

Industrial pipeline rehabilitation? It can only be **Atlac**

Atlac resins have been performance proven through decades of applications in aggressive environments that require chemical and thermal resistance in combination with high mechanical properties. Now these high performance resins are making inroads into industrial relining.

Although, unsaturated polyesters (Synolite and Palