

A New Approach to Pipeline Rehabilitation with DuPont™ Kevlar®

Putting new life into old pipes

When ExxonMobil Production Deutschland GmbH (EMPG) wanted to reline a 2,2 kilometre section of wet oil pipeline near Meppen, Lower Saxony (N-W Germany), several concerns faced the firm, in addition to the usual difficulties in trenchless rehabilitation jobs. The cement-lined steel flowline ran through marshy ground, making access difficult; aggressive reservoir water and other corrosive ingredients such as hydrogen sulphide (H₂S) and carbon dioxide (CO₂) were present; and its route included bends up to 45 °.

After reviewing available technologies, EMPG chose Primus Line®, developed by Rädlinger GmbH of Cham, Bavaria. Primus Line® technology is based on the use of a flexible, thin-walled tube woven from DuPont™ Kevlar® fibre. In a pipeline rehabilitation job the flexible tube is unwound from a large drum and drawn through the existing pipeline, which merely serves as a conduit. Thanks to the fibre's extremely high strength, the tube withstands operating pressures up to PN 25, irrespective of the condition of the existing pipeline. Once the Primus Line® is in place, it does not require bonding to the inner surface of the old line.

The rehabilitation job was completed in 2005. According to Herr Thomas Neunhoeffer, EMPG production supervisor and project leader at Meppen, the Primus Line® was pulled through the 2,2 km pipeline in only seven sections. With a wall thickness of only 8 mm it was installed in diameters DN 200 and DN 250 (10 and 12 ") to carry oil up to 60 °C at a pressure up to 32 bar (45,5 lbf/in²). The old pipe did not need any expensive repairs or pressure testing before the drawing operation.

"The complete installation on the moor at Meppen cost significantly less than what a new pipeline construction in a suitable quality of steel would have cost," Herr Neunhoeffer stated. "In more general terms I would say the Primus Line® system saves at least half the price compared to installing a new pipeline of the same diameter."



"We regard this rehabilitation job as a pilot project," he commented, "so we have been inspecting it regularly. We can confirm its full integrity after two years in service, and there are no visible signs of aging or any other damage. It is the first installation of its kind in a liquid hydrocarbon environment, so we cannot predict its future behaviour, but its calculated lifetime is 25 years."

He added: "I am convinced that the Rädlinger system is a suitable rehabilitation method for various applications in the crude-oil pipeline sector. I can certainly recommend it. At EMPG we will continue to use the system where appropriate, and we already have projects lined up where it will be used."



Kevlar.

Herr René Perle, marketing leader for Rädlinger's Primus Line® group, said: "DuPont™ Kevlar® fibre is a highly sophisticated product which we have combined with our own high-tech weaving technology. Together they have allowed us to develop our fabric-reinforced plastic pipe that can be used for relining pressure lines over 25 bar, and in continuous lengths up to about 2000 m."

Herr Perle added: "Primus Line® with Kevlar® has been successfully used for rehabilitation of pipelines carrying gas, oil, water and abrasive media. We foresee various other applications in future, including pressure lines in on-and offshore locations and for hot-water transportation."

DuPont™ Kevlar® fibre is five times as strong as steel. Its remarkable combination of characteristics has led to a very broad variety of applications: from oil and gas extraction to body armour, from tire reinforcement and protective gloves to fibre optics, from aircraft and boat construction to motor gaskets and top-quality sports equipment.



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Product safety information is available upon request.

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