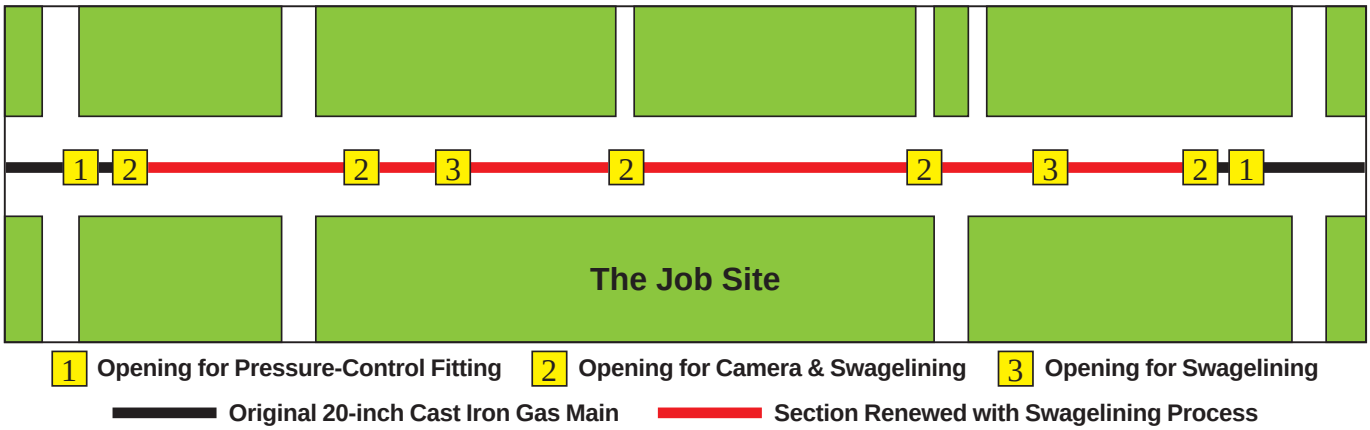
Swagelining Job in New Jersey Sets Records

Compressed-fit Lining Used to Renew 3,700 Feet of 20-inch Cast Iron Pipe

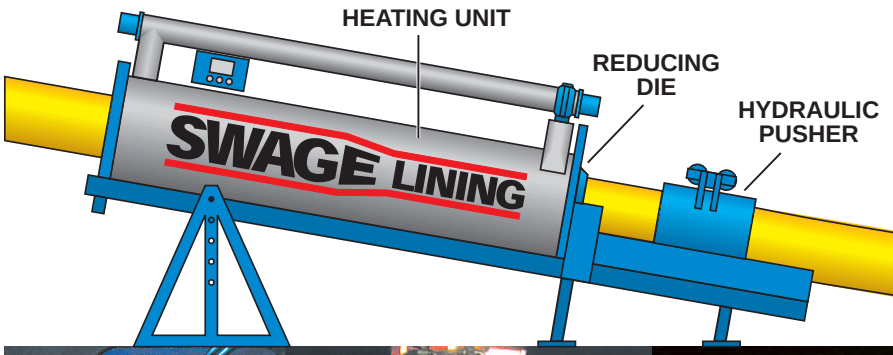


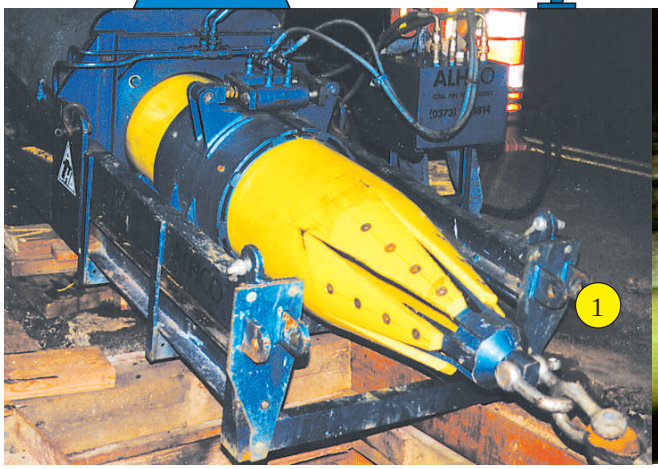
Elizabethtown Gas Company and the Gas Research Institute (GRI) have successfully completed a project in Union, NJ, using the Swagelining process and set three records as a result. The 20-inch diameter medium-density polyethylene (MDPE) SDR-21 was the largest ever installed by this process in the U.S., and since one of the pulls was 980 feet, that set a new Swagelining world record, too. The third record was for the largest diameter electrofusion couplers (520mm) ever used to join PE pipe.

