

## EUROPIPE Pipes internally lined with Epoxy Flow Coat Ready for 100 Percent Hydrogen

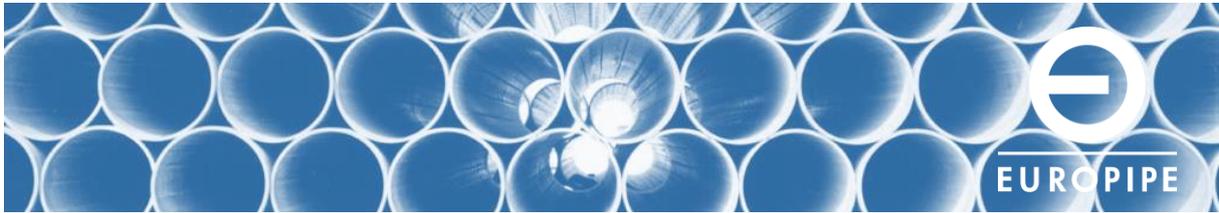
In a [previous publication](#) it was confirmed that EUROPIPE's L485 (X70) pipes are an excellent choice to be used for future hydrogen pipelines designed according to ASME B31.12. The tests showed that the steel exceeds the properties assumed in the standard in a 100 bar pure hydrogen atmosphere.

Epoxy-based internal flow coatings provide important and well-recognized benefits during installation and operation of gas pipelines. As a part of EUROPIPE's hydrogen research program, different flow coatings were tested in pure hydrogen to evaluate their suitability for use in hydrogen transport. Recent suitability tests conducted by the Salzgitter Mannesmann Research Company (SZMF) have confirmed that EUROPIPE's pipes internally coated with epoxy-based flow coatings **are capable to be used for hydrogen pipelines** in a 100 bar pure hydrogen atmosphere.

The investigated test specimens originate from pipes internally lined at MÜLHEIM PIPECOATINGS (MPC) with epoxy-based flow coat materials TEKNOPOX 3296-06 (82 Vol.-% solid content) and TEKNOPOX 3297-00 (97 Vol.-% solid content) supplied by TEKNOS. The flow coating thickness of all specimens was between 61 µm and 120 µm.

The testing protocol followed API RP 5L2 for the resistance to gas blistering and EN 10301/ISO 15741 for the resistance to gas pressure variations (cyclic testing) and hydraulic-pressure blistering. These standards are commonly used for qualification testing of internal coatings for non-corrosive gases. The abovementioned "blistering tests" are usually performed with nitrogen as pressurizing gas to simulate the effect of spontaneous pressure drops on the internal coating. For the performed tests hydrogen was utilized as a pressurizing gas to investigate how or whether hydrogen, having the smallest molecular diameter, would influence the resistance of the coating to spontaneous pressure drops. Missing resistance can lead to blistering, delamination or reduced adhesion of the internal coating.

The specimens were placed in an autoclave and pressurised with hydrogen to 100 bar. For the testing according to API RP 5L2, the pressure was released after 24 hours in less than 5 s, to simulate a very rapid pressure drop.



In comparison with the API RP 5L2, the testing method according to EN 10301/ISO 15741 exhibited 10 cycles of pressure variations. Moreover, the behaviour of the flow coatings when subjected to pressure variations in a liquid environment (water saturated with  $\text{CaCO}_3$ ) was investigated.

After all tests the surface of the specimens were examined and the adhesion of the flow coating was determined according to ISO 2409 (cross-cut test).



Formation of blisters was not observed and the delamination parameter were determined as “0” for all specimens confirming an excellent adhesion of the internal coating after the performed tests.

