

Condition Assessment: It's All About the Data

Cooperation and coordination adds value.

By Jose L. Villalobos

Making good decisions starts, or should start, with one basic thing: knowing what you're doing. For a government engineer or manager responsible for part of the public works infrastructure, this means knowing where it is and exactly what's broken before committing resources to finding a solution. In the real world, though, that doesn't always happen.

The U. S. has what is probably the most extensive civil infrastructure in the world. Most major U.S. cities have between 2,000 and 6,500 miles of sanitary and storm sewers, and some estimates put the total value in the neighborhood of \$20 trillion. Water pipelines represent an investment of a similar order of magnitude.

In our experience, public works managers rarely have the critical hard data they need, such as remaining pipeline wall thickness or the structural condition of reinforcing steel in major buried structures, to make informed decisions regarding repair, rehabilitation, or replacement of pipelines and other major infrastructure assets before they fail. In some cases, it is physically impossible to access these facilities to conduct an assessment.

Without reliable record drawings or verifiable field data, managers pretty much have to fly by the seat of their pants, left with the unenviable choice of issuing RFPs and signing contracts based on what is essentially an educated guess, or leaving their systems vulnerable to outright failure.

Fortunately, this has already begun to change. Inspection and testing technologies from other industries have been finding their way into sewer system O&M. Computers have vastly sped up

data acquisition, GIS database systems are becoming widespread and affordable, while the Internet has decisively changed the ways information is shared, organized, and managed. In theory, these new technologies should be providing utility owners with the right data at the right time for the right price.

Even so, many or most agencies are still in a quandary about how to get data they need, especially data for large-diameter water transmission and wastewater lines, where access is difficult or impossible and the systems, in many cases, must be kept running 24/7.

There are several reasons for this. First, the technology has been relatively slow to develop, since more than 70 percent of water and sewer pipelines in the U. S. are 24 in. or less in diameter, and until recently most assessment technology innovators have focused on serving that market.

Another obstacle is the inherent (some would say, "notorious") conservatism of the public utility sector—understandably reluctant to adopt a new technology or procedure until it has been proven by extensive long-term use.

Progress is also somewhat hampered by prevailing contracting laws, which require either a professional-services contract or a bid contract. What's really needed in many cases is a blend of both. The work involved in determining existing conditions cannot be completely encompassed in a design contract or a construction contract. It may require a good deal of contractor labor, for example, to open up access points, but still demand the experienced eye of an engineering professional to evaluate assessment methodologies, interpret data, and recommend repair, rehabilitation, or replacement strategies.

With this in mind, our company recently joined with several outstanding specialist firms to form the Civil Infrastructure Assessment Group (CIAG). Each member company brings its own unique state-of-the-art capabilities to the table—innovative yet viable, well-proven methods for investigation and assessment of large-diameter water and wastewater pipelines.

To take one simple example, the City of Oakland (CA) retained CIAG to examine approximately 6,000 lineal feet of 66-in. concrete sanitary sewer pipe in the central business district to help determine what repairs would be needed and how soon. Preliminary manned entries showed it would be impossible to complete a planned CCTV survey because the sewer was nearly half-filled with rock-hard consolidated silt. CIAG member Brenford Environmental (then doing business as Garner West) was brought in to clean the line with its patented high-pressure recirculating water system. A post-cleaning inspection then found that the line had only minor damage, and this detailed condition assessment data enabled the city to prepare extremely tight and cost-effective bid documents for the repair, with a potential saving of about \$200,000.

In a more complex situation, a client might draw on a wider range of CIAG members' capabilities. For example, if an owner has a large-diameter interceptor that can not be taken out of service, but they need to know its condition, they may need a combination of :

- Limited manned entries.
- Internal diameter measurement.
- X, Y, and Z coordinates for the interceptor.

- Verification of the non-existence of voids over the interceptor.

