PRIMUS LINE

Job Report

Preventative maintenance of a DN 400 PN 16 steel water main installed in a bridge

Client:
Stadtwerke Passau GmbH, Germany

Year of Construction:
September 2016

Type of Project:
Rehabilitation of a pipeline DN 400 PN 16 steel water main

Our services:
- Delivery of the flexible Primus Liner and connectors
- Cleaning of existing pipe DN 400 steel pipe
- Installation of the system Primus Line® DN 400 P_{max} = 20 bar
- Installation of the Primus Line connector
- Pressure testing

Task:
The Marienbrücke bridge in Passau, with a length of approx. 220 m crosses the Inn river at the height of the St. Stephan Cathedral and connects the old town with Innstadt, which is the only district in Passau to the right of the Inn. At the same time, the Marienbrücke bridge is the only and last connection for motorised traffic to Innstadt and to Austria before the Inn flows into the Danube.
A drinking water pipe DN 400 steel PN 16 is installed in the body of the Marienbrücke bridge. This important main supply pipe provides the city of Passau with drinking water and is operated by the municipal authorities of Passau. The steel pipe was laid in 1977 with a length of approx. 210 m. A compensator for handling the pipe expansion was integrated into the centre of this pipe. The dilatation of the compensator is approx. 10 cm (+/- 5 cm). In 2016, Stadtwerke Passau decided to renovate the pipeline section after more than 30 years of operation in order to ensure the supply of drinking water.

Due to the location of the pipeline, it was difficult to construct a new building for economic and temporal reasons (scaffolding, road blocks, recalculation of the statics). It was decided to rehabilitate the pipeline using relining technology.
In accordance with the client‘s requirements, the rehabilitation system used in this case should be able to pass through the compensator, and ensure its function and withstand an operating pressure of 10 bar.

Technical details:

Host pipe material:	Steel pipe
Year of construction:	1977
Transported fluid:	Drinking water
Diameter of host pipe:	DN 400
Operating pressure:	6 bar
Primus Line® system:	DN 400 P_{max} = 20 bar
Total length:	210 m
Number of construction sections:	1 installation section
Complete rehabilitation project:	5 days

Rehabilitation System:

Stadtwerke Passau GmbH decided to install the Primus Line® system from the company Rädlinger primus line GmbH. The innovation of the self-developed system was decisive for the commissioning of the company from Cham in Bavaria. 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. Compared to all other variants, this unique feature of Primus Line® solved the challenge of maintaining the compensator function. The inner layer of the Primus Liner is approved according to DVGW W 270 test certificate 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 400 that is installed in the drinking water pipe DN 400 with a single aramid layer (medium pressure) can be used for operating pressures of up to 20 bar.

Construction process:

Once the pipeline had been separated, a camera inspection of the pipeline was first carried out in order to obtain information about the condition of the pipe. The inspection showed an incomplete cement mortar lining of the pipe wall, the uncoated compensator made of steel, as well as the uncoated site deposits and incrustations. The auxiliary cable/winch cable was also drawn in during the camera inspection. For this purpose, appropriate deflection rollers were mounted on the bridge abutment of the old town side of the bank. The pipe was cleaned mechanically. In doing so, a combination of rubber discs and scrapers was pulled through the pipe several times using a cable winch. Further camera inspections were held to review the cleaning progress. A cutter was then used to remove the incrustations in the compensator and on the uncoated areas. After final mechanical follow-up cleaning by means of rubber discs and a repeated camera inspection, the cleaned section to be rehabilitated could be released for the insertion of the liner. The Primus Liner DN 400, prefabricated at the factory in a U-shape and wound on special reels, was transported to the construction site and positioned at the Innstadt side of the bank. The insertion was completed using cable winches under extremely tight conditions below the bridge at a mounting height of approx. 5 m. The flexible liner was pulled in with a maximum tensile force of 10 kN due to the folding technique used and the resulting reduction in the pull-in forces. The maximum permissible tensile force for the Primus Line medium pressure liner was 100 kN. The liner was then brought into its round, self-supporting and permanent shape through the continuous application of compressed air. With the installation of the Primus Line connectors, as well as the final leak test of the rehabilitated pipe section, the rehabilitation of the drinking water pipeline was completed within just about five days without being noticed by the surrounding traffic.

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