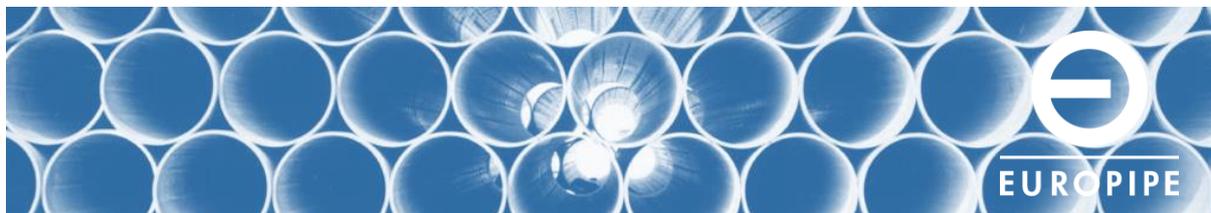
All flow coating specimens showed a very good behaviour in the tested pure hydrogen environment, no blistering, degradation or reduction of adhesion could be observed. EUROPIPE’s pipes with internal coating applied by MÜLHEIM PIPECOATINGS are the perfect choice for future hydrogen pipelines.

**With these material results, EUROPIPE contributes to more clarity for the technical challenge in a safe hydrogen transport via pipelines.**

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#### About EUROPIPE

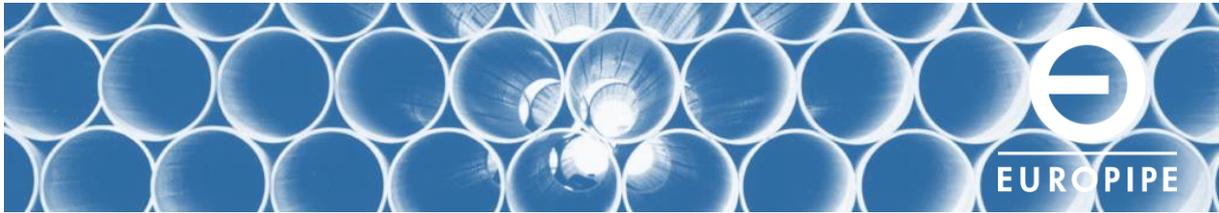
EUROPIPE GmbH based in Mülheim an der Ruhr, Germany, is the world market leader in welded large-diameter steel pipe production. The EUROPIPE Group with locations in Germany and the USA employs a workforce of some 1,000 worldwide. Its production capacity amounts to over 1 million tons or 3,000 kilometers of large-diameter pipe per year. EUROPIPE is owned in equal shares by AG der Dillinger Hüttenwerke and Salzgitter Mannesmann GmbH.

[www.europipe.com](http://www.europipe.com)

#### About MÜLHEIM PIPECOATINGS

MÜLHEIM PIPECOATINGS GmbH, a 100% subsidiary of EUROPIPE based in Mülheim an der Ruhr, Germany is one of the world's leading specialists in the application of pipeline protective coatings and linings. The production capacity of MÜLHEIM PIPECOATINGS amounts to over 4.5 million square meters of external and internal factory coatings per year.

[www.muelheim-pipecoatings.com](http://www.muelheim-pipecoatings.com)



### About Salzgitter Mannesmann Forschung (SZMF)

SZMF offers ISO 17025 accredited tests, mainly on steel and coatings, and research and development services with a know-how that is based on 85 years of experience in research. SZMF is a 100 % subsidiary of Salzgitter AG and has two locations in Germany: Salzgitter and Duisburg.

*[www.salzgitter-mannesmann-forschung.de](http://www.salzgitter-mannesmann-forschung.de)*

### About TEKNOS

Teknos is a global coatings company with operations in more than 20 countries in Europe, Asia, and the USA. It was established in 1948, and is one of Finland's largest family-owned businesses.

It employs approximately 1,800 with over 250 people working in R&D. Teknos is one of the leading suppliers of industrial coatings with a strong position in retail and decorative paints. Teknos has strong and well-documented proof of its expertise in the surface treatment for internal and external pipeline applications and an extensive product range of painting solutions for the pipelines in different environments, including onshore and offshore.

*[www.teknos.com](http://www.teknos.com)*