

Swagelining Renews Force Main Under the Elbe River

edited by Laura Saccogna

Officials in Heidenau, Germany decided last July that the city's 500-mm (20-in) diameter steel force main that crossed under the Elbe River at Heidenau had to be replaced. The 440-m (1,430-ft) line between a pumping station on the west bank and a treatment plant on the east bank had become seriously weakened by corrosion since its installation around 1960. Early in 1997, leaks through perforations in the main resulted in the replacement of short sections on both sides of the river.

Repair or replacement of the actual river crossing had been delayed until a fast, non-disruptive, affordable technology could be found. Speed was important because the force main was the only line which crossed the river, and could not be taken out of service for long. Storage for the effluent on the west bank of the river was very limited. It was determined that the line could not be out of service for more than 12 days.

The repair or replacement process should be non-disruptive, if possible, because of heavy barge traffic on the Elbe. If traffic on the river were stopped for even a day, it would be very disruptive and expensive. In addition, environmental considerations strongly discouraged any construction method which would disturb the river bottom.

The city of Heidenau and Mannesmann Seiffert Industrieanlagen GmbH (MSIG), Potsdam, the general contractor in charge of the project, wanted to be sure they made the best investment of the public funds entrusted to them. With the problems clearly identified,



Heavy commercial traffic on the Elbe River meant the rehabilitation process should be nondisruptive.

Mannesmann began to research the repair or replacement options available to them.

The severely deteriorated condition of the pipeline, as well as the arc it followed under the river limited the rehabilitation options. However, MSIG had used the Swagelining process previously and included that process in the bid specifications. When the bids were reviewed, British Gas Technik GmbH, Berlin, and Partington Engineering Services, Manchester, England, which is part of BG Transco, won the installation contract.

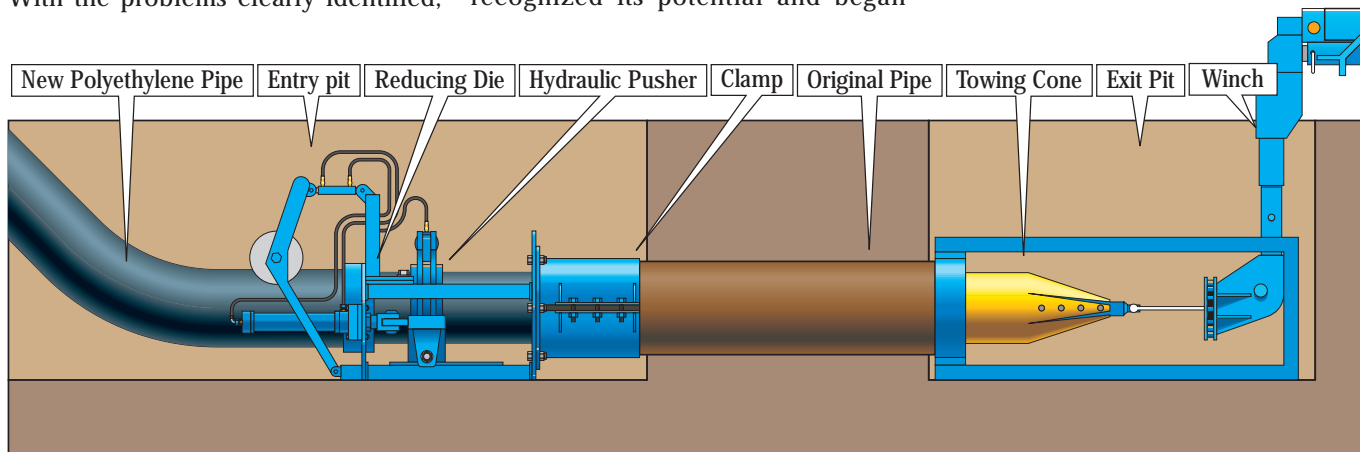
The Swagelining Process

The Swagelining process was specially developed by BG plc (formerly British Gas) as a method of replacing its own aging gas distribution network. When licenses for the process were made available, clients and contractors quickly recognized its potential and began

rehabilitating water, sewer, and oilfield pressure pipes as well as gas. As a result, over 800km (500 miles) of pipeline have been rehabilitated with the Swagelining process.

