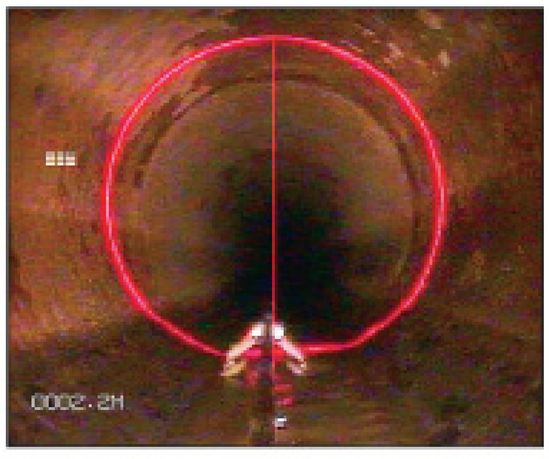
Making an impact

Laser profiling is better established in Europe, where it has been used for about five years. The reason is simple, says Mark Knight, associate professor in the Department of Civil Engineering at the University of Waterloo in Waterloo, Ontario, and executive director of the university Centre for Advancement of Trenchless Technologies (CATT).

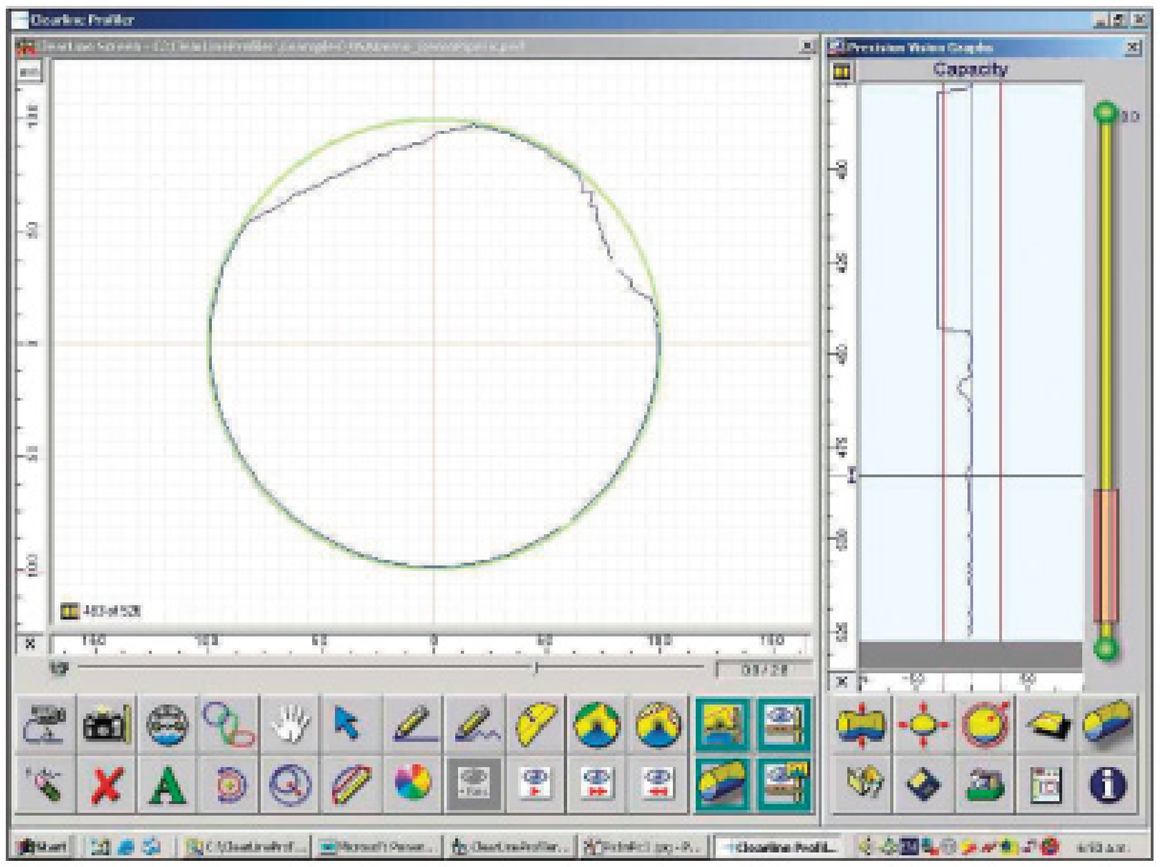
"In Europe, pipes are buried closer to the surface so live loads are more likely to affect the pipes," says Knight. "In North America, we bury them 10 feet or more, and the loads dissipate."

The technology has made an impact. A benchmarking project designed to test side scanning evaluation technology (SSET) in a dozen Canadian municipalities under the auspices of CATT and the Buried Asset Management Institute International in Atlanta, Ga., has been postponed in light of the newer laser equipment, says Knight.

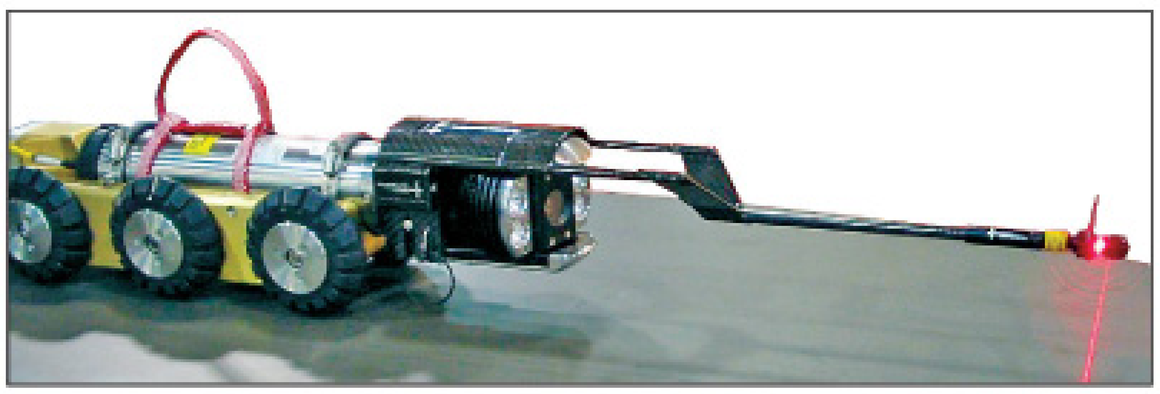
But laser profiling devices have more uses than checking pipes for government project owners. A laser scan will show rehabilitation contractors where pipes are undersized, or oversized. "If you want to design a liner to rehabilitate that length of pipe, you can take every defect into consideration," says Muenchmeyer. "Afterward you can profile the liner and determine within a reasonable tolerance how thick the liner is and how well it fits into the existing pipe."



A ring of laser light is shown inside a pipe free of roundness defects.



A pipe measurement diagram shows the desired shape of the pipe and the actual shape as determined by laser profiling.



In this common laser profiling configuration, a CUES LP917 laser profiler is shown coupled with an OZII video camera.

Sensitive to environment

The technology isn't without growing pains. Some units are sensitive to moisture and temperature variations, and even slight deviations in laser angles give false results.

"If you're riding on sand in the pipe and the inclinometer is off, it distorts the readings even more than it would if you were using just a CCTV camera," says Joe Vannieuwenhoven, product manager with Aries Industries Inc., a laser profiling equipment maker in Waukesha, Wis.

"The inside circle of the pipe will read as an ellipse, which is exactly the problem you're trying to identify. We solve that problem by equipping the profiler with an internal inclinometer."

The technology also doesn't work well in pipes filled partially with water — it provides information only on dry sections of the pipe. The solution here involves the addition of a sonar device to read the information below the waterline. Software integrates the two readings into a single result.

"These tools are becoming multi-sensory," says Knight. "We're seeing units that provide CCTV images, laser profiles and sonar readings on a single pass. Keeping all of those units calibrated with respect to each other could be a chore."

The first tool to become widely integrated with laser profilers is the laser micrometer, a laser scanner that accurately measures the dimensions and depths of pipe defects, scanning all pipe joints in 360 degrees. The laser micrometer has already been incorporated into FDOT standards.

More to come

Laser profiling technology is still developing. "We're going to see inspection units that offer more capabilities, including laser scanning and micrometry," says Vannieuwenhoven. "But as the technology becomes more complex, we're going to see a compensating demand for simplicity in operating these units. Contractors will expect a tool that doesn't require a high-level technician to do number-crunching or data analysis. They want something that can be run using an existing truck and existing operators."

Demand for laser profiling is expected to continue as government agencies look for new ways to ensure that they are getting value for its construction dollar. Likewise, laser profiling equipment manufacturers, and pipe manufacturers who might benefit from tougher standards, are lobbying state and municipal governments to adopt laser profiling.