Elizabethtown Gas Company, headquartered in Union, NJ, serves 231,000 customers in seven New Jersey counties. They have 2,600 miles of pipeline with mains ranging from 2 to 30 inches in diameter. Over the past few years, leaks had occurred at the joints of a 3,700-foot section of 20-inch cast iron main. Since the pipe was buried under a busy highway, a trenchless technology was considered to be the best renewal technique.

After careful study, the engineers at Elizabethtown Gas, headed by Mike Stonack, Manager, Engineering Design, decided a compressed-fit lining would be their best choice. This decision was based on the following facts: 1) minimum reduction in flow capacity; 2) the original cast iron pipe was in good shape; 3) there were no offsets in the section; 4) the liner needed to withstand 25 psi pressure; and, 5) five services would have to be reconnected after the installation was complete.

GRI was interested in this installation because they are actively investigating all





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Sections were butt-fused in the street.

Once assembled, the sections were moved to the swaging machine.

of the major renewal technologies to determine which might be suitable for use by the gas industry. Steve Gauthier, Principal Technology Manager, Strategic Collaboration at GRI, is the team leader for the trenchless technology area of GRI's R&D program. He said GRI had hired an independent contractor, Jason Consultants, Washington, D.C., to help them. This was done because GRI wanted to have the data evaluated by an independent third party who had no built-in bias. After reviewing the Swagelining project with Glyn Hazelden, Assistant Vice President, Operations and Engineering, Elizabethtown Gas Company, GRI chose to co-fund the project.

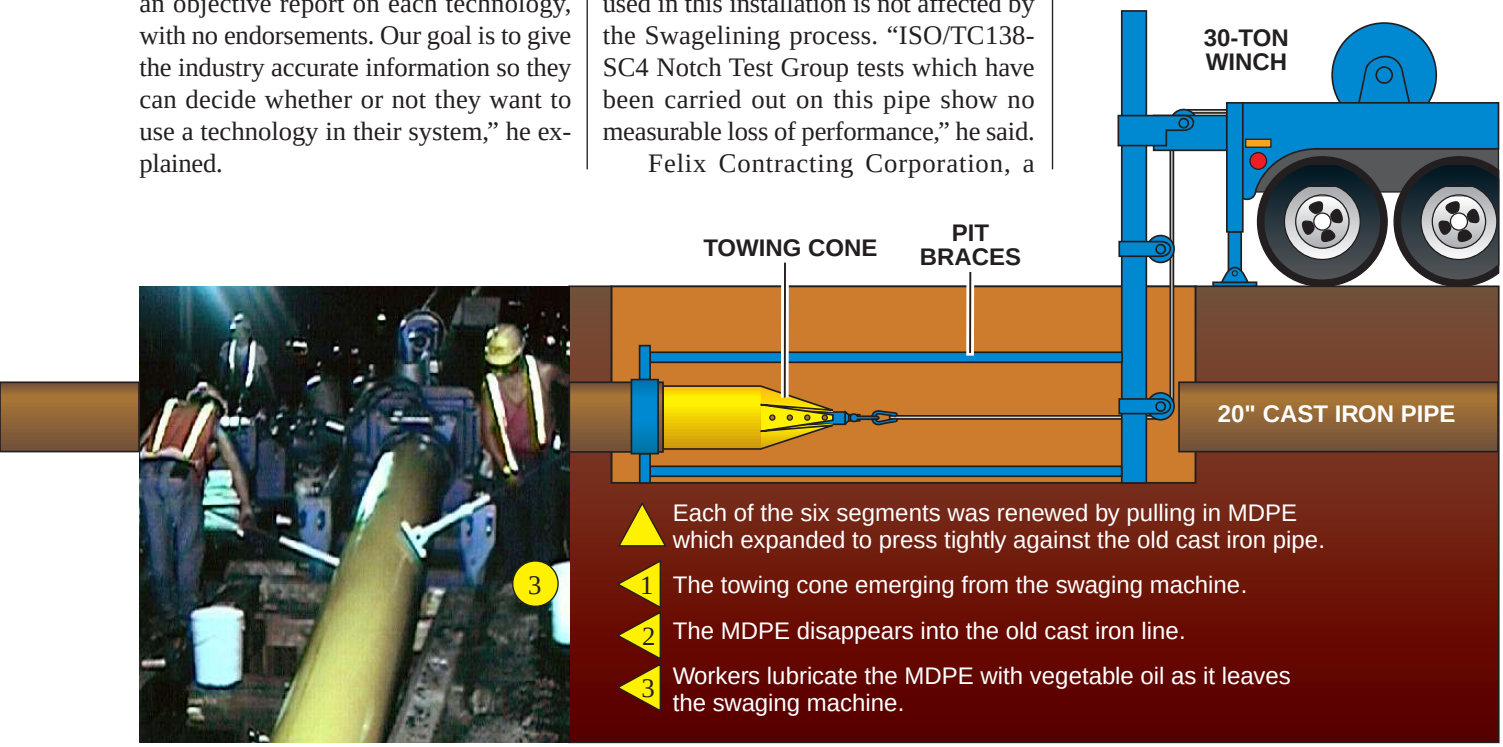
Steven Kramer, a principal in Jason Consultants, said the company is in the last stages of the program which began in August, 1993. "The final outcome will be an objective report on each technology, with no endorsements. Our goal is to give the industry accurate information so they can decide whether or not they want to use a technology in their system," he explained.