As these examples suggest, CIAG's approach is to offer the utility owner a "palette" of available services rather than try to define a specific scope ahead of time. As work proceeds, it may be necessary to force-clean the pipe, conduct a sonar or laser profiling, or send in a specialized electromagnetic or leak-detection robot to look at it first. Regardless of the conditions encountered in the field, an experienced engineer is involved from the onset of the project, ensuring the appropriate assessment method is utilized.

Once the hard data are gathered, i.e., detailed, real-time information about the facility's condition, the agency may choose to do the work itself or retain a consultant to prepare plans and specifications for the rehabilitation effort. Either way, the owner stands to gain substantially in a variety of ways, including lower bids, faster delivery times, fewer change orders, less impact on the rate payers, tighter contract specifications, and improved risk management.

We believe the kind of organization described here—loosely-structured, consultant-led teams of technology specialists—is a useful model, and that this approach will gain in popularity. Three

points are worth stressing:

Alliance-based technology delivery has the potential to offer faster, more responsive and detailed data. The cost is not insignificant, but that is offset to some extent because the team's resources—special equipment, capabilities, and personnel—are tapped only when and as needed. We believe this approach can succeed even in cases where partnership members are also potential business rivals, because the demand for timely, usable data is bound to grow rapidly as systems everywhere show the effects of prolonged usage.

Shift to value-added model. The public sector in general tends to treat information as a commodity. CCTV services, for example, are now aggressively priced and usually contracted on a per-foot basis. But services like those discussed here don't fit this model well; they are more like a SWAT team for information, designed specifically to develop high-quality information (i.e., solutions) rapidly. The bottom-line argument here is compelling: One dollar spent to acquire high-quality condition assessment data can easily save ten dollars or more in future maintenance and rehab costs.

Change in contracting practices. Low-bid contracting laws, designed to protect taxpayers against fraud or mismanagement, may actually be working

against the public interest, to the extent that they fail to recognize or make adequate allowance for the role and value of advanced diagnostics. For best results, it may be necessary to develop some new contracting vehicles for this kind of mixed service, which is neither pure consulting nor pure contracting.

Some utility industry players will naturally tend to regard this approach with skepticism or even suspicion. Owners will resist paying a higher price for the kind of data they are used to buying on a cheap commodity basis; designers and contractors fear it may take business away from them. But the purpose here is not to take work away from designers or contractors. To the contrary, it is about providing accurate data before preparing bid documents, so everybody, both designers and contractors, so can do a better job of bidding and building the contract.

For facility owners today, the risk is greater than ever. A long history of staff cuts and budget constraints mean many agencies no longer have the manpower and the "institutional memory" they could rely on a generation ago to help them foresee and prevent problems. **GE**

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CIAG Members

- Lead firm V&A Consulting Engineers (www.vaengineering.com) specializes in corrosion engineering, coating systems management, condition assessment, and structural rehabilitation of civil infrastructure facilities.

- RedZone Robotics, Inc. (www.redzone.com) develops innovative, semi-automated products and technologies that reduce costs and simplify operations for clients in the industrial, nuclear, and defense markets. RedZone's "Responder" robotic platform incorporates multiple sensors to create 3D models of and obtain detailed condition data for large-diameter pipelines.

- Brenford Environmental Systems (www.brenford.com) has effectively revolutionized large-diameter sewer cleanouts with its high-power Sewer Hog™ system—a patented positive-pressure, closed-loop, non-odor-emitting technology. Introduced only a few years ago, the Sewer Hog system has convincingly demonstrated its ability to clear severely blocked lines dramatically faster than conventional systems and—even better—with no interruption in service.

- The Pressure Pipe Inspection Company (www.ppic.com) brings two innovative inspection technologies to the group: Remote Field Transformer Coupling, an electromagnetic inspection system that locates and quantifies wire breaks in a prestressed concrete cylinder pipeline, and the tether-controlled Sahara® sensor, which pinpoints even the smallest leaks in water mains without disrupting pipeline service.

- National Plant Services (www.nationalplant.com), a Caryl Corporation company, extends CIAG's capabilities with a wide range of sewer cleaning, CCTV, infiltration/inflow control, manhole rehabilitation, preventive maintenance, cleaning, non-destructive utility locating, and related services.