"I think that what's going to happen is that, as the industry becomes more familiar with the capabilities of laser profiling, you're going to see it used more and more," says Muenchmeyer. "We're going to see a lot more success stories using this technology." ✦

ONE CONTRACTOR'S STORY

When the Florida Department of Transportation (FDOT) made laser profiling mandatory on all new pipe projects on July 1, 2006, some state contractors saw a business opportunity.

Mike Dean, president of Rockline Vac Systems Inc. of Dania, Fla., purchased a laser profiler from CUES Inc. with a laser micrometer in July 2007. The business added the specialty to its slate of other services, including CCTV inspection, chemical and pressure grouting, PVC slip-lining and cured-in-place pipe lining.

"We use the laser profiler only for FDOT projects," says Dean. "It's really used only as a method to determine whether pipes have been installed properly. When the general contractor takes on a construction project, the cost of laser profiling is already part of the contract.

"We're hired by the prime contractor or one of the subs to report to the government engineer on the project. It's crucial at that point because the manufacturer of the pipe — either concrete or PVC — is out of the picture. The test determines whether the work performed by the installer is going to be accepted or rejected."

Dean says that his company has performed laser profiling inspections five times. "It's not the type of service you can convince people to add to normal inspections without a good reason," he says. "We promote the service by sending flyers to local construction contractors to make them aware we offer it, and it's also something I make people aware of at trade meetings."

While there's no current standard by which to judge various laser profiling products, contractors looking to invest in a unit should examine the requirements of potential clients to ensure that the equipment delivers the degree of accuracy required. FDOT, for example, wants to see readings with an accuracy of plus or minus 0.5 percent.

While Dean knows the technology has wider applications beyond road building projects, the opportunities to use it haven't yet arisen. "I'm sure the technology could be used on a sanitary line as well, but you're not going to convince the client to simply add a laser profile inspection to a CCTV inspection unless they're willing to pay for it," he says. "Right now, outside of road work, it's considered an extra."

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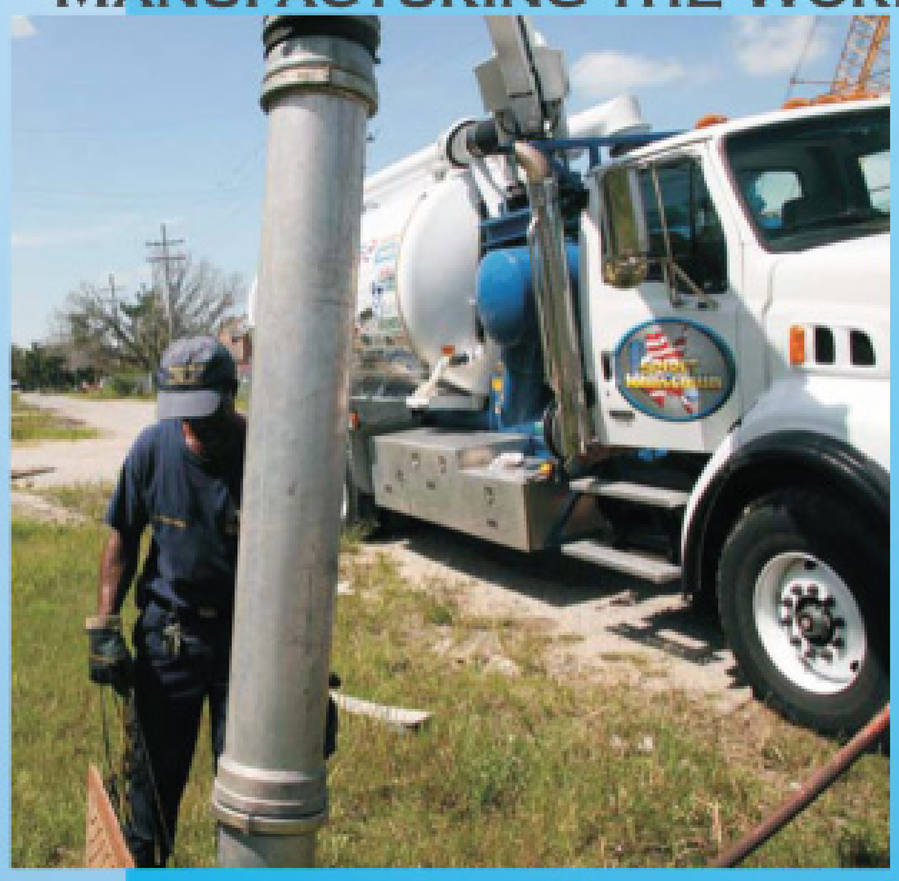

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City of Pearland technicians use a cellphone-based system to record data on lift stations and other assets. (Photo courtesy of BirdNest Services Inc.)

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OVER THE AIRWAVES

A data collection and reporting system based on cell phones aids system management and capital planning for the City of Pearland, Texas

By Linda Day

"In terms of long-range planning, the system gives you better projects and helps you construct facilities only where they're needed. It also helps identify problem areas that can be remediated before sewage backs up in people's yards."

Eddie Kirst, P.E.

The City of Pearland, Texas, 25 miles from Houston, is a microcosm of the trials of wastewater infrastructure management.

Old Town Pearland dates to the 1930s and 1940s, and waves of population since then have created a jumble of sanitary sewers, old and new, leaky and tight. Recently, the city has added hundreds of new connections a month to its system of five wastewater treatment plants, 78 lift stations, and 12 water stations.

Until recent years, operators tracked most of these facilities manually, writing field log books from which supervisors transcribed data into the computer. The city now gathers that data using cellular telephones, saving time and supporting sound system planning.

Better data management

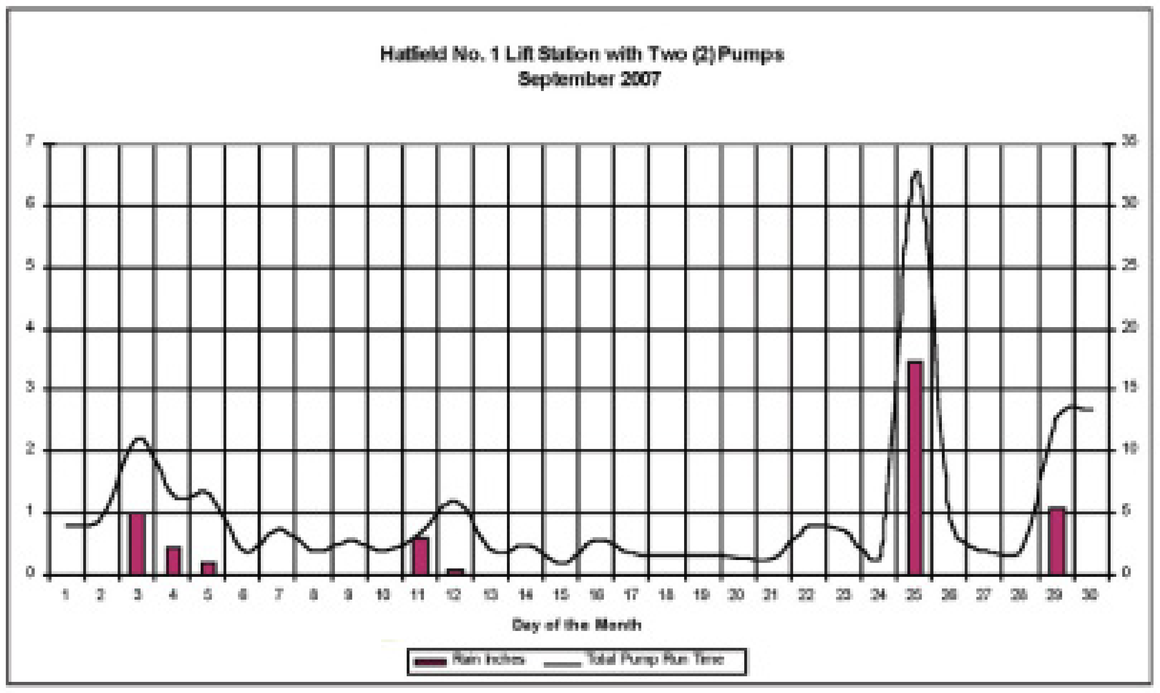
In 2005, Bobby Whisenant, then superintendent of water production and wastewater treatment (now retired), turned to BirdNest Services Inc. of Houston for the new data management solution. The company coded the city's infrastructure into menus for wastewater and water system operators' cell phones.

Organized by route and station, the menus take each operator through every item of data that must be captured for every station on a given route. The phones perform basic error checking and transmit the data to a central processing center in Dallas. From there, reports are available almost instantly, to city staff members with a computer and the right password.

