

## Job Report



## Renovation of a DN 450 PN 28 brine pipe for Kem One

### Client:

Kem One

### Year of Construction:

August 2019

### Type of Construction Measure:

Rehabilitation of a brine transport pipeline DN 450 with a length of 455 m. The pipe's maximum operating pressure is 28 bar and traverses underneath a channel with four 45-degree bends with  $r = 33xD$ .

### Construction company:

General contractor: Altero Travaux Publics; subcontractor: Danphix S.p.A.

### Situation:

The Kem One plant in Lavéra is using the brine pipeline to produce sodium carbonate, hydrogen and sodium hypochlorite from chlorine. The Kem One plant is the source of 25% of French chlorine production and 40% of French VCM production. The DN 450 steel pipe is regularly inspected with ILI tools to assess the condition of the pipe. In 2018, the pipeline operator identified the need to perform preventative maintenance on a section with 455 m which runs underneath a channel with four sweeping bends with 45 degrees ( $r = 33xD$ ). The client had the choice to install a new steel pipe using HDD or rehabilitate the existing pipe using Primus Line<sup>®</sup>, a Kevlar<sup>®</sup>-reinforced no-dig relining solution. A comparison study was performed by engineering consultant Eureteq specialized in France and internationally in project management in transmission pipelines and in technical and regulatory consulting. The study came to the conclusion that significant cost savings were feasible using the Primus Line<sup>®</sup> system in addition to a significant reduction of time required to execute the project. In addition, corrosion is eliminated using the Primus Line<sup>®</sup> system.



### Technical Details:

Material of Host Pipe:	Steel, unlined
Transported Fluid:	Brine (sodium chloride concentration 300 gram / litre; completely dissolved in water)
Diameter of Host Pipe:	DN 450
Operating Pressure:	28 bar
Test Pressure:	34.5 bar
Primus Line® System:	DN 400 PN 32; connectors DN 400 with DIN flanges DN 450 PN 40
Total Length:	455 m
Number of Sections:	1 installation section
Installation Time:	1 week

### Rehabilitation System:

The Primus Line® system is referenced in EN ISO 11295:2017 – classification and information on design and applications of plastics piping systems used for renovation and replacement. The Primus Line® system also complies with the technical standard DVGW VP 643 – flexible textile-reinforced plastic liner for pipe-relining of gas high pressure pipes. The system consists of a Kevlar®-reinforced liner and specifically developed end fittings. The liner accommodates the operating pressure of the pipe, due to the reinforcement layer and does not bond to the host pipe. An annulus space remains. The liner is seamlessly manufactured at an ISO 9001 certified production plant in Germany and transported on reels to the site. Due to the flexibility of the material, the liner can traverse angles of up to 45 degrees, can be installed in lengths of more than 1,000 m in one pull, and has an installation speed of up to 600 m per hour.

During factory acceptance testing, a burst pressure test was conducted on the produced liner DN 400 high pressure as well as the connector. The test results showed a burst pressure of the liner of 92 bar. The connectors were successfully tested with 115.5 bar. Long term tests according to DVGW VP 643 and ISO 9080 determined a fabric factor of 2.0 to achieve a 50 year life span. In addition, a safety factor of 1.25 is incorporated. Hence, the pipeline can be safely operated with 28 bar. The liner's PE inner coating is suitable for the transport of brine

### Project Description:

In preparation of the installation of the Primus Line® system, a by-pass was created to guarantee the supply of brine during the renovation time. In a first step, the pipe was CCTV inspected to assess the condition of the host pipe. The contractor performed mechanical cleaning of the host pipe using rubber pigs. The 455 m of liner were delivered pre-folded into U-shape on a transport reel directly to the site. A pulling head was mounted to the start of the liner and connected to a rotation joint and subsequently to the cable of a pulling winch. The liner could be installed in less than one hour and was re-rounded using compressed air. The end fittings equipped with DIN flanges PN 40 were mounted. The renovated section was successfully pressure-tested using brine with 34.5 bar. The void between the liner and the host pipe was filled with nitrogen to monitor the annulus space. The life of the existing asset was extended by at least 50 years.

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