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.

SDR 22 High density polyethylene (HDPE) pipe from Egeplast was selected for the Elbe River crossing because it offered high strength relative to its wall thickness. This pipe is designed for a maximum pressure of 10 bar. The strength was important because of the deteriorated





HDPE Egeplast fittings were used to connect the HDPE to the steel pipe while Friatec electrofusion couplings tied into the pipe lining.

condition of the steel pipe, and the relatively thin wall would result in no loss of flow capacity. Egeplast also supplied the PE-to-steel flanged adaptors.

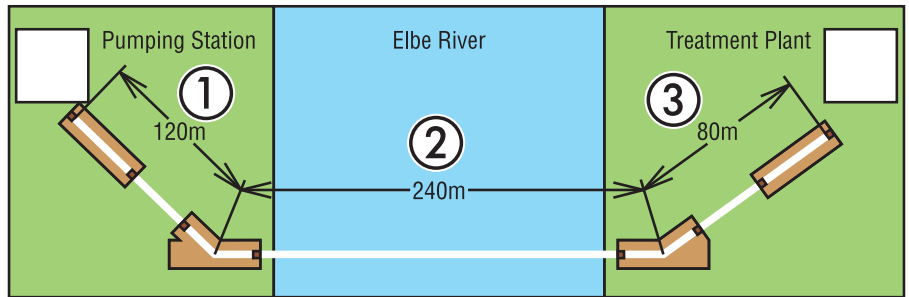
Close coordination between the companies involved was very important because there was almost no room for error. It was decided that the project would be divided into 3 sections. The first was 120m (390 feet) from the pumping station to the west bank of the river. Section two was the 240m (780 feet) of the river crossing. Section three was the 80m (260 feet) from the east bank of the river to the treatment plant.

Installation Begins

Work began on August 28, 1997 when crews began excavating the four pits which would be necessary to pull the new HDPE pipe into place. At the same time, Mannesmann crews began fusing the 20m (65-foot) sections of PE into the full lengths needed for each pull. After being fused, each finished section was carefully pressure-tested to make sure there were no leaks.

The morning of September 4 was clear as crews from Partington Engineering Services arrived to begin the actual installation of the Swagelining. The steel force main was taken out of service, and 9m (30-foot) sections of pipe were removed from each pit. They had passed the point of no return. Now there was very little room for error. They quickly cleaned the first section and inspected it with closed-circuit television.

Over the next five days, the other two sections were cleaned and inspected, and the Swagelining process was used to install



The towing cable and nose cone pass through the Swagelining die as the first installation begins.

the HDPE in Sections 1 and 3. Section 1 was also reconnected to the pumping station and Section 3 was reconnected to the treatment plants.

Crossing the River

On the morning of September 9, directors of the local water and gas authorities, the mayor of Heidenau, the local TV station, and managers from all of the companies involved were present to witness the Swagelining of the river crossing. A 40-ton winch was positioned at the edge of the pit on the east bank. A cable which ran through the steel pipe connected the winch to the new HDPE pipe on the west bank. As two-way radios crackled in the morning air, the RPM of the winch increased, the cable became taut, and the HDPE pipe began to move from the pit into the steel pipe.

While the winch cable guided and pulled the HDPE from one end, hydraulic cylinders on the other side of the river clamped and pushed the lubricated pipe. This action caused the HDPE to pass

through the Swagelining die which temporarily reduced its diameter by approximately 7%. BG plc has carried out extensive research and testing to ensure that the long-term stability of PE is not affected by the Swagelining process. ISO/TC138-SC4 Notch Test Group tests also show no measurable loss of performance.

A little less than three hours after the leading end of the new HDPE entered the old pipeline, it emerged into the pit on the opposite bank. The PE pipe was allowed to relax before its connection to Sections 1 and 3. At noon on Friday, September 12, eight days after being taken out of commission, the rehabilitated force main was put back in service.

The result was a strong, new pipe which would last much longer than the original steel pipe. The total cost of Swagelining was estimated at 25% of the cost of full replacement, without any disruption of river traffic or damage to the sensitive environment.

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