"What used to take hours and days now takes seconds," says Whisenant. "It was great, the money the city saved in overtime."

Long-range planning

The data can be charted and graphed (see accompanying example), making it easy to spot anomalies and trouble spots for quick repair and remediation. But at the



The City of Pearland database helps identify situations that need attention. This lift station averaged about three hours total run time per day during dry-weather flow, alternating the lead and lag pumps. But during wet weather, the two pumps ran much more. Based on this data, the city stepped up its I&I reduction program in the area.

outset, no one realized that the system would also support sound planning.

In 2007, Pearland set out to update its 20-year, $200 million wastewater system capital improvement program (CIP). When Eddie Kirst, P.E., of Kirst Kosmoski Inc. consulting engineers in Houston, took on the project, he was pleasantly surprised to find that since the CIP was developed in 2005, two years of detailed flow data, pump run times, rain dates and rain amounts had been collected. He was able to download it all.

"With the BirdNest data, we were able to dynamically model the whole system — every manhole, every lift station, and every piece of property," says Kirst. "We found that the city didn't need some projects we had proposed two years earlier based on estimates and sound engineering judgment, and there were other projects we hadn't projected that the city would need."

Design and planning

"In terms of long-range planning, the system gives you better projects and helps you construct facilities only where they're needed," Kirst says. "It also helps identify problem areas that can be remediated before sewage backs up in people's yards."

Beyond that, Kirst notes another cost advantage for new facilities. Texas mandates that in the absence of local reliable flow data and engineering analysis, sewer systems must be designed to convey about four times the estimated average daily flow to allow for inflow and infiltration.

The data provided by the BirdNest system and the engineering analysis provided by Kirst Kosmoski will allow Pearland to reduce the peak factor on some parts of the system significantly. "That's a huge cost saving, not only in capital costs but also in daily operation and maintenance costs," Kirst says. ✦

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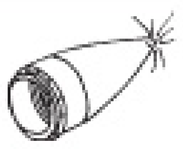

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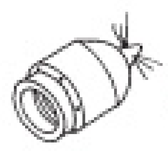

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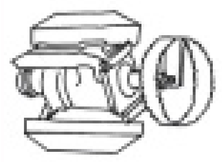

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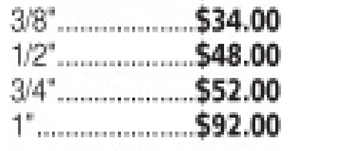

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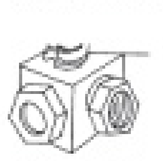

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RING OF LIGHT

The CoolVision laser profiling system from Aries Industries achieves high accuracy with a proprietary optical system and 3D modeling software

By Dan Heim

Accurate assessment of the condition of underground pipes is essential for efficient planning of maintenance, rehabilitation or replacement.

Imagine having a 3D model of those pipes — one that can be rotated, panned, zoomed, and measured on a computer screen. That's what users get with the CoolVision 3D laser profiling system from Aries Industries Inc. It does so with nearly the same workflow as conventional CCTV inspection systems.

The laser profiler complements CCTV cameras, which are still needed for the visual record.

The circle on the screen is actually slightly elliptical in proportion to the degree of pipe ovality. What looks like interference at the lower left is a parallel data stream containing information about distance, inclination, light intensity, internal humidity, and data stream integrity. (Photos by Dan Heim)

The fully interactive onscreen 3D model allows easy measurement of critical parameters such as distance, inclination and ovality (deformation), while the synchronized video shows defects such as cracks, bad joints, roots, and interior scaling.

By projecting a circle of laser light on the section of pipe ahead of the camera, recording the image of that projection, and then analyzing the image with sophisticated 3D processing software, the system creates a highly accurate 3D model of the pipe interior. Later, at the user interface, the 3D model can be displayed concurrently with visual data from the CCTV camera and graphic data on the parameters of interest.

Joe Vannieuwenhoven (known as Joe Vann), product manager for Aries, and Jerry Botts, president and CEO of Botts Consulting Group, exclusive marketing representative for CoolVision, demonstrated the technology April 16 in Gilbert, Ariz. The test included a 500-foot data run in a 24-inch PVC pipe 25 feet below a city street.

Walk-around

The CoolVision laser profiler is a self-contained unit designed to be towed behind a standard non-steerable camera tractor or pulled by cable. The unit is not self-propelled, but couples easily to any tractor using the included hardware.

Coupling is accomplished with a rigid hitch that allows up-and-down motion as needed for changes in inclination, but resists side-to-side deflection. The minimum pipe size for profiling is 8 inches; the maximum is 48 inches. The computer software can adapt to circular, elliptical, or arched pipes, but not to square pipes.

Other accessories modify the laser profiler for larger-diameter pipes. These include hub extenders for better centering, and extender brackets to better position the laser and camera modules. In larger pipes, the image of the projected circle of laser light would otherwise be out of frame for the camera. It is the shape of the projected circle, along with data from an onboard 2-axis inclinometer, that provides the information needed to build the 3D model.

In a pipe carrying water, the laser light refracts at the air-water interface, stretching the projected circle on one side and skewing the

Jerry Botts of Botts Consulting Group checks the CoolVision laser module before deployment during the demonstration run held in Gilbert, Ariz.

TECHNOLOGY TEST DRIVE

EQUIPMENT:
CoolVision 3D Laser Profiler

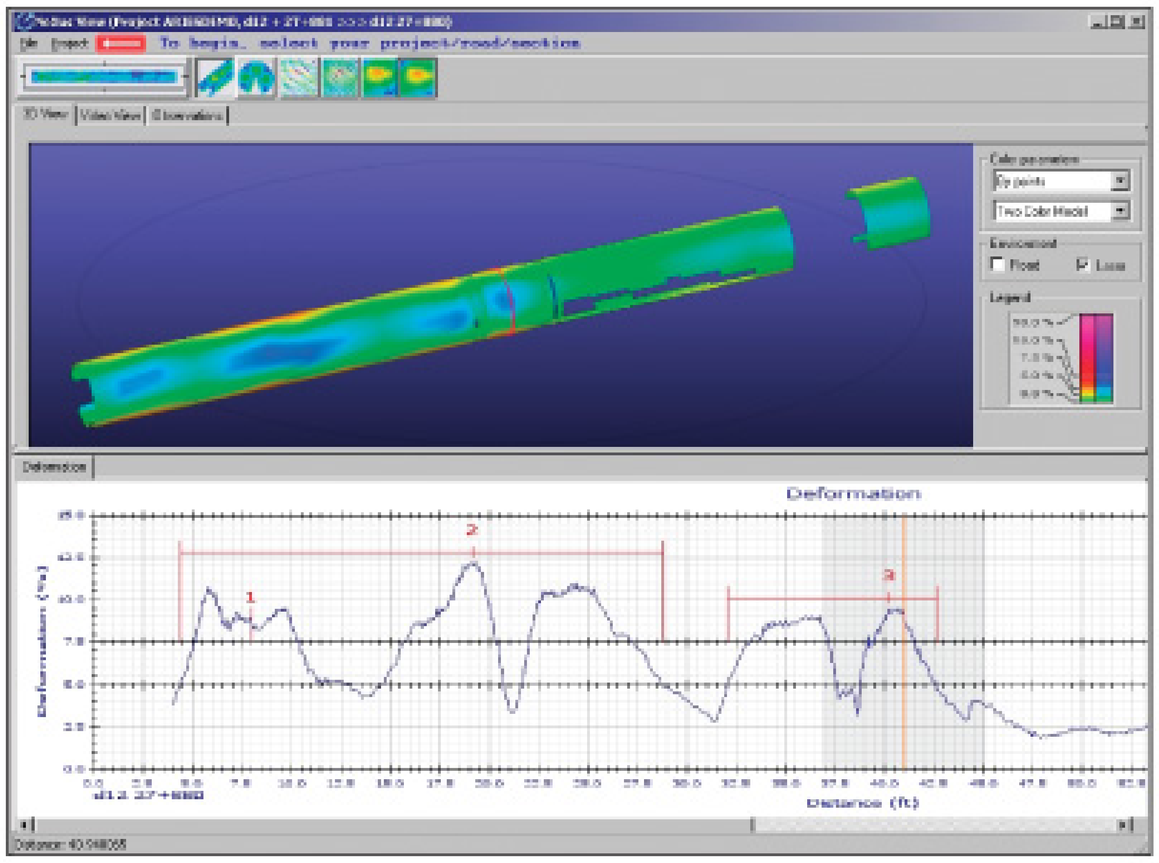
MANUFACTURER:
Aries Industries Inc.,
Waukesha, Wis.
800/234-7205
www.ariesindustries.com

LOCATION OF DEMO:
Gilbert, Ariz.

