Paterson, N.J.

CIPP of Leaking High-Pressure Gas Main

In This Issue:
The Obstacles Faced and the Innovative Solutions Behind This Year’s Award-Winning Project
A leaking gas pipe doesn’t, on the surface, scream Project of the Year winner, but when you listen to how this project unfolded and how the problem was solved, there’s no question that it is a truly innovative and challenging project, deserving of such a distinction.

The project in Paterson, N.J., brings a lot to the table—inventiveness, ingenuity and patience. Who would have thought that a 700-ft gas main would be the center of so much fuss? Freezing temps, an innovative robotics device and a recently invented carbon fiber laminate were key elements in this project.

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"Seeing that product, I realized that it was perfect for our application due to its strength and minimal thickness [0.026 in.]," says Ragula, a 20-year veteran of gas main relining. In addition, the material has a natural curvature, making it relatively easy to configure it into an internal sleeve.

"George approached me and said he had this challenging problem that he runs into a lot and he has no solution for," Ehsani says. "He thought my invention could solve that problem. We started a testing program and the Gas Technology Institute (GTI) tested our laminates for this unique application. As far as the repair of pipes by bridging a two-foot gap in an existing pipe, this was the first application for our PipeMedic™."

With that part of the problem solved, Carbone and Ragula turned to designing a robotic device to cut away the standpipe and install the PipeMedic™ laminate. A new robotics device was designed, developed and successfully tested for cutting out the standpipe. The delivery system for the PipeMedic™ laminate had to be modified by adding a sled to the front of the robotic device so the packer pig could successfully be centered in the drip pot, which meant the front of the pig had to be pulled to the opposite edge of the drip pot preventing the pig from falling into the pot.

The process of cutting the standpipe and installation of the PipeMedic™ laminate was simulated and tested at PPM under the watchful eye of GTI. The GTI test results indicated that the simulated drip pot pipe section met the pressure requirements of industry standards for cured-in-place liners. During the actual project, it took just a few minutes for the robotics system, which had an Aries camera attached, to travel down the main and an hour to cut away the standpipe in several cuts with the cut pipe sections dropping into the bottom of the pot. Using the robotic device, the PipeMedic™ laminate coated with epoxy resins was inserted into the pipe. After the resin cured, the CIPP process for the entire 700-foot pipe was pretty straightforward.

**Obstacles**

Having the solution to rehabbing the line in hand, PPM and PSE&G experienced "onsite audibles, as Ragula referred to them.

First up was the condition of the pipe, which was completely filled with debris including sand, rocks and caked-on residue through the gas traveling through the pipe) and a vertical standpipe (a pipe that goes from inside of the drip pot starting at the very bottom of the pot, out of the gas main and to the road surface where the liquids are siphoned out).

“We knew we couldn’t remove [the drip pot] and that we were going to have to cut off the siphon pipe internally and install a bridge of some sort afterward to connect the two sections [in order to line the entire pipe],” says Ragula.

Since the drip pot couldn’t be removed and replaced with a section of straight pipe that could then be relined, a trenchless method for the removal of the standpipe had to be designed, developed and tested. Additionally, the 24-inch gap across the drip pot could not be lined because it was too long of an unsupported length of liner, so a means of installing the bridge across the gap that could be later lined along with the segment of cast iron pipe was needed.

**The Solution**

Carbone and Ragula reviewed and tested several products for the drip pot bridge before finding their answer. Ragula had participated in a Trenchless Technology Road Show in Newark, N.J., and while there came across QuakeWrap, a leading designer, supplier and installer of innovative fiber reinforced polymer (FRP) products for repair and strengthening of structures. Company founder Dr. Mo Ehsani had developed a product—PipeMedic™—using carbon and glass fiber reinforced polymer laminates to repair and strengthen steel, cast iron, corrugated metal, clay, brick, concrete, PCCP, wooden pipes and culverts.

"Seeing that product, I realized that it was perfect for our application due to its strength and minimal thickness [0.026 in.],” says Ragula, a 20-year veteran of gas main relining. In addition, the material has a natural curvature, making it relatively easy to configure it into an internal sleeve.

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of oxides and tar from years of manufactured gas passing through it. “The pipe was 16 inches in diameter and we couldn’t pull an eight-inch pig through the line,” Carbone says. “The residue had built and built and built until the line was almost completely filled. It sticks to the pipe and you can’t get it off.”

The heavy debris was removed by using a NLB high-pressure water-jet blasting system. A sandblasting tool head was modified to deflect the majority of the grit toward the bottom of the main in an effort to remove the excessive debris. All of this was made more difficult by the below-freezing temperatures and daily snow accumulations.

With the main out of service, groundwater started entering the pipe and the source of the leakage had to be eliminated prior to lining. After the debris was cleaned-out, a closer camera inspection revealed a crack in the pipe allowing water to seep in. This required modifying a robotic tool-head to lay-down and trowel cement over the cracked pipe to eliminate the water entry. The cold temps also impacted the curing time of both the carbon laminate bridge and CIPP liner. It took three days to cure the resin for the carbon laminate and five days for the adhesives to cure to the old pipe.

Sharon M. Bueno is managing editor for Trenchless Technology.

**Owner:** Public Service Electric & Gas Co.

**Contractor:** Progressive Pipeline Management

**Engineer:** Public Service Electric & Gas Co., Progressive Pipeline Management, QuakeWrap, Inc.

**Manufacturer:** PipeMedic™ by QuakeWrap, Inc., Karl Weiss Technologies GmbH, Aries

The **PipeMedic™** laminates and method of repair of pipes described in this paper are subject to pending U.S. and international patents by Professor Mo Ehsani.