



Electro Scanning Technology Adds Another Layer of Inspection

Sharon M. Bueno — Feb 02, 2013

When trying to find where and why it was experiencing infiltration in its sewer system, the City of Redding, Calif., used all the common methods to ascertain the source of the leaks: flow monitoring, television inspection, joint air pressure testing, as well as smoke testing.



Despite addressing all the detected leaks, the collection system's wet weather flows remained consistently 300 percent greater than dry weather flows. The City of Redding turned to the Electro Scanning technology, in a pilot program, to try to pinpoint exactly where and what type of defects were the cause.

Electro Scan uses a sewer scanning system that complements and adds another dimension to locating defects and problems within the underground sewer lines. Electro Scan locates defects by measuring changes in the electrical resistance of the pipe wall in non-conductive pipe, such as clay, plastic, concrete, reinforced concrete and brick, which are electrical insulators, thus having a high resistance to electric current.

"A defect in the pipe that can leak water will also leak an electrical current, whether or not water infiltration is occurring at the time of the test," says Mark Grabowski, Electro Scan Inc. vice president of municipal markets.

Redding Issues

The City of Redding wastewater collection system has the same challenges as most utilities across North America: infiltration. In Redding's case, during periods of high rainfall, a particular sub-basin received flows in excess of 300 percent of their daily dry flows, resulting in increased system operating costs. According to Grabowski, flows went from 150,000 gals per day to 450,000 gals per day.

These increases had occurred over years and city officials had tried to locate and repair them, using multiple inspection methods; these inspection methods included CCTV inspection, flow monitoring, joint air pressure testing and smoke testing. While these methods located defects, the infiltration continued.

"[The City of Redding] had CCTV'd the entire system multiple times and just couldn't locate where these sources of infiltration were coming from and how water was getting into their system during the wet weather events," Grabowski explains. "There were a considerable number of pipe defects that could not be located."

Redding contracted Electro Scan to conduct a scan of more than 25,000 ft of its 6- to 8-in. vitrified clay sewer to learn where the sources of infiltration in a sub-basin had particularly high peak wet weather flows of 450,000 gals per day. Grabowski says the area that was scanned using Electro Scan technology was considered the city's worst infiltration sub-basin.

How It Works

Electro Scan used its ES660 scanning system and software for the pilot project, which lasted seven days. The Electro Scan system is fully integrated into existing CCTV truck models and uses the equipment found in them, such as the reel, cable and footage encoder. The heart of the ES660 system is two probes — one for pipes 6 to 20 in. and one for pipes 20 to 60 in. — which examines the entire circumference of the pipe. The probe, which consists of three electrodes, is attached to a reel-mounted cable, commonly found in most CCTV inspection trucks.

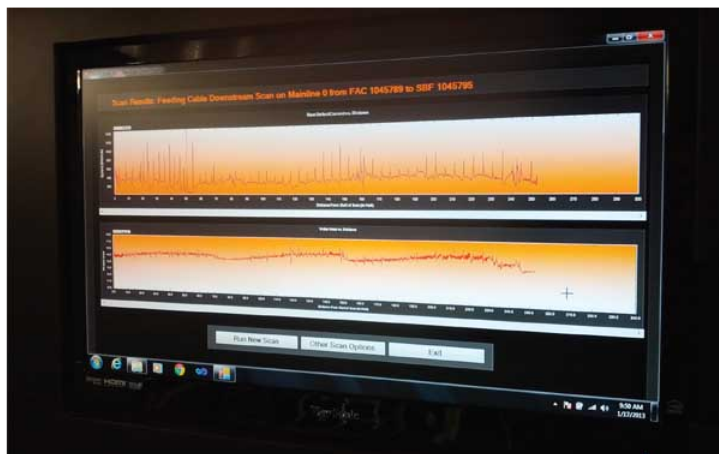
With a jetting truck set up at the downstream manhole and the CCTV/ Electro Scan truck at the upstream manhole, the jetting truck is able to pull the probe through the pipe, while providing the water needed for the probe's electrical readings. As it is pulled through the pipe, the probe is taking an electrical reading every 14 milliseconds, and linking those readings with a distance reading. Using the proprietary Sliding Funnel Plug, a column of water is able to move with the probe through the pipe, eliminating the need to flood an entire segment of pipe. This column of water also surcharges up the lateral connections about 2 to 3 ft, allowing the probe to assess those service taps as it passes by.

"When the probe is close to a pipe defect, the electric current increases because the defect decreases the electrical resistance of the pipe wall," Grabowski says. "Flooding the pipe with water at the probe location helps to replicate a wet weather event, allowing the pipe to be inspected under wet conditions, as well as allowing us to use that water to carry electricity to the walls of the pipe, into the joints and crevices of the pipe to give us a full examination."

Electro Scan uses proprietary software, which it is in the process of making fully integratable with the existing NASSCO PACP software. Data from the probe is collected on the computer or laptop in the CCTV truck and a visual analysis can be made. The data can also be wirelessly uploaded to a computer tablet or smartphone that is equipped with Electro Scan software. The software automatically takes the raw data collected through a series of calculations, generating objective and quantitative data about leak locations and their severity, as well as gallons per minute infiltration rate.

"What you get looks like an EKG reading of the pipe," Grabowski says. "From that visual analysis, you would love to see a perfectly straight line, which indicates no problems. Blips in the reading, indicates possible defects."

In addition to the graph, users get a chart showing quantifiable data — where the defect starts, where the defect ends, the length of the defect and the severity of the defect. Also, because Electro Scan has objective and quantifiable data, it is able to provide a gallons per minute infiltration estimate, assuming certain conditions, Grabowski says.



The Electro Scan software takes the raw data collected from the probe and generates objective and quantitative data about leak locations and their severity —resembling an EKG reading

CCTV Difference

What is the difference between using electro scanning vs. conventional CCTV inspection? "With CCTV, you can only discover what you can actually see," Grabowski says. "[In the case of Redding], many of the defects were actually the rubber couplings on the outside of the pipe that weren't tightened up. With the CCTV, you only saw the inside of the pipe. The camera cannot go into the bell and spigot of the pipe and examine the joint.

"CCTV is a great tool for dry weather assessment and assessing structural issues and looking for fats, oils and grease, as well as dips and sags in the pipe," he says.

"Even with electro scanning, you are going to want to go back in the pipe with CCTV to look at the defect and see what exactly it is to determine how to repair it. What we are doing is adding another layer of data at which the engineers and municipalities can make educated decisions on how they are going to spend their money on repairs. CCTV isn't designed to locate infiltration and that's what our specialty is."

In Redding, once the electro-scanned data was reviewed, 12 spot repairs were used to verify the data and were found to be within a foot. "They did not just blindly believe our results," he says. "They excavated down to the pipe and blue smoke into it, watching the smoke pour out of the joints where we told them it was."

After addressing those 12 spots, the infiltration was substantially reduced. "Their overflows that went up to 450,000 gallons per day, [lessened] to 250,000 gallons per day. They cut their wet weather flows almost in half by just addressing those 12 spots," he says.

Additional repairs have since been made, resulting in further infiltration reductions, Grabowski says. He added that more defects have been targeted and are scheduled for repair.

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