DEMONSTRATED BY:
Joe Vannieuwenhoven, Aries Industries; Jerry Botts, Botts Consulting Group

LIST PRICE:
$60,000 for laser profiler retrofit to existing camera van

The final product of the laser profiling system is a 3D model of the pipe that can be rotated, panned, zoomed, and overlaid with the data of interest. This sample image shows the deformation of a 36-inch PVC pipe as color-keyed areas.



The hitch connecting the laser profiler to the camera tractor allows vertical rotation to accommodate changes in inclination and facilitate loading into the pipe. Horizontal flex is all but eliminated, ensuring that the profiler follows directly in line with the tractor.

Positional data is obtained via transducers in the wheels. Looking much like 48-tooth sprocket gears, these heavy, stainless steel wheels turn without slipping and register distance in direct proportion to their rotation. Positional accuracy is maintained at speeds up to 50 feet per minute.

data. The software that creates the 3D model recognizes this, and ignores that skewed data. In its place is simply a gap in the visual model that makes it look like the bottom section of the pipe is missing. The modeling software only needs 55 percent of the complete circle to extrapolate the data and create a full 3D model.

Projecting a circle of laser light gives the system its inherent accuracy. Some laser profiling systems use points or bars of light, providing less geometric data to describe the pipe in three dimensions. By recording 2,000 points of data at 30 frames per second, the system attains 0.25 percent accuracy and 99.9 percent repeatability, according to Aries.

Positional data is obtained via transducers in the wheels. Looking much like 48-tooth sprocket gears, these heavy, stainless steel wheels turn without slipping and register distance in direct proportion to their rotation. Positional accuracy is maintained at speeds up to 50 feet per minute, well in excess of industry standards.

Data is transferred to a computer in the camera van on a cable that contains 12 conductors, including a coaxial cable. There it is encoded into a format readable by the modeling software. Next, the data is transferred via DVD or FTP to the C-Tec Data Analysis Center in Montreal, Quebec, where proprietary software creates the 3D model. Results are returned to the client via a written report and DVD within 48 hours.

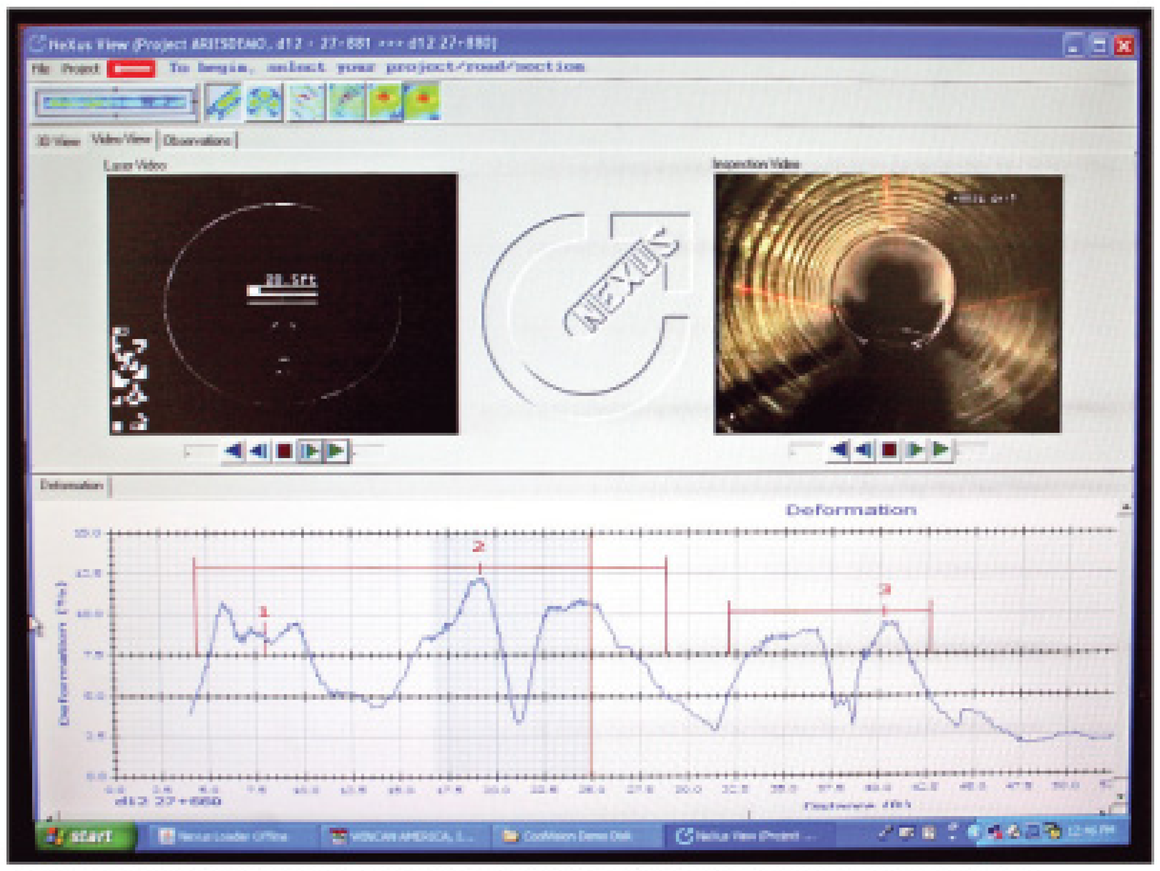
As an example of the volume of data generated, eight hours of measurements will fit on one DVD (4.7 GB), or require about three hours of broadband uplink time. Video data is encoded in MPEG-2 format and includes a multiplexed data stream recording distance, inclination, light levels, deformation, internal humidity (of the profiler), and a data parity check.

Operation

A crew from the City of Gilbert arrived early with a vacuum truck, and had the manhole opened and cleaned by 9 a.m. At 10 a.m., Vann and Botts began their demonstration with an overview of the product, followed by questions and answers for the city crew. This included a look inside the camera van, where the operator console and computer were located.

By 10:30 a.m., Vann and Botts were ready. After hitching the laser profiler to a camera tractor, they lowered the combined 75-pound unit 25 feet down the manhole and into the 24-inch metal pipe. An onboard winch and manhole-mounted cable roller made the process easier. Once the equipment was inside the pipe, they used the tractor motor to level and position the laser profiler at the end of the pipe and calibrated the starting point.

At the console, Vann started the data run by simply switching on the recording software and acti-



Nexus Loader display software provides simultaneous views of the projected circle of laser light (upper left), the standard CCTV camera view (upper right), and numerical data such as distance, inclination, pipe deformation, and more (bottom).

vating the tractor. Moving at 40 to 50 feet per minute, the laser profiler covered the 500 feet to the next manhole in less than 15 minutes, all the while streaming real-time images and data to the monitor. There, the Nexus Loader front-end software displayed a tri-window view showing the projected circle of laser light, the CCTV video feed, and a graph of all measured parameters.

Even without the 3D model, Vann's trained eye could see from the shape of the projected circle of laser light that this pipe was sagged in some sections and deformed in others. With the 3D model, these defects would be immediately obvious.

To demonstrate another capability of the equipment as set up, Vann stopped the unit in mid-pipe, focused the camera on the interior surface, and used a MilliM video micrometer, a tool used to accurately measure cracks and joint gaps in pipelines. By projecting a set of parallel and perpendicular lines, the operator can tell when the camera's line of sight is perpendicular to the pipe surface, a necessary condition to avoid parallax errors during measurements.

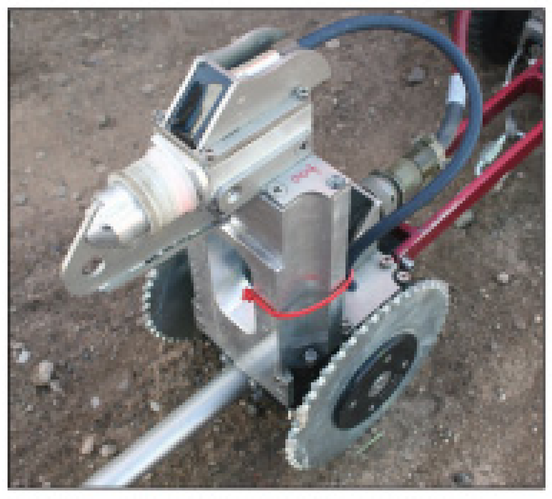
Thus calibrated, Vann pointed out the now-onscreen image scale and used the cursor to draw a line between two points on the pipe surface. The properly scaled length of this line was immediately displayed and recorded.

