

ZOOMING FORWARD

An emerging inspection technology helps utility managers identify sewer system problems, prioritize repairs and use budget dollars wisely

By Bill Di Tullio and Sandy Milley

Sewer system inspection and maintenance can be time-consuming and costly, especially if the assumption is that every manhole and every foot of pipe needs attention.

In reality, cleaning and maintenance needs are typically confined to about 30 percent of a sewer system. That means municipalities can save substantial time and money by concentrating on problem areas.

Today, new sewer inspection and diagnostic hardware can help system owners identify problem areas quickly and cost-effectively. As a result, utility executives can allocate budgets more intelligently and increase the efficiency of in-house and contracted sewer maintenance crews.

Zoom inspection cameras play a critical role in quickly identifying areas that need to be addressed. The less money spent inspecting, the more dollars are available for critical repairs and maintenance. That means more protection from sewer backups and overflows, and a more dependable and reliable sewer system.

Finding problem areas

To take proper care of a wastewater collection system, a wastewater authority must be able to answer these questions:

- What assets are in place?
- What are the maintenance requirements and what is the structural condition of those assets?

- What must be done to sustain the desired level of services?
- At what point is it necessary to take action?
- How much does it cost to sustain the desired level of service?

Although these are basic questions, few sewer system managers can answer all of them. Conventional approaches to sewer inspection — essentially the in-line televising of the entire system — have made it expensive to develop a sewer system inventory and to diagnose the condition of the buried infrastructure.

In reality, such comprehensive inspection is usually not necessary. Most collection systems are not in as bad of shape as previously reported or as originally thought. Projects and pilot programs completed throughout the United States and Canada show that more than 70 percent of all sewer pipelines are clean, structurally sound and in no real immediate need of repairs. Therefore, utilities do not need to spend time and resources on in-line inspection and cleaning of every foot of pipe.

Zoom camera technologies allow utilities to quickly and cost-effectively view their entire wastewater collection system. The technology helps them obtain a list of defects in a fraction of the time and cost required by traditional methods.

Zoom technology in brief

Zoom technology uses a camera that is lowered into a manhole to inspect both the manhole and the pipe segments immediately upstream and downstream. The camera has zooming capabilities to view a significant length up or down the pipe. The camera uses a digital/numeric zoom lens. The typical optical capacity is 22:1, and it can be expanded up to 170:1 when using the digital/numeric function. Two unique benefits of a zooming camera are its ability to:

- Videotape the manhole and pipeline with one piece of equipment, saving time and money
- Inspect a system while it is in service, providing valuable information on the maintenance requirements and structural condition of the sewer system.

Information collected with the zoom camera can then be used to build affordable Geographic Information System

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(GIS) mapping, containing as-is data on the sewer system. Mapping built from as-is data provides a valuable tool for improving sewer system management and performance, reducing costs and avoiding emergency repairs.

By performing zoom inspection at each manhole, utility managers can determine the most appropriate maintenance and capital improvements to perform, establish priorities and schedule necessary work.

A zoom camera inspection crew will typically inspect about one mile of pipe per day, including manholes, versus about 1,500 feet per day, not including manholes, using in-line inspection equipment.

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After field data gathering, qualified office technicians (trained in WRc/Pipeline Assessment Certification Program protocol criteria by NASSCO) review all video inspections, use survey software to record the defects observed, and calculate priority grades using the WRc standard of grading and language. As a result, zoom camera inspection provides a quick and cost-effective method for targeting and prioritizing cleaning and more detailed in-line inspection activities.

Getting value

A zoom/clean/inspect program gives



Zoom cameras, like this model from CUES Inc., enable cost-effective sewer system inspection.

the maximum value for the dollar. Under such a program, only dirty and defective sewers are inspected and cleaned. It has been shown that only about 25 percent of a sewer system's pipelines need regular cleaning, and in-line inspection may be necessary for less than 20 percent of the entire system.

The Town of Stoneham, Mass., performed a zoom/clean/inspect program to address its crumbling infrastructure. Every pipe segment and manhole was given a condition rating using WRC rating codes that classified the potential for blockage and the internal structural



Zoom camera technology detects conditions that require further attention. Upper photo, grease buildup; lower photo, root intrusion, a source of infiltration and a potential cause of blockage.

condition of each pipe segment and manhole.

At the end of the project, Bob Radigan, the town's collection system operations manager, said, "Besides saving the town a substantial amount of money inspecting the condition of our sewer system, we now know what's happening within our collection system. This helps us establish proactive maintenance management and capital improvement programs."

