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# Addressing Aging Water Infrastructure

## Pilot Project in Cleveland Evaluates Structural CIPP for Water Mains

By Jim Rush

The project was completed by contractor Terrace Construction of Cleveland with the Sanexen personnel onsite to assist with the CIPP installation. It consisted of about 2,000 ft of 6-in. diameter cast iron water main installed between 40 and 60 years ago.

About once a minute somewhere in the United States, there is a water main break. That means by the time you finish reading this article, thousands of gallons of our most precious resource will be lost through aging pipe networks. In severe cases, water main breaks can cause major damage and impact safety, while in more routine instances customers are left without service.

According to the U.S. Environmental Protection Agency (EPA), there are 240,000 water main breaks per year, and the break rates increase substantially as a system nears the end of its useful life. And as our buried pipelines continue to age, we can expect to see this number increase unless additional efforts are made for their renewal.

With this in mind, EPA's Office of Research and Development initiated an Aging Water Infrastructure Research Program, which includes field demonstrations of emerging technology in collaboration with water and wastewater utilities. The purpose of the program is to gather reliable performance and cost data to enhance the use of existing or emerging technologies that may be beneficial yet under-used. Cost-effective and high-performing technologies allow utilities to make the best use of their resources and thus help stave off the effects of aging water infrastructure.

One component of the research program is a study on "Rehabilitation of Wastewater Collection and Water Distribution Systems." Independent research and development firm Battelle was commissioned to write the report with input from the Trenchless Technology Center at Louisiana Tech University, Jason Consultants and ALSA Tech.

As part of the project, EPA and the City of Cleveland, Ohio, collaborated on a pilot project that examined the use of CIPP for water mains. "What we wanted to do is demonstrate the cost and effectiveness of existing and emerging rehabilitation technologies," said Dr. Ariamalar Selvakumar, environmental engineer and EPA Task Order Manager for the field demonstration project. "We concentrated on drinking water rehabilitation because there are not as many technologies being used in that area."

EPA surveyed existing technologies and worked with interested vendors in selecting the processes to be used for field demonstration. For the Cleveland field demonstration project, the Aqua-Pipe product from Sanexen Environmental Services Inc. was selected.

### About Aqua-Pipe

Aqua-Pipe is a structural cured-in-place pipe (CIPP) liner developed for the drinking water industry by Sanexen Environmental Services, based in Montreal. The product was designed to meet ASTM F1216 and F1743 guidelines for the rehabilitation of water mains and certified to NSF/ANSI Standard 61.

The product was developed in the 1990s and has been used to line more than 1 million ft of pipe in the United States and Canada. The liner is composed of a two-jacket, polyester-woven jacket that is winched into place. The inner jacket contains a polymeric inner membrane to keep it watertight.

To install the liner, a temporary bypass system must be set up to keep water service in operation during the lining process. Access pits are then installed and the existing pipe cleaned and prepped for liner installation.

Before the installation, the pipe is inspected by CCTV cameras and service connections are plugged using robotic equipment to prevent to resin from setting within the connection. Once this work is complete, the resin-impregnated liner is ready to be pulled into position and cured with hot water. The water activates the thermo-setting resins, which form a structural liner within the pipe.

After curing, the liner is undergoes hydrostatic pressure testing before service connections are reinstated robotically. The line is then disinfected and re-connected to the water system.

The product is used for water mains in diameters ranging from 6 to 12 in., and in lengths up to 500 ft.

## Field Demonstration

The City of Cleveland Division of Water has historically approached water main renewal in two ways. Most common for areas with high break rates, thus needing a structural solution, dig-and-replace is most common. In areas where the pipe is structurally sound on the outside but suffering from tuberculation on the side, cleaning and cement mortar lining is common.

For the Cleveland field demonstration, a section of pipe was chosen along Ferncliffe Ave., a residential area near Cleveland Hopkins Airport. "For our pilot project we were looking for an area that had a high break rate that needed a structural solution, but we also wanted a street that wasn't industrial or commercial," said Alex Margevicius, assistant commissioner of the Division of Water. "We were already doing other work in the area, so Ferncliffe Avenue emerged as a good candidate to pilot this technology."

The project was completed by contractor Terrace Construction of Cleveland, with the Sanexen personnel onsite to assist with the CIPP installation. It consisted of about 2,000 ft of 6-in. diameter cast iron water main installed between 40 and 60 years ago. The project area ran from W. 190th Street in the west to Rocky River Drive in the east.

Margevicius said that the Division of Water had been looking for less disruptive alternatives to dig-and-replace. "Open trench is extremely painful to residents, to customers, to the commuting traffic out there," he said. "With dig-and-replace, you've got a 6-ft wide trench. You've got dirt everywhere. It's messy. It's inconvenient. We wanted to find something else."

After talking with Sanexen representatives and reviewing the product, the Division decided to proceed with the pilot project, which was completed in August and September 2010.

## Looking Ahead

The rehabilitation market for drinking water pipe has lagged behind sewer pipe, so a great demand exists in the market. Sanexen general manager Sylvain Boissonneault says that he sees more activity emerging in the drinking water sector. "Because we are dealing with potable water, it took longer to develop a suitable product," he said. But now we are catching up. We see the water market growing really fast."

EPA and the City of Cleveland, Ohio, collaborated on a pilot project that examined the use of CIPP for water mains using the Aqua-Pipe product from Sanexen Environmental Services Inc.


Margevicius said that while testing needs to be completed, he is pleased with the initial results and that the Division of Water would be open to using CIPP for water mains in the future. He said that a large factor in the decision to use CIPP vs. dig-and-replace would likely be cost. "We have hope that in the future as the CIPP technology for drinking water pipes becomes more used and contractors become more familiar and comfortable with it, that the price will come down and become more cost-competitive with replacement," he said.

For Selvakumar, the hope is that more and more cities will be amenable to using new technologies in addressing their infrastructure renewal as more information becomes available. "By doing these projects and making the reports available, other cities can see the cost and effectiveness of these processes," she said. "Many times, municipalities will not try something unless they see it done somewhere else."

The "Rehabilitation of Wastewater Collection and Water Distribution Systems" report is in progress and is expected to be available this summer.

Jim Rush is editor of *Trenchless Technology*.