SOMETHING OLD, SOMETHING NEW…

A new twist on a proven trenchless rehabilitation technology shows promise for resolving a California water company's steel pipe replacement issues

By Suzan Marie Chin

At the end of a challenging demonstration and test project, the Squaw Valley Mutual Water Co. hopes that it has found a solution for the somewhat tricky replacement of its aging water lines.

A new rehabilitation solution, tested in June 2006, will bring the small water company a minimally disruptive method for replacing and upgrading about 3,000 feet of galvanized steel transmission pipes.

The successful test involved a new application of a proven method of pipe bursting, adapted for the special challenges of bursting small-diameter steel lines. The water company also successfully tested pipe bursting on larger asbestos cement piping.

Mountain terrain

Situated in the Sierra Nevada mountain region of California, Squaw Valley was home to the 1960 Winter Olympic Games and has since become a highly desirable resort community. Founded by the Poulsen family in the 1950s, the Squaw Valley Mutual Water Co. installed most of the community's original water system, which is fed by two mountain springs and several wells on the valley floor.

The system is comprised of asbestos cement pipe for its larger diameter lines (6 to 10 inches) and galvanized steel for service lines (1 to 4 inches). The mountainous terrain creates issues of access and roadway disruption for this small community, which spans less than two square miles.

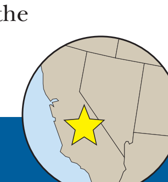
The company had been using dig-and-replace methods for its pipe repairs, but that became costly due to the county's strict requirements for submission of full engineering plans for each project. Les Wilson, the water company's general manager, wanted to find a more economical way to replace all the community's galvanized steel lines without costly permitting and associated project drawings.

Test project

A long-time resident of the community, Bruce McCubbrey, referred Wilson to TRIC Tools Inc. of Alameda, Calif. McCubbrey had called upon TRIC to address a failed water line on his property — a 3/4-inch galvanized steel pipe that ran under the home's master bedroom.

The replacement of this service line gave the water company a chance to test a new method of pipe replacement with potential for use in steel pipe replacement elsewhere in the service area.

The impacter assembly is removed in preparation to begin the second pull from the middle hole.



PROFILE:

Squaw Valley Mutual Water Co., Squaw Valley, Calif.

CUSTOMERS:
280 lots (250 active)

AREA SERVED:
2 square miles

PIPE INFRASTRUCTURE:
27,000 feet (3,000 feet galvanized steel, the balance asbestos cement)

IMPROVEMENT BUDGET:
$100,000 annually

Worn grippers require assistance for entire pull.

Final adjustments are made to the pipe attachment.

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>
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> **Squaw Valley Mutual Water Co.**

"The method involves using pipe bursting equipment, but with some modifications," Wilson explains. "Unlike cement or clay pipes that can be replaced easily with standard pipe bursting, steel pipes when burst or split turn into very sharp ribbons and shards that can damage the new pipe being installed. We were looking to install the new pipe while removing the old pipe completely from the ground."

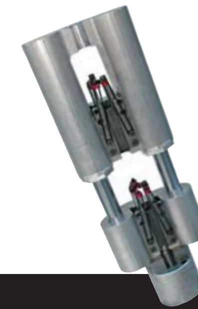
For the test project, the TRIC team excavated an exit pit about 10 feet deep against the foundation wall on the side of the home. A water service closet with an exposed dirt floor inside the home provided an easy entrance point. A 3/8-inch PTI cable was threaded through the existing line from the service closet to the exit pit.

In the exit pit was a special extraction cage with a splitting blade facing the old pipe. On this cage was mounted a TRIC BC20 18-ton hydraulic puller or ram, powered by a portable high-pressure hydraulic pump. The PTI cable exited the galvanized pipe and ran under the splitting blade and into the puller.

A steel cylinder slightly larger in diameter than the existing pipe was attached to the end of the pulling cable in the service closet. The old pipe was to be completely replaced by a new 1-inch, high-density polyethylene (HDPE) line, which was attached to the end of the steel cylinder.

As the ram pulled on the cable, the steel cylinder forced the old pipe through the ground, causing it to emerge in the exit pit. The extraction cage split the old pipe at the top as it emerged

Upper right, easing the bursting head into the entrance pit. Lower right, the bursting head enters the asbestos cement pipe and is pulled by the hydraulic ram in the exit pit.



BURSTING TECHNOLOGY

Pipe bursting and pulling equipment from TRIC Tools Inc. comes in various configurations to address specific needs. The Squaw Valley Mutual Water Co. demonstration projects used a system comprised of a Monolithic BC20 hydraulic puller, duct rodder, 3/4-inch steel cable, hydraulic pump and resistance plates.

The puller is a high-pressure tool designed for plumbing contractors who need to replace water and sewer lines. It is compact (20 x 8 x 6) and weighs 44 pounds. The puller requires a high-pressure hydraulic power source.

Resistance plates measuring 24 by 24 inches are positioned against the wall of the exit pit to distribute the resisting force of the pipe being replaced across a broad area. The puller can burst and pull in pipe sizes up to 4 inches at 18.5 feet per minute with a pulling force of 20 tons at 10,000 psi. Additional pullers are available for bursting and pulling pipe sizes up to 14 inches. For information: 888/883-8742; www.trictrenchless.com.

WHY HDPE?

High-density polyethylene (HDPE) solid-wall pipe has been used for potable water applications since the 1960s, and it has unique characteristics that make it a preferred material for pipe bursting and other trenchless rehabilitation.

Squaw Valley Mutual Water Co., at the recommendation of TRIC Tools Inc., selected HDPE for its pipe bursting demonstrations and for future replacement projects. A long life and a 100-year manufacturer guarantee were desirable, as was the ability to obtain pipe rated at 200 psi. The company's main water supply is a tank on a hill that generates fairly high pressures.

Because of its flexibility, HDPE provides more options for work crews in staging, and it is easily fed into bursting operations, helping to reduce construction costs. The pipe can be bent to a radius 12 times its nominal pipe diameter and is well suited for dynamic soils (prone to earthquake). It also withstands cold weather, important for Squaw Valley, which sees extreme cold during its long winters. Non-metallic pipe also eliminates corrosion, tuberculation, and bacteria growth.

Above, the electrofusion coupling process is used to join the final joint and connect the new pipe to the valve assembly. Below, detaching the bursting head in the middle pit.

from the ground. This allowed the pulling cable to be diverted upward. The split pipe continued horizontally and was cut off and removed in short sections.

The process continued until the entire original section of pipe had been removed and the HDPE replacement pipe was pulled into place. The test project was successful, and the new section of line was tied in and service restored without incident.

Although the new method showed potential, it had to be tested on a larger municipal line, so another demonstration project was scheduled.

Bigger stakes

The municipal line demonstration involved the bursting and replacement of a 6-inch asbestos cement pipe with 6-inch HDPE. The pipe selected was about 150 feet long and in an area with limited traffic and no service connections.

After access and exit pits were excavated, the crew ran into a few snags. They quickly realized that if they were to use a combination of static pulling and pneumatic hammering as planned, they were short of the air hose needed to span the pipe length.

In addition, the fused sections of HDPE pipe that the contractor had brought to the site were not long enough to enable replacement in one pull. The project thus had to be completed in two pulls, creating the need for another entrance/exit pit.

"Luck was with us that day, because just about at the center point of the demonstration line, a leak had occurred earlier, and an excavation to deal with the repair had already been made," says John Rafferty of the TRIC Tools Technical Development Department team. "We were able to use that repair excavation as both the exit pit for the first section of pipe and the entrance point for the second section."

Entrance and exit

Designation of the entrance and exit pits is critical. The entrance pit must be situated to allow easy deployment of the fused section of new pipe. HDPE is flexible, making it possible to install a single section as long as 1,000 feet. It is important to have an area at the entrance large enough to string the full length of the line.

The exit pit needs to be large enough to accommodate the crew and equipment and, if necessary, shoring equipment. It is also advantageous to pull against grade. If the exit pit is higher, the crew can run a small amount of water into the existing line to reduce resistance during a static pull. The introduction of the water to the ground surrounding the burst pipe can decrease the required bursting pressure by as much as half.

The TRIC crew completed the two sections of bursting and replacement using the same family of high-pressure equipment as for the smaller steel line project, but with a push-pull method, combining static and impact forces to propel the bursting head through the existing pipe.

Static force applies tension to the cable pulling the bursting head from the front. Impact force helps the head along by acting as a small jackhammer, beating from behind the head and using built-up cable tension to propel the head more effectively than by either method alone. The push-pull method gives the bursting unit the strength to break through Dresser Couplings, tough soil, or even concrete, thus speeding the pulling process.

Once the two replacement sections were installed, they were tied together and put back into the system through an electrofusion coupling process specifically designed for HDPE pipe.

The road forward

The test projects proved pipe bursting as a potential solution for avoiding the disruption and infrastructure damage of trenching. The final hurdle for the water company will be pipe upsizing.

Squaw Valley intends to upsize most of its 2-inch steel lines to 6-inch HDPE. Upgrading from 4-inch asbestos cement, VCP or galvanized steel to 6-inch HDPE, or similar size ratios, is not an issue, but the jump from 2- to 6-inch pipe is still in the developmental phases. Wilson and TRIC representatives expressed optimism that, with some modifications, the technology can accomplish 2- to 6-inch upsizings.

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"One of the advantages of this method is that, since it is in a sense a repair, the county may not require full plans, and will simply give us an encroachment easement. That would be quite a savings," Wilson says.

In addition to possible reduced permit and planning costs, the methods will help Squaw Valley limit restoration costs and disruption to its mountainside community. The company also hopes the projects will encourage residents to replace their own aging steel service lines, improving the integrity of the community's high-quality water system. ✦

MORE INFO:

239 **TRIC Tools Inc.**
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