After retrieving and stowing the laser profiler and camera tractor, Vann and Botts ran another short question-and-answer session to explain what would normally happen next. As this was only a demonstration, the data would not be forwarded to C-Tec. Instead, Vann loaded a sample DVD from another job to show immediately what the 3D model would look like.

With the 3D model onscreen, Vann showed how he could scroll back and forth along the pipe to an area of interest. The CCTV camera view and a graph of pipe ovality (deformation) were simultaneously displayed and synchronized with the cursor position.

Then he zoomed in on a color-keyed section of the model that indicated high deformation, and rotated the image for the best view. It was clear that the deformation was not uniform, as it would be under normal soil loading conditions, and instead likely was due to premature failure of that section of pipe.

The camera module at the rear of the unit is ruggedly built and fixed in position relative to the laser module by a rigid conduit "backbone" joining the two.



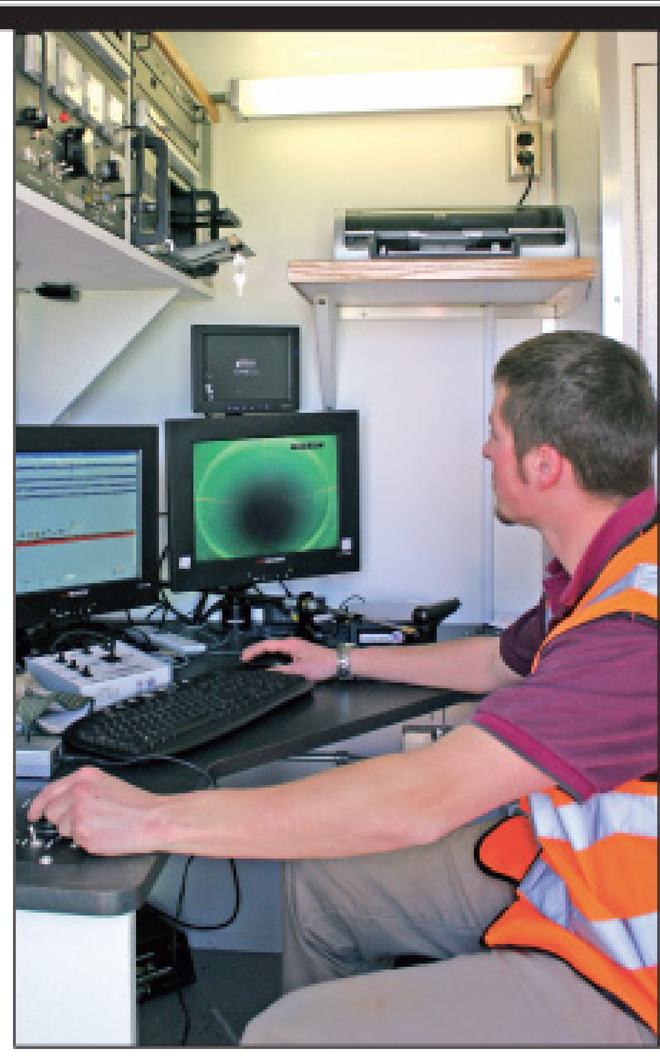
The laser module at the front of the unit uses a solid-state red light laser to draw the circle projected onto the pipe's interior surface.

Observer comments

Mechanically, the laser profiler is a simple system that can interface easily with any camera tractor. Lowering and deploying a "train" of two connected units (camera tractor plus laser profiler) is obviously more difficult than deploying a single camera tractor, which weighs about half as much. Still, deployment proceeded with no problems, even in a 25-foot-deep manhole.

The results, though simulated in this demo, were impressive. Vann manipulated the 3D onscreen model, rotating and zooming to point out features like sag and deformation. Simultaneously onscreen were the visual record from the standard CCTV camera, and the graphic display of measured parameters, all keyed to position and fully scrollable up and down the pipe.

With only a single pass required for data acquisition, no additional time beyond that required for a standard CCTV inspection was needed. Given how much additional information is acquired, and the accuracy of that information, this system appears to increase data return significantly for the time invested in field inspections.



Joe Vannieuwenhoven of Aries Industries Inc. demonstrates the proper methods for tractor control and data acquisition.

For end user convenience, the data is delivered first in raw format as part of the laser video to a third-party company, where software automatically reads and analyzes the information before final verification by a specialized technician. The inspection deliverables include a PDF report of the Deformation (Ovality) Graph, Flat Analysis Graph, and picture index. The Nexus software is provided on DVD and includes both videos synchronized, the 3D pipe view for ovality, the deformation graph, and other pertinent information. ✦

"The operator completes the laser profiler and CCTV inspection at virtually the same productivity level. There is no need to field calibrate, because the system automatically does this every second as it measures the actual inside pipe dimension with every profile."

Joe Vannieuwenhoven

Manufacturer comments

Vann notes that the laser profiler is designed to minimize operator setup and to eliminate post-inspection data analysis in the field. "The operator completes the laser profiler and CCTV inspection at virtually the same productivity level," he says. "There is no need to field calibrate, because the system automatically does this every second as it measures the actual inside pipe dimension with every profile." The equipment is annually certified by an accredited independent testing agency.

MORE INFO:

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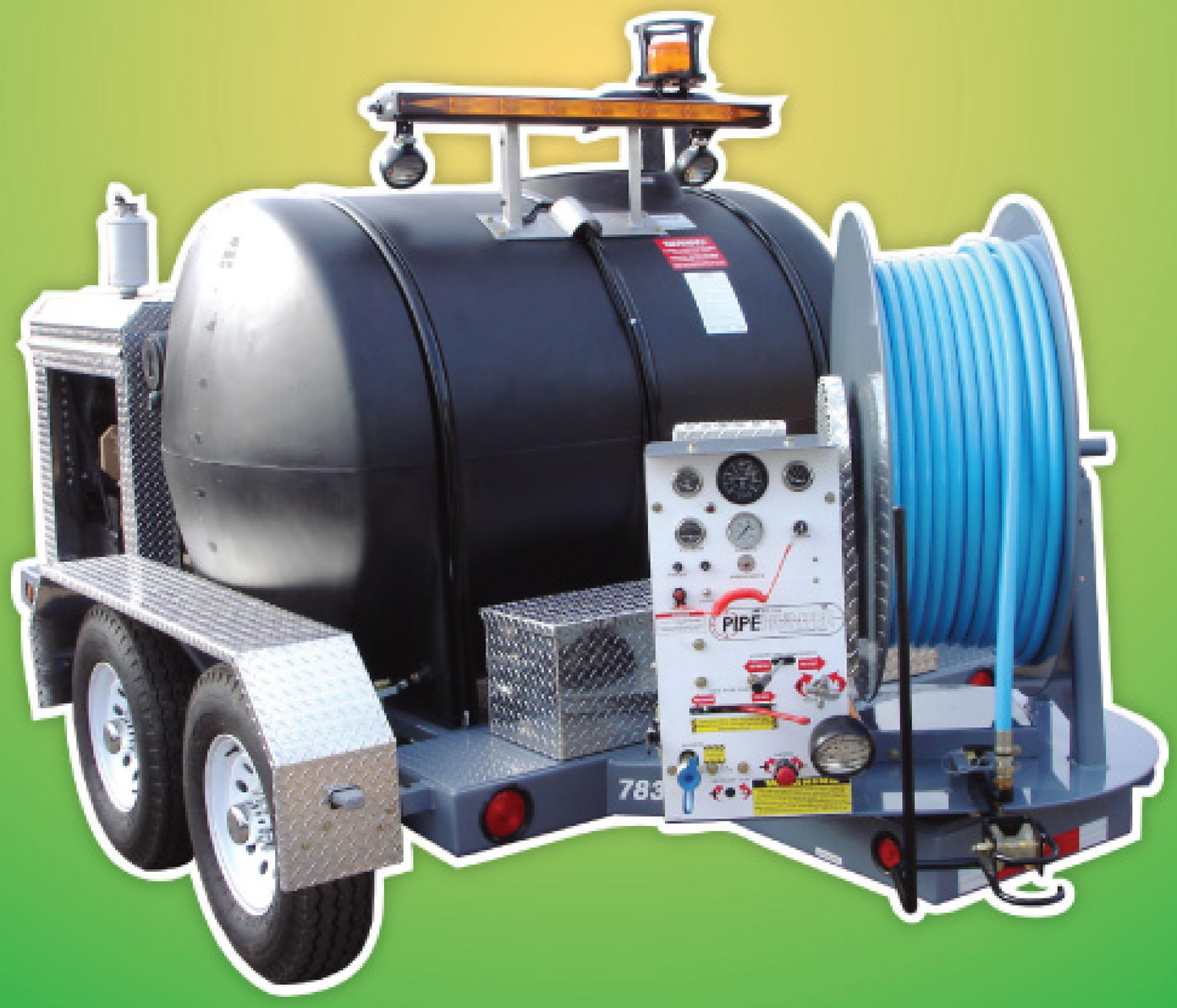

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WORKING JOINTLY

2008 Grout Boot Camp brings competitors together in an effort to help industry members learn

By Irv Gemora

I say it often because it is so true: I am thrilled to be in this role where I can help the trenchless technology industry grow.