Recognized by agencies

The EPA and state and local agencies acknowledge the cost-effectiveness of zoom inspection. EPA recently identified the zoom camera inspection of sewer systems as an Innovative Environmental Technology.

The Texas Commission of Environmental Quality (TCEQ) and Pennsylvania Department of Environmental Protection on separate occasions also acknowledged zoom-camera inspection as an

acceptable screening tool for responding to consent-ordered sewer assessment programs.

A recently completed project for the Dallas Water Utilities (DWU) using zoom camera technology to assess the services and structural condition of a portion of its sewer system validated that viewing every foot of pipe is not necessary in a comprehensive, intelligent pipeline inspection plan for wastewater collection systems to determine potential for critical sewer backups and overflows.

There are many benefits to zoom camera inspection. Utilities that periodically zoom-inspect their systems can create a current and complete inventory of manholes and pipelines, develop GIS mapping of the service and physical condition of each manhole and pipe segment, monitor the rate of deterioration of pipes and manholes, conduct predictive failure assessments and develop proactive maintenance and capital improvement programs to prevent overflows and system failures.

Variable objectives

The objectives of zoom/clean/inspect programs vary from utility to utility. The objectives may include:

- Complying with regulatory requirements, including consent orders and administrative orders.
- Prioritizing cleaning and in-line inspection activities.
- Inspecting the entire system to monitor service and structural changes on a periodic cycle (for example, 20 percent per year, over five years as opposed to using CCTV to inspect the entire system over a longer period). Cleaning and in-line CCTV inspection is then performed where necessary.
- Inspecting manholes and pipelines that are inaccessible to camera box trucks.
- Developing and updating GIS mapping of the sewer system.
- Identifying infiltration sources.
- Identifying capacity and structural deficiencies.
- Identifying blockages and other maintenance requirements.
- Conducting a condition assessment.
- Conducting investigations of illicit sanitary connections to storm sewers.
- Assessing cMOM compliance risk exposure.
- Complying with cMOM and GASB34.

Return on Investment

The return on investment can be measured in many ways. First, savings are realized by cleaning and inspecting

only dirty and defective pipes, and the savings can be used to address the identified problems. Field crews and budget dollars are thus used more effectively to deliver greater value. Often, the payback on a zoom camera inspection project is less than one year.

Aside from these savings, utilities that practice periodic zoom inspection can stretch the life of buried assets. By inspecting the system periodically, they can put off capital investments until the manholes and pipelines reach the end of their useful life. The "find and fix" approach ensures that infrastructure service life is maximized.

Finally, the programs improve customer service and regulatory confidence through better system performance and reliability. These benefits cannot be measured monetarily, but they are very

New stand-alone zoom trucks are available. Camera kits added to in-line inspection trucks improve the versatility of existing inspection systems. All-terrain vehicles permit inspection of manholes and pipelines that were previously inaccessible.

important to the sewer system manager.

For all these reasons, the use of zoom cameras is growing rapidly. Zoom cameras are being developed by the leading camera manufacturers in the United States. New stand-alone zoom trucks are available. Camera kits added to in-line inspection trucks improve the versatility of existing inspection systems. All-terrain vehicles permit inspection of manholes and pipelines that were previously inaccessible.

Proven in practice

Zoom condition assessment software

was developed in Canada more than 15 years ago. In 1997, the City of Hamilton, Ont., initiated a comprehensive zoom camera inspection of about 25,000 manholes and connecting pipelines, using the first version of the software.

Last year, the city began a project to reassess the manholes and pipelines that were previously inspected along with an additional 9,500 manholes. The current project will update the mapping and condition assessment that was initiated during 1997, provide weekly inspection project reports identifying immediate system needs, provide current condition data into the city's Hansen work order software and update the condition data included in the database once the work orders have been closed.

The City of Quebec has also initiated a zoom/clean/inspect program, starting a multi-year project that will determine the service and physical condition of about 28,000 manholes and connecting pipelines.

Zoom cameras have been in use for about 10-years in the United States. Initially, hand-held manhole inspection zoom cameras were introduced. More recently, truck-mounted zoom cameras able to inspect up to 350 feet of the sewer have found their way into the U.S. market.

With the growing need to identify system defects quickly and cost-effectively, and with increasing use of zoom cameras for establishing maintenance and in-line inspection priorities, the pipeline footage inspected using zoom technology could double each year for the foreseeable future.

Zoom camera technology is a promising way for wastewater utility managers to budget effectively to improve sewer system performance.

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