The Swagelining process was specially developed by British Gas as a method of replacing its aging gas distribution network. Over 6 million feet have been installed worldwide and over 400,000 feet of that have been in the United States. The system uses polyethylene pipe that has an outside diameter slightly larger than the bore of the pipe to be renewed. The diameter of the PE pipe is temporarily reduced by a die, and then inserted into the old pipe. Once installed, the PE pipe expands to fit tightly against the old pipe. A full range of tapping, branching, and connection methods has been developed to provide a total renewal system.

Jim Hopwood, who is in charge of Swagelining in North America, said British Gas has carried out extensive research and testing to ensure that the long-term stability of the Plexco pipe used in this installation is not affected by the Swagelining process. "ISO/TC138-SC4 Notch Test Group tests which have been carried out on this pipe show no measurable loss of performance," he said.

Felix Contracting Corporation, a Swagelining licensee based in New York, NY, worked with the prime contractor, Henkels & McCoy, Inc., Burlington, NJ, to install the new pipe. Before taking the section out of service, it was isolated with two pressure-control fittings, and the eleven customers connected to the section were rerouted to other lines. Then, pits were opened to allow the line to be inspected by closed-circuit television. The inspection revealed that several service connections were protruding into the main and would have to be removed. Fortunately, the pits which were dug to remove the protruding service taps could also serve as entry/exit points for the Swagelining process. Otherwise, the pipe was in good shape and contained very little debris. The line was cleaned with a wire-brush pig.

By August 12, 1994, the Swagelining equipment was in place and 50-foot sec-



Each of the six segments was renewed by pulling in MDPE which expanded to press tightly against the old cast iron pipe.

1 The towing cone emerging from the swaging machine.

2 The MDPE disappears into the old cast iron line.

3 Workers lubricate the MDPE with vegetable oil as it leaves the swaging machine.

tions of Plexco MDPE pipe, manufactured by Chevron Chemical Co., were stored at the project site. These sections were butt-fused into 100-foot sections before being brought onto the roadway. To avoid disruption as much as possible, the installation crews worked from 6 p.m. to 6 a.m. Each installation from one entry pit to the next would require two nights. During the first night, the 100-foot sections were aligned in the center of the street, fused together to the proper length, and pressure-tested at 50 psi. The next night, the pipe was swaged and pulled into the cast iron pipe. This process was repeated for each of the six sections.

A sizing test was made on each cast iron section before the new PE pipe was swaged and pulled in. A special piece of MDPE had been made to the same diameter (19.5 inches) as the swaged line. This piece was pulled through the cast iron pipe to be sure the swaged line could be inserted without being damaged.