As executive director of the most respected industry organization focusing on training, education and networking, I work with many amazing people and companies that contribute to the growth of our industry. NASSCO is known for its networking opportunities, and now we're even bringing competitors together to help them educate prospects and secure leads.

In April, a Grout Boot Camp was held at our headquarters in Owings Mills, Md. Aries Industries, De Neef Construction Chemicals, Avanti International, and Logiball Inc. joined to conduct the extensive three-day educational session. Attendees were contractors and municipal employees from around the U.S. and Canada. In the past, seminars were attended primarily by municipal employees. By extending the audience to include contractors, the dynamics of the workshop have improved and the real-life experiences have become even more important.

One municipal employee, Dwayne Dowell from the City of Fruitland, Md., told me, "This experience has been extremely valuable. I have learned more in the past two days about grouting than I have over the past year on the job. The experiences shared by other attendees have been very informative."

I encourage NASSCO members to take advantage of the space and opportunity offered to them. Our new office, halfway between Philadelphia, Pa., and Richmond, Va., has a large demonstration room for members to showcase their products and services, host events, and schedule meetings.

The Grout Boot Camp was held in the heated warehouse, a more than 1,000-square-foot area with a garage door that can accommodate a truck and other equipment. The space includes a classroom that comfortably seats up to 30 people.

Renting the classroom, warehouse and demonstration room is an exclusive benefit for NASSCO members. We want to help our members grow, and giving them space to showcase their offerings and educate their prospects is one of many ways we can help.

While I am biased when it comes to NASSCO, I am not alone when I speak about the benefits a NASSCO membership has to offer. If you're not already a NASSCO member, I invite you to learn more. Visit us at www.nassco.org or call 410/486-3500. ✦

Irv Gemora is executive director of NASSCO. He can be reached at director@nassco.org. The new NASSCO headquarters is at 11521 Cronridge Drive, Suite J, Owings Mills, MD, 21117. Call 410/486-3500.

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SHARING PERSPECTIVES

An engineering department in California took strong measures to increase staff diversity. It soon paid off in fresh ideas with practical applications.

By Ken Wysocky

Alarmed by a lack of ethnic diversity and concerned that it would inhibit new ideas and fresh perspectives, Uchenna Udemezue and colleagues decided to change the face of the Department of Engineering and Transportation in San Leandro, Calif.

Today, the department is anything but homogeneous. Thanks to aggressive outreach that includes targeted recruiting and partnerships with area junior high schools, high schools, colleges and universities, about 45 percent of its engineers are white, about 20 percent are black, 20 percent are Asian and 5 percent are Hispanic.

Seven years ago, the engineers were 85 percent white, 10 percent Asian and 5 percent Hispanic, notes Udemezue, the department director. Behind the numbers, the department gained something even more valuable — new ideas generated by people with diverse backgrounds, experiences and perspectives.

Wisdom from travels

The seeds were planted when Udemezue and two colleagues observed the unique perspectives they gained when they met with colleagues from abroad. Such perspectives weren't as evident in their department.

Udemezue also was concerned about the lack of good engineering candidates. Local universities were reporting fewer engineering student registrations. Udemezue says the department was lucky if it received half a dozen qualified applicants for engineering openings. A decade ago, openings usually drew 50 or more applicants. Such trends do not bode well for a public sector facing a wave of retirements.

When a local college professor told Udemezue that a top civil engineering student had turned down a full scholarship to earn a master's degree in that field in favor of paying her own way through law school, he knew something had to be done.

To achieve more diversity, the department knew it had to change how it attracted candidates. So when engineering openings occurred, the department supplemented its recruiting by running ads in publications such as the *National Society of Black Engineers* magazine and the *Northwest Asian Weekly*, Udemezue says.

Back to the schools

"We looked for magazines that cater to different groups, so we were sure to reach everybody," he says. Department leaders also collaborated with junior high schools and high schools. They sent out letters to area public and private schools, along with a PowerPoint presentation, and asked to speak to students, whether at a large general assembly or just a classroom at a time.

It was slow going at first. Many school officials suggested that Udemezue and colleagues make their pitches on school-sponsored career days. But at that point, students are ready to graduate, and it's too late for the kind of intervention Udemezue had in mind. But persistence paid off.

"We're very aggressive," he points out. "Every year, we speak to every high school and as many junior high schools as possible. Sometimes we'll just drive down to a school in person and ask to speak to a math teacher or a counselor. At one school, it took us two years to get our foot in the door. Now they want us to do three different sessions."

"Our department is now very well represented, with whites, blacks, Asians and Hispanics. It's fascinating when we have a staff meeting and you see the ideas start flying around. It's a beautiful and incredible thing to see."

Uchenna Udemezue

Udemezue quickly found that most students didn't know what civil engineers do. "So we let them know what it takes to be an engineering student and dispel any myths — tell them the truth about what it entails," he says.

"For instance, most students think they need to be math whizzes to be an engineer. You need to be good at math, but not necessarily a whiz. They also think engineers are nerds, but we tell them today's engineers need human interaction skills, too.

"We emphasize that no knowledge is unimportant when it comes to being an engineer, whether it's geography, history or sociology. We tell them to read as much as they can and always broaden their horizons, because it all comes into play later."

Creating internships

Along with the school presentations, the department offers four paid internships that run from high school through college graduation. High schoolers can earn up to $14 an hour and college students make $22 an hour.

"We try to expose them to all possible aspects of engineering, from sewage treatment to golf courses," Udemezue says. "Some interns are actually doing design engineering work comparable to that being performed by a college graduate with one or two years of experience in the field."

So far, the department has hired two out of the nearly 40 interns who have passed through the program. But even if interns take civil engineering jobs elsewhere — or even work for the department and then leave for another job — Udemezue still considers the program a success.

"If they go on to bigger and better things, that's a good thing," he says. "We'd rather have two years of excellence than hire someone and get 20 years of mediocrity. This isn't a selfish move to take care of just ourselves; it's also aimed at helping the engineering field overall. We measure the success of the program by how many of the interns graduate and become civil engineers."

The department takes proactive steps to make sure engineers stay for a long time and remain happy about their jobs. "We sit down and determine some long-term goals and figure out how to help them achieve those goals — help them get better than they are," Udemezue says. "We expose them to everything possible to make them better."

Fresh solutions

Now, when department engineers meet to discuss how to solve problems, a different dynamic exists. Udemezue recalls a discussion about ways to slow down traffic and better protect pedestrians on a particular intersection. An Asian engineer said that while speaking with someone in China, he learned about a special kind of turnabout intersection used there for bicyclists.

"We asked him to get more information, and now it's something we've added to our toolbox," he says. "Different cultures bring different perspectives to the table."

Udemezue takes great pride in what the program has accomplished thus far. "Our department is now very well represented, with whites, blacks, Asians and Hispanics," he notes. "It's fascinating when we have a staff meeting and you see the ideas start flying around. It's a beautiful and incredible thing to see." ✦

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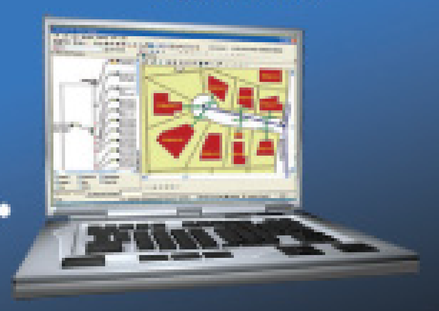

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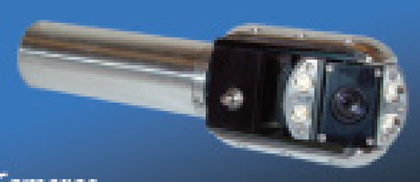

