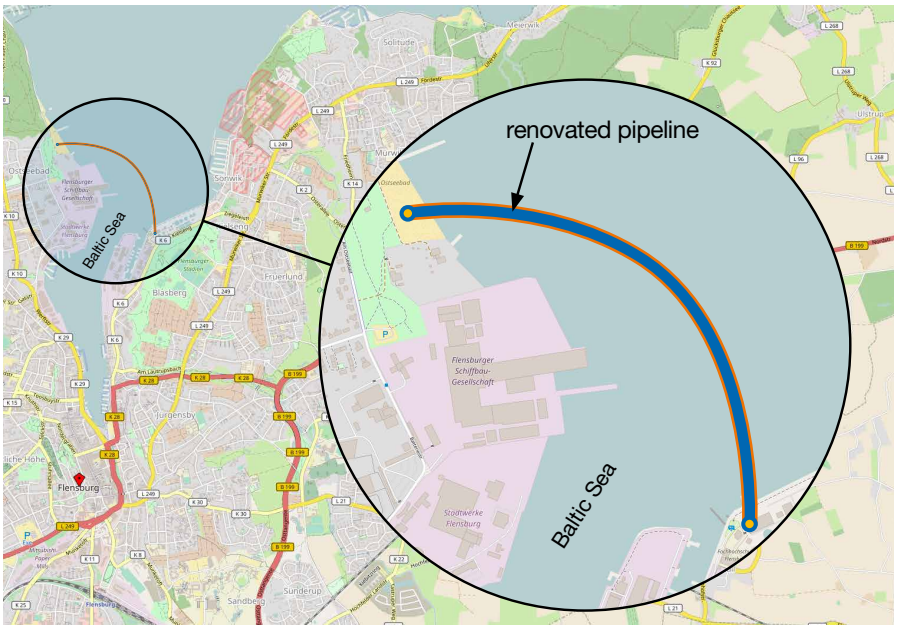
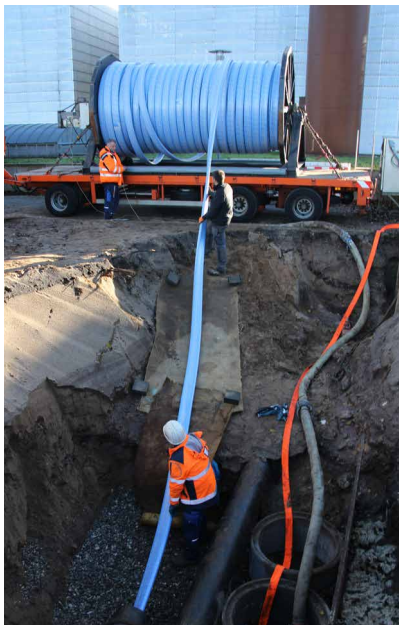
Job Report





Rehabilitation of „fjord siphon“ with a length of 1,240 m

Client:
Stadtwerke Flensburg GmbH

Year of Construction:
November 2016

Type of Project:
Rehabilitation of inverted siphon DN 300 PE 80 PN 10

Our services:
- Delivery of the Primus Liner including connectors
- Pigging of existing pipe DN 300 PE 80 PN 10
- Installation of the system Primus Line® DN 250 Pmax = 15 bar
- Installation of the Primus Line® system connector
- Pressure testing

Task:
Stadtwerke Flensburg GmbH operates a drinking water siphon through the Flensburg Fjord in the area of the harbour. This important main supply line was manufactured from PE 80 in the 1970s and flushed into the bottom of the fjord. The fjord pipeline runs 1,240 m from the Ostseebad waterworks in an elongated arc to a bank path on the north-east bank. Due to the location of the siphon, it was difficult to construct a new building for economic and temporal reasons. To ensure the supply of drinking water, the responsible persons opted for preventive maintenance of the pipeline section and to rehabilitate it using relining technology. The rehabilitation system used was to pass through bends of up to 30 degrees, in accordance with the requirements of the client, and to withstand an operating pressure of up to 10 bar.

Technical Details:

Host pipe material:	PE 80
Year of construction:	approx. 1970
Transported fluid:	Drinking water
Diameter of host pipe:	DN 300
Operating pressure:	10 bar
Primus Line® system:	DN 250 P_{max} = 15 bar
Total length:	1,240 m
Number of construction sections:	1 installation section
Relining duration:	approx. 3 hours
Complete rehabilitation project:	8 working days

Rehabilitation system:

The innovation of the self-developed Primus Line® system was decisive for the contracting of Rädlinger primus line GmbH. Primus Line® is a trenchless technique for the rehabilitation of pressure pipelines. The basis of the procedure is a flexible high-pressure liner and connection technology that was specially developed for the system. Due to its multi-layer structure and very low wall thickness, Primus Line® offers a high degree of flexibility and extremely high material strength. The inner layer of the Primus Liner is approved according to DVGW W 270 and the KTW guideline for rehabilitating drinking water pipes. The outer layer is made of wear-resistant PE. There is a static-bearing layer made of seamless aramid textile fabric between the inner and outer layers. The flexible design makes it possible to pass through bends of up to 45 degrees. Individual installation sections of up to 2,500 m are possible. Primus Line® is self-supporting and sits freely in the annulus of the host pipe so is not glued to it. The Primus Liner DN 250 for drinking water that is installed in Flensburg with a single-layer hybrid structure (aramid-polyester textile) can be used for operating pressures of up to 15 bar.

Construction process:

Once the pipeline had been separated, a camera inspection of the submerged pipeline was first carried out in order to obtain information about the condition of the pipe. The inspection showed sanding in the siphon and on the respective sides of the siphon, as well as slight deposits on the pipe wall. The pipe was cleaned hydraulically. In doing so, the sanding was first removed by means of water jetting and the slight deposits were removed through pigging. The rope connection was created using the pig. The cleaned section to be rehabilitated could then be released for the installation of the liner.

The Primus Liner DN 250, prefabricated at the factory in a U-shape and wound on special reels, was transported to the construction site and positioned on the north-east bank of the harbour basin. The insertion was carried out by means of cable winches in one pull. The total inserted length of 1,240 m is the longest single insertion in Germany and was completed within three hours.

Due to the folding technique used and the associated reduction in the pull-in forces, the liner could be pulled in with a maximum tensile force of 17.2 kN. The maximum permissible tensile force for the Primus Liner DN 250 (low-pressure) is 90 kN. The liner was then brought into its round, self-supporting and permanent shape through the continuous application of water. With the installation of the connectors, as well as the final pressure test according to DVGW W 400-2 (contraction method), the rehabilitation of the siphon was successfully completed. The Primus Line® system has a minimum life span of 50 years.

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