Because of the large diameter of the pipe, a special Swagelining machine and a 30-ton winch were used. The Swagelining machine was equipped with a heating unit which would preheat the MDPE to 70˚ Celsius (158˚F) before it entered the reducing die. It also had a built-in hydraulic pusher which could be used to assist the winch when needed.

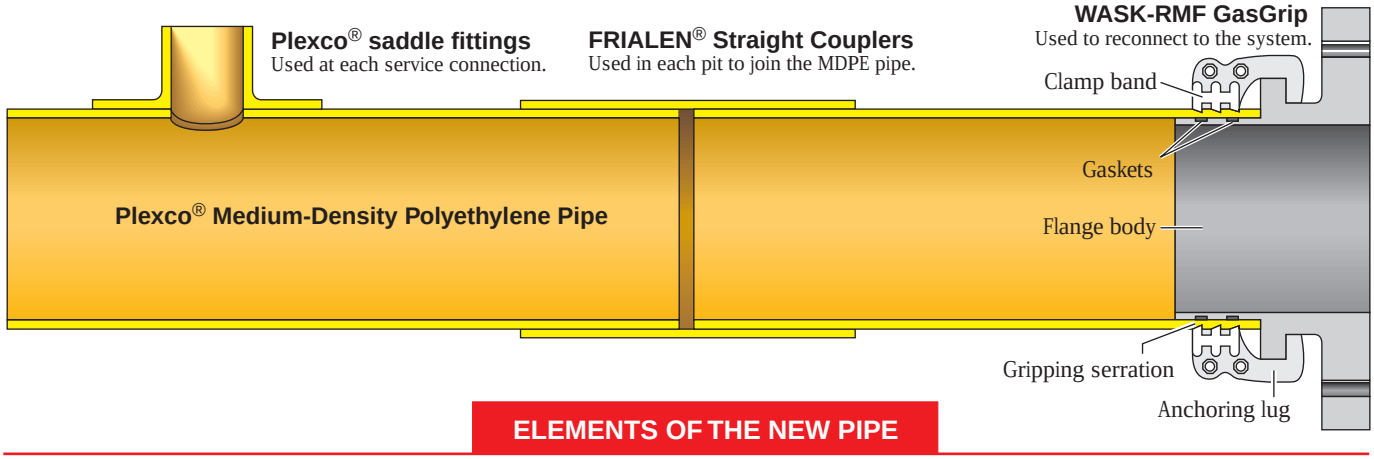
Pete Marino, Field Engineer with Felix Contracting Corporation, said there is less distortion with the Swagelining process than with other size-reduction methods. "Instead of being squeezed down with rollers, the pipe is passed through a reducing die and elongated. There's much less distortion this way. In fact, we never reduce the diameter more than 10%, and the pipe remains smooth. Some processes distort as much as 20%, and it's not evenly distributed. It forms valleys and ridges," he explained.

As the swaged line relaxes, it presses tightly against the host pipe.

The PE sections were electrofused together in each pit with Frialen® straight couplers. Before closing the pits, five customers were reconnected to the new line. The 4-inch service connections were made by fusing saddles to the exposed sections of polyethylene main. The main was then tapped through the saddles. All of the service lines located within the right-of-way of the road were replaced with plastic pipe. Next, the new pipe, including the service connections, was pressure-tested at 60 psi. Then, the 3,700-foot section was reconnected to the system utilizing Wask-RMF GasGrip flange adaptors at each end.

"The Swagelining process worked very well in this situation," Mike Stonack said. "We didn't want to use open-cut replacement because of the heavy traffic on the highway and the concentration of buried utilities. Repaving costs would have also been significant. Swagelining was the most cost-effective of the trenchless technologies which offered a pressure pipe and a proven method to reconnect service laterals. We were very pleased with the result."

"This was a perfect job," Pete Marino said. "The coordination between Elizabethtown Gas Company and the contractors couldn't have been better. The pipe went in easily in spite of some misaligned joints in the old pipe. We were able to make some long runs quickly, and we set some world records. I'm proud to have been a part of this," he said.



ELEMENTS OF THE NEW PIPE

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