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Taking Control

A video inspection program helps Zion, Ill. track sources of I&I

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FEATURED INSIDE

Taking Control

The City of Zion (Ill.) places video inspection at the heart of its effort to identify and eliminate sources of clear water entering its sewers

By Suzan Marie Chin

Arthur Hoyt has seen a variety of system problems since he started work as Water and Sewer Division Supervisor for the City of Zion, Ill.

His division handles all the typical maintenance tasks such as inspections, meter installations, cleaning, repairs and breaks for the city, population 22,866. But Zion's biggest maintenance challenge is an abundance of flooding problems.

The division has performed a number of upgrades and upsizing of pipe over the years to correct its overflows. Although somewhat helpful, these projects have tended only to shift the problem from one area to another.

"Although the process is very time consuming, it's a great idea to use this kind of field evaluation for equipment purchases of this nature."

Arthur Hoyt

Of greater concern to the division are the many illegal homeowner hookups. The area receives an average of 30 inches of snow per year, on top of heavy rainfall. In the past, many homeowners who did not have sump pumps installed drain tile around the footings of their homes and tied it directly into the sanitary line.

In addition, some owners who did have sump pumps preferred not to empty the water into their yards (thus eventually to the storm sewers). So they plumbed the sump pumps directly into the household sanitary service line. The city overlooked these illegal hookups for years, but now the overflow problem demands that Arthur and his staff take corrective action.

Time for an upgrade

The city has embarked on an ambitious campaign to identify and cut off sources of clear water entering the sewers. Critical to that effort is an effective system for video inspection and reporting on pipe conditions.

The division had been using a video camera system for many years to pinpoint pipeline problems. But with advances in optical technology, and with a growing need to assess problems efficiently and accurately, the time had come to invest in a new inspection system and vehicle.

Arthur had not yet approached the city council for a budget to buy the new system, so he turned to a process his division uses before making major capital purchases. He conducted a thorough evaluation of equipment and vendors that included a field demonstration (see sidebar). And he involved representatives from other departments to get well-rounded and unbiased opinions.

"The technology had come a long way since we purchased our first camera, and there were items that I needed to evaluate carefully," Arthur says. "If it had been a simple equipment purchase, no problem, but this was something I wanted to be sure of and feel comfortable presenting to the council for approval."





Above: Stuart Romig monitors a pipeline inspection from the city's Pearpoint trailer, which is equipped with a fully outfitted control room.

At left: The City of Zion chose Pearpoint video equipment for its inspection program. The pan-and-tilt camera and crawler provide inspection capability for 6- to 24-inch lines.

Before embarking on the selection process, Arthur and his staff zeroed in on their video inspection requirements. The crew needed full pan-and-tilt camera capability and a tractor-based system for running in primarily 8- to 12-inch lines. It was critical for the tractor to navigate effectively in greasy and unclean lines. Zion also needed high picture quality for pinpointing problems and user-friendly, robust pipe survey reporting software.

After its evaluation, Zion purchased a 9-foot video inspection trailer, outfitted with a control room, from Pearpoint Inc. Equipment consists of a Pearpoint pan-and-tilt camera and Crawler, providing inspection capability for 6- to 24-inch lines. A controller maneuvers the camera and tractor and acts as a computer keyboard for use with the on-board computer and flexidata™ pipe survey reporting software.

The equipment also includes a power supply, drum with 1,000 feet of cable, and small and large light heads for illuminating inside pipes larger than those the camera's built-in lights can cover effectively.

P R O F I L E

City of Zion, Ill.

POPULATION:	**22,866**
WATER AND SEWER STAFF:	**7 employees**
SEWER CUSTOMERS:	**6,500**
SEWER SYSTEM:	**100 miles of gravity mainline, primarily 8- to 12-inch pipes**

Comparison Shopping

The City of Zion used a carefully designed evaluation process to buy its new video inspection van. As a start toward the selection, Water and Sewer Division Supervisor Arthur Hoyt attended the major industry trade shows and looked at equipment from several vendors. For an evaluation team, he chose two staff members from the Water & Sewer Division and two from the Streets Department.

For the actual evaluation, the city invited five vendors, instructing each to bring a "fully-loaded" version of its camera offering, along with a survey data collection software package. An evaluation form allowed city staff to score each system based on chosen criteria, including:

Truck and compartment: Operator viewing room layout, equipment storage room layout, overall vehicle layout, washdown system, cable reel system, electrical system convenience and safety.

Camera: Picture quality, overall camera setup and design, light head location and design.

Transporter: Ease in pipe size setup, ability to negotiate grease, ability to negotiate sand and gravel, ability to enter tight spaces, ease of use in controls, travel speed to 1000 feet.

Accuracy: Distance measurement, inclinometer.

Software and hardware: User friendliness.

Each vendor's unit had to perform a field demonstration in two lines, one very greasy and one gravel- and debris-filled. Good performance in such lines was critical, as the Water and Sewer Division staff often lacks time to clean lines before inspection. Each vendor evaluation "test-drive" took one full day. After the evaluations, Arthur presented his findings and made his recommendations, which were approved by the city council.

"We've already had several instances where we have had to prove to homeowners that we were not the problem. We could back it up with video clips and pictures of their tie-in to the system."

Arthur Hoyt

Becoming more proactive

Although manpower limitations restrict the division to a reactive maintenance approach, its goal with the addition of the new camera system is to begin a scheduled series of inspections.

The camera has opened up a "whole new world of issues — we're now able to see more problems in the sanitary system that need attention," Arthur says. Because of the new findings, the city has budgeted for sliplining of about eight blocks of sewer main over the next several years. In addition, the city has received and accepted a proposal from a local engineering firm to perform an extensive inflow and infiltration (I&I) study.

That study will help Zion identify I&I sources and make repairs, thus reducing the potential for sewer surcharging and backups. The study will concentrate in one area that was installed in the 1950s and contains approximately 12,000 linear feet of pipeline. Many techniques will be employed with the new inspection camera system.

Visual manhole inspection will help the division detect and record physical characteristics and evaluate condition, pipe depths and possible groundwater leaks. Smoke testing will help locate inappropriate sources such as downspouts and yard drains, and storm sewer inlets that are improperly connected.

The division will also conduct surcharging and dye testing, simulating rainfall by flooding the storm sewer with dyed water and observing the flow in the sanitary sewers. The staff will perform these simulations by temporarily plugging the storm sewers with inflatable bags, then filling them with water from a nearby fire hydrant while adding a harmless, brightly-colored dye.

After the storm sewer is surcharged, the adjacent sanitary sewers will be observed through a manhole inspection and with the video camera to detect evidence of the dye transferring from the storm sewer system.

Report and recommendations

Finally, the division will conduct wastewater flow monitoring using two in-line flow meters installed directly in the sewer within a manhole. The meters will record flow rate, depth and velocity. Data from the meters will be uploaded once a week for analysis.

The division will complete TV inspection of the study area before the testing begins and will document the I&I sources





Water and sewer service technician Lee Enright conducts water main flushing, one of the City of Zion's regular maintenance chores.



Ernest Abbott, City of Zion service technician, works on a water meter test bench. The city (population 22,866) serves some 6,500 sewer and water customers.

throughout the various phases of the investigation and testing. When the study is complete, a report and recommendations for rehabilitation and improvements will be prepared.

Detailed record keeping and survey reports from Zion's flexidata pipe survey reporting software package will help Arthur and his team work efficiently and eliminate duplicate efforts. While the camera clearly identifies system problems, the survey software will give the division a simple and effective method for logging connections, system conditions and problems, recording when and how often a line has been inspected or cleaned, and indicating whether the problem lies within the city system or in homeowners' service laterals.

"With this information readily on hand, I can look up pictures and reports of a specific tie-in and quickly determine responsibility," says Arthur. "We've already had several instances where we have had to prove to homeowners that we were not the problem. We could back it up with video clips and pictures of their tie-in to the system." The division also uses a GIS mapping system (ArcView) and IDs have been given to all of the city's pipe.

As part of its maintenance program, each summer Zion sends its crew and vehicle to clean 8,000 to 15,000 feet of sewer line per day. The city now needs a new sewer jetter truck, and Arthur plans to base the selection on a comparison process similar to that used for the video camera truck.

"Although the process is very time consuming, it's a great idea to use this kind of field evaluation for equipment purchases of this nature," he says.

Throughout the division, effective planning and wise equipment choices are helping to move the city toward its goals of a better functioning sewer system and the elimination of system problems. ■

The city has embarked on an ambitious campaign to identify and cut off sources of clear water entering the sewers. Critical to that effort is an effective system for video inspection and reporting on pipe conditions.

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