Kevin Nagle is a product specialist with TT Technologies (www.tttechnologies.com), Aurora, Ill.

Pipe-Bursting Project Puts Failing Water Main Out of Its Misery

When a deteriorating water main is located below a busy city street, replacement opportunities are limited. A Colorado utility met the challenge with static pipe-bursting. BY KEVIN NAGLE

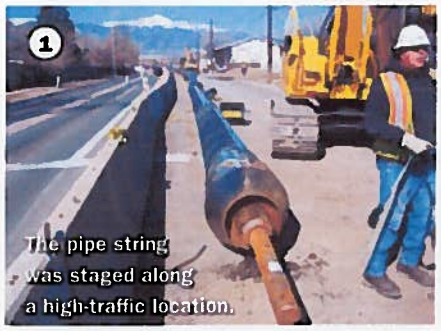
FOR 15 YEARS, Colorado Springs (Colo.) Utilities (CSU) had been dealing with a deteriorating 24-in. 2,500-ft steel, coal-tar-lined water main that runs below one of the city's busiest thoroughfares. During that time, crews tried various temporary fixes, including screws, wood plugs, and welded patches. The high-traffic location (photograph 1) had prevented the city from undertaking full-scale main replacement. The utility considered directional drilling, but abandoned the idea because of insufficient work space and concern for existing utilities in the right-of-way.

The city's trenchless contractor and a trenchless equipment manufacturer developed a plan for replacing the main with static pipe-bursting technology, using a machine that could deliver up to 625,000 lb of pulling force. Specially designed bladed rollers were pulled through the host pipe by a hydraulically powered bursting unit (photograph 2). As the rollers were pulled through the main, they split the host pipe. An expander attached to the rollers forced the host pipe to open from the bottom, expanded the host pipe into the surrounding soil, and simultaneously pulled in new high-density polyethylene (HDPE) pipe.

Rods were securely linked, not screwed together, to provide optimum connection strength and eliminate rod torque. Using a ladder-type rod connection significantly increased production time and cut down on the possibility of rod separation. The ladder rod configuration is made up of a male and female drop-in connection and takes only seconds to connect. Ladder rods made installation and disassembly quicker, because the rods were removed at the exit pit while bursting was in progress. A need for potentially dangerous high-torsion threaded rods was also eliminated.

PREPARATION

The water main feeds a water tank on the east side of town. CSU personnel shut down the water main during the project, but fed the tank through alternative routes, eliminating the need for a bypass and allowing crews to keep disruption to a minimum. The 2,500-ft length was divided into five sections. Because sections of the



The pipe string was staged along a high-traffic location.

The bursting unit used a hydraulic power pack.

When the launch and exit pits were prepared, the hydraulic bursting unit was put in place.

A CSU field crew positions the completed bursting apparatus in the launch pit.

main had been dug up many times over the years, soil conditions varied greatly, from tight clay to running sand in the span of several feet.

Typical launch and exit pits measured 40 ft x 12 ft x 14 ft (photograph 3). Contractor crews planned to burst runs of more than 500 ft, but doing so wasn't always possible because of the pipe's diameter, material, and coal-tar interior.

When the launch and exit pits were prepared, the hydraulic bursting unit was placed in the exit or pulling pit. Crews then rodded the line with linked bursting rods from the exit pit to the launch pit. At the launch pit, the bursting head, expander, and blade-roller cutting head were attached, along with 24-in. HDPE product pipe (photograph 4). Bursting operations were then ready to commence.

BURSTING OPERATION

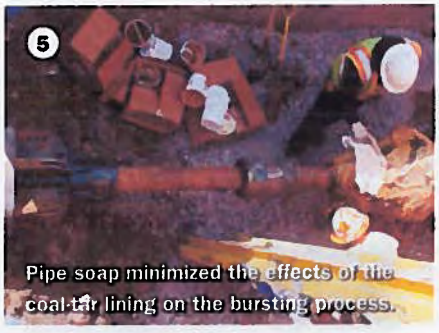
The coal-tar coating inside the pipe created a problem. On the first few pulls, the coating accumulated in front of the expander. To allow pulling to continue, crews excavated and cleared the material, adjusted the cutter wheels, and placed pipe soap on the front of the expander head. The soap prevented the tar from sticking to the front of the expander and allowed bursting operations to proceed smoothly (photograph 5).

Ultimately, 430-, 466-, 517-, 496-, and 620-ft runs were completed successfully (photograph 6). CSU crews completed the excavation and backfill. Contractor and utility crews completed tie-ins and kept the project moving forward and on schedule. Problems caused by the coal-tar buildup caused bursting time for the first two runs to be about 8–10 hours. However, after adjustments were made, bursting times for the remaining sections dropped to 3 hours per run.

BURSTING INTO THE FUTURE

This project has paved the way for CSU to plan replacement of hundreds of miles of deteriorating steel pipe using static pipe-bursting that travels an existing main's path. The utility will realize significant savings in restoration costs and minimal social disruption. With the static pipe-bursting method, crews can complete installation without disrupting other utilities that share the right-of-way.

4 The bursting apparatus was attached to HDPE product pipe.



5 Pipe soap minimized the effects of the coal-tar lining on the bursting process.

6 Bursting followed the existing main's path.

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