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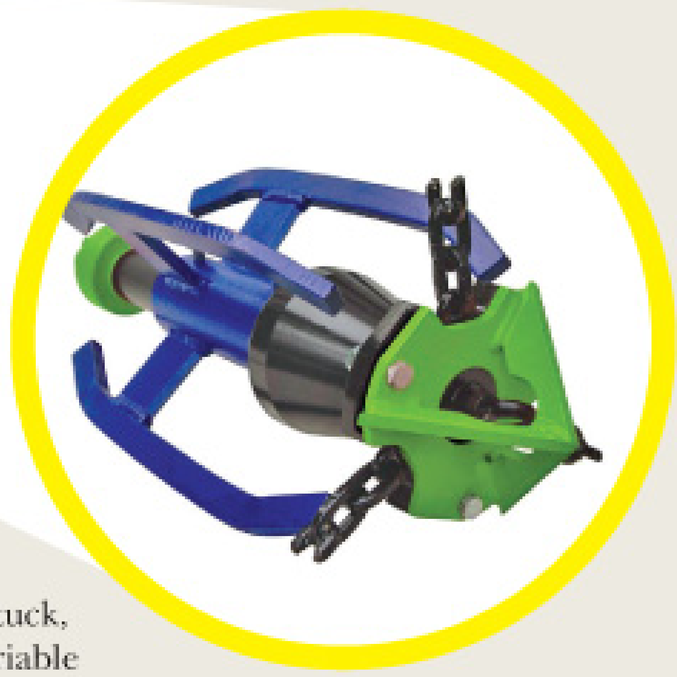
Product Spotlight

A Nozzle Designed for Tough Cutting Jobs

By Ted J. Rulseh

Some pipe obstructions demand more than mere jetting power — they need heavy-duty cutting action. Lumberjack series nozzles from NozzTeq Inc. are high-speed (up to 50,000 rpm), low-torque, multi-purpose cutters.

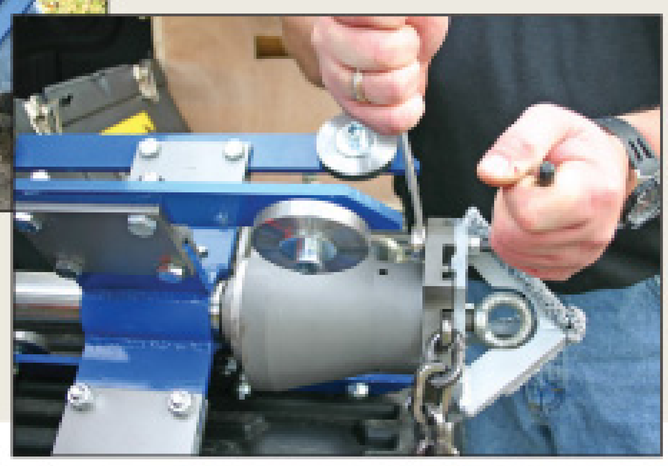
Nozzle rotation is powered with the water pressure supplied by a common sewer cleaning jetter truck. Although it is designed to cut roots, many users apply it for cutting concrete, grease, mineral and chemical deposits, tuberculate, and protruding laterals. The nozzles operate in pipes from 3 to 48 inches.



Lumberjack series nozzles from NozzTeq Inc.

The rotation bearings are sealed, grease-lubricated and water-cooled. No lubrication is required after use. The standard and optional cutting accessories are designed to eliminate potential pipe damage.

The low-torque, high-speed operation helps keep the nozzles from getting stuck, spinning off the hose, or cutting through the host pipe. The cutters rotate at variable speeds with flow rates from 10 to 250 gpm at variable pressures. Each model cleans the pipe interior using a filled chain link. The cutters also have a removable cutting blade for severe blockages.



All models are supplied with propelling jet housing. The Lumberjack cutter kit includes turbine, water-supply tube, chain plate/pull plate, tow ring, cutting blade, sleds, five sets of chain per sled size, propelling nozzle with jets and adapter, spanner wrench, tools and toolbox.

The cutters are available in different models, enabling contractors to choose the unit for optimal cleaning effect. Six models range in weight from 20 to 98 pounds, in length from 4.8 to 43 inches, and in pipe cleaning capability from 3-4 inches to 16 to 24 inches (capability to clean 48-inch pipes is optional). **For information: 866/620-5915; www.nozzteq.com.**

RIDGID Designs Full-Range Utility Locator

RIDGID's SeekTech SR-60 underground utility locator is able to receive a full range of locatable frequencies, enabling it to be used with any preset frequency transmitter. Users can locate within a frequency range of 10 Hz to 490 Hz, tune 1 Hz at a time, and search all broadband passive frequencies at once. It also has 30 field-programmable, user-designed frequencies and uses multi-directional antennas. **For information: 800/769-7743; www.ridgid.com.**

Water Cannon Releases EXTREME Line of Washers

The EXTREME line of continuous-duty pressure washers from Water Cannon features an aircraft-grade aluminum frame with epoxy powder-coated finish, 50 Mesh inlet filter, E-Z Start unloader valve, oversized pneumatic tires and dual-padded shock absorbing feet. It also has a triplex heavy-duty low-speed pump with thermo sensor and 3/4-inch, cold-rolled steel axle for durability. Accessories include gun/wand assembly with quick connects, 50-foot hose, and Maxi-Flo chemical injector. **For information: 800/333-9274; www.watercannon.com.**

Envirosight Introduces Push Camera with Sonde

The VeriSight push camera system with sonde from Envirosight LLC features a stainless-steel, self-leveling camera with tri-level sonde, splash-proof digital controller with text writer, storage for 45 hours of MPEG4 video on an 60 GB internal hard drive and a welded, stainless-steel reel with Kevlar-reinforced 100- or 200-foot push rod. The camera, with shadowless LED array, measures 1.8 inches and comes standard with a 2.4-inch skid. A 4- to 8-inch adjustable skid is available. Located behind the camera, the sonde operates at a selectable 512 Hz, 640 Hz or 33 kHz for locating distances up to 12 feet. Built into a water- and shock-resistant ABS plastic housing, the controller displays video on an 8-inch TFT LCD. **For information: 866/936-8476; www.envirosight.com.**

Dresser Roots Designs Compact Blower Unit

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The EasyAir X2 compact blower unit from Dresser Roots is compact, pre-assembled, skid-mounted with all piping, valves and instrumentation in place. Designed for both vacuum and pressure applications, the package features a powder-coated noise enclosure for durability and quiet operation. **For information: 877/363-7668; www.rootsblower.com.**


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TT Technologies Designs Large Diameter Cutter Head

The Steel Cutter head from TT Technologies is designed for bursting/splitting steel pipes up to 32 inches in diameter when used with larger Grundoburst static bursting systems. Pulled by a hydraulic bursting unit, the cutter head's special cutting wheels slip the host pipe, while an extended expander displaces the split pipe into the surrounding soil and pulls in the new pipe. **For information: 800/533-2078; www.tttechnologies.com.**

Clear Computing Offers Garmin Route Updates

229

Clear Computing's Total Activity Control management system has added route updates to vehicles equipped with Garmin navigational devices and StreetEagle GPS systems. The feature enables route drivers to start their day from any location, receiving fixed service routes from their Garmin device, along with visual and verbal driving instructions (multiple-language supported) and an e-mail copy of the route. For companies using work orders, the TAC will send the work order list or next work order to the vehicle, and the Garmin will take the driver from the current location to the service location. The TAC also can e-mail full-color PDFs, which the driver can print, should written customer service forms be needed. **For information: 888/332-5327; www.clearcomputing.com.**


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Simple Solutions Launches New Wolverine Filter

The New Wolverine septic vent filter from Simple Solutions LLC features a filter housing and injection molded design made from ABS plastic with an easy-fill cap for carbon replacement. The filter holds nearly 3 pounds of catalytic activated carbon, specifically formulated to remove hydrogen sulfide, methane and mercaptins from septic, sewer and plumbing vents. It also has received Uniform Plumbing Certification (UPC) from the International Association of Plumbing and Mechanical Officials (IAPMO). **For information: 866/667-8465; www.stopsepticodor.com.**

General Pipe Launches Metro-Rooter Cutting Machine


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The Metro-Rooter cutting machine from General Pipe Cleaners features 75 feet of 5/8-inch Flexcore wire rope center cable, engineered to handle roots and other tough stoppages in 3-inch through 6-inch lines, or can be switched to 100 feet of 1/2-inch cable for smaller jobs. The narrow profile of the lighter, compact unit facilitates handling in tight places, on stairs and during loading onto trucks. The root cutter includes a fold-down handle, truck-loading wheel and tough, lightweight frame on 10-inch semi-pneumatic wheels for easy transport. **For information: 800/245-6200; www.drainbrain.com.** ✦

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ASSOCIATION NEWS

Municipal Sewer & Water invites your national, state or local association to post news items in this column. Send contributions to editor@mswmag.com.

NUCA President Testifies

National Utility Contractors Association President Terry Dillon testified before the House Appropriations Subcommittee on Interior, Environment and Related Agencies, encouraging the committee to restore State Revolving Fund (SRF) appropriations to at least $1.35 billion, the amount allocated before 2004. In his statement, he addressed the cuts in federal appropriations for the EPA's Clean Water program, which finances water treatment projects across the country.

Dillon explained that combined and sanitary sewer overflows dump 950 billion gallons of raw sewage into lakes, rivers and streams each year. He related a story about an emergency repair job his company did involving four feet of standing sewage in an Indiana neighborhood. Following the hearing, the committee asked Dillon to provide a plastic-encased slice of tuberculated water pipeline like the one he brought with him.

Maximizing Infrastructure

The International Pipelines Conference is July 22-25 at the Omni Hotel in Atlanta, Ga. Its theme, *Pipeline Asset Management: Maximizing Performance of Our Pipeline Infrastructure*, reflects a trend among infrastructure owners to recognize the value of their underground assets and better manage them. Professional development hours can be earned at these workshops:

- Maximizing the Performance of Steel Pipe Assets
- Pipeline Risk Management: A Compendium for Pipeline System Managers
- Sewer-Pipeline Condition Assessment
- Pipeline Asset Management Practices
- Maximizing the Performance of Iron Pipeline Assets
- Locating and Depicting Underground Utilities
- Trenchless Technology Applications for Urban Gas & Water Mains Rehabilitation
- Maximizing the Performance of Concrete Pressure Pipe Assets
- Water-Pipeline Condition Assessment (PCA)

Call 800/548-2723 or visit http://content.asce.org/conferences/pipelines2008/index.html.

Lightning Safety Campaign

The National Weather Service (NWS) has designated June 22-28 as Lightning Safety Week. Lightning kills an average of 62 people a year. In 2006, lightning caused 47 deaths and 246 injuries. To increase awareness, the NWS has a special web site with handouts, indoor safety and outdoor risk reduction tips, medical facts, history, survivor stories, streaming videos, and photos. Go to www.lightningsafety.noaa.gov.

Treatment Process Wins Award

The Royal Society in Great Britain presented the Brian Mercer Award for Innovation to a self-sustainable wastewater treatment process designed to alleviate water scarcity. The process, which uses submerged anaerobic membrane bioreactors, treats dilute effluents at ambient temperatures.

Physical Security

The American Society of Civil Engineers' Environmental & Water Resources Institute is taking a public comment on its new standard, Guidelines for the Physical Security of Water Utilities, until Aug. 20. The standard applies to the physical security of raw water facilities, wells and pumping stations, water treatment plants, finished water storage facilities, distribution systems, and water system support facilities. To comment, contact Phillip Mariscal at pmariscal@asce.org or 703/295-6338. For more information on the standard, contact Karen Albers at kalbers@asce.org or 703/295-6404.

CALENDAR

June 1-3
International Water Association-Water Environment Federation Wastewater Treatment Modeling Seminar, Château Mont-Sainte-Anne, Quebec. Call Bruce Johnson at 720/286-5373 or visit www.modeleau.org/WWTmod2008.

June 1-4
PennTec Annual Conference, Penn Stater Conference Center, State College, Pa. Call 717/642-9500 or visit www.pwea.org.

June 8-12
American Water Works Association Annual Conference and Exhibition, Georgia World Congress Center, Atlanta. Call 800/926-7337 or visit www.awwa.org.

June 22-25
National Environmental Health Association Educational Conference and Exhibition, Westin La Paloma Resort and Spa, Tucson, Ariz. Call 303/756-9090 or visit www.neha.org.

July 15-18
National Association of Clean Water Agencies Summer Conference and Meeting, Hilton Hotel, Anchorage, Alaska. Call 202/833-2672 or visit www.nacwa.org.

July 22-25
International Pipelines Conference, Omni Hotel at CNN Center, Atlanta, Ga. Call 800/548-2723 or visit www.asce.org.

Aug. 3-7
StormCon North American Surface Water Quality Conference and Exposition, Orlando World Center Marriott, Fla. Call 805/682-1300, ext. 129 or visit www.stormcon.com.

Aug. 17-20
American Public Works Association Congress: The Best Show in Public Works, Morial Convention Center, New Orleans, La. Call 800/848-2792 or visit www.apwa.net.

Sept. 7-10
WateReuse Symposium, Hilton Anatole, Dallas, Texas. Call 703/548-0880 or visit www.watereuse.org.

Sept. 21-24
Distribution Systems Symposium and Exposition for Distribution, Engineering and Plant Operations Professionals, Austin, Texas. Call Tricia Loughead at 800/926-7337 or visit www.awwa.org.

Sept. 30 -Oct. 3
Wisconsin Wastewater Operators Association Conference, Holiday Inn, Stevens Point. Call Richard McKee at 608/795-0024 or visit www.wwoa.org.

Oct. 5-8
National Rural Water Association Convention, Reno, Nev. Call 508/252-0629 or visit www.nrwa.org.

Water Prize Winner

Andrew Benedek, a member of American Water Works Association, is the first recipient of the Lee Kuan Yew Water Prize, which recognizes contributions to world water problems through innovative technologies or programs. Benedek founded Zenon Environmental to develop cost-effective membrane solutions for water treatment. The $217,500 award was presented during the Singapore International Water Week in June.

Business of Water

Published by the American Water Works Association, *The Business of Water: A Concise Overview of Challenges and Opportunities in the Water Market* introduces the challenges and opportunities facing the industry. More than 35 full-length articles address investment trends, conservation practices, regulatory trends, strategic planning, financing topics, water pricing and value issues, and more. The book is available at www.awwa.org/bookstore.

Infrastructure Report

The broadcast release date of Penn State Public Broadcasting's *Liquid Assets – The Story of Our Water Infrastructure* to national public television is Oct. 1. The 90-minute documentary covers the history, engineering challenges, and political and economic realities of water, wastewater, and stormwater infrastructures. Municipalities can download an outreach toolkit and graphics at www.liquidassets.psu.edu.

UW-Madison Engineering Course

The University of Wisconsin-Madison Department of Engineering Professional Development is offering the following CEU, LU, PDH classes at the Madison campus.

- June 2-3 – Fundamentals of Drinking Water (K015)
- June 9-10 – Understanding Water Chemistry for Practical Application (J795)
- June 11-13 – Designing Wastewater Pumping Systems and Lift Stations (J796)

Call 608/262-2061 or visit http://epdweb.engr.wisc.edu.

American Public Works Association

APWA has these courses as classroom workshops or audio/Web-based broadcasts:

- June 12 – Developing a Successful Fleet Replacement Program (Web).
- June 26 – Municipal Stormwater Self-Audit: A How-To Guide (Web).

Call Carrie Merker at 816/472-6100, ext. 5213 or visit www.apwa.net.

American Water Works Association

The organization is offering a CEU/PDH webcast on Pump Station Maintenance on Aug. 6. Call 800/926-7337 or visit www.awwa.org.

North Carolina

The state university at Raleigh is offering these courses:

- June 18 – Location, Navigation and Data Collection Using Global Positioning
- June 25 – Soil Survey in the 21st Century

Call Joni Tanner at 919/515-1678 or visit www.soil.ncsu.edu, then Training, Short Courses, and Workshops.

New England

The New England Interstate Water Pollution Control Commission (NEIWPCC) Training has the following courses.

- June 3 – Focus on Flow for Wastewater and Collection Operators, Haverhill, Mass.
- June 4 – Sampling Procedures for WWTP Operators, Millbury, Mass.
- June 11 – Care of Emergency Generators, Millbury, Mass.
- June 11-12 – Laboratory Procedures and Review, South Kingstown, R.I.
- June 11-13 – Preparing for Your Grade 1 & 2 Operator Certification Exam (with math), Hartford, Conn.
- June 12 – Operation and Maintenance of Centrifugal Pumps, Millbury, Mass.
- June 17 – Geographic Information Systems (GIS) for Wastewater Collection Systems, Hanover, N.H.
- June 24-26 – O&M of Wastewater Collection Systems, Buffalo, N.Y.
- June 25 – Safety in Wastewater Treatment Facilities, Attleboro, Mass.

For more information, call 866/824-9656 or visit www.neiwpcc.org/training/schedule.asp.

Water Environment Federation

The WEF has the following seminars:

- June 1-3 – Wastewater Treatment Modeling Seminar, Mont-Sainte-Anne, Québec
- June 10-11 – NPDES Permits Program Overview Course for Permittees – Including New and Emerging Issues, Milwaukee, Wis.
- June 18-19 – Asset Management for Water and Wastewater Utilities, New Orleans, La.
- June 24-25 – Fats, Oils, and Grease Management Training, Phoenix, Ariz.

Call 703/684-2441 or visit www.wef.org. ✦

See us at the AWWA ACE show at the Georgia World Congress Center in Atlanta, June 8-12, 2008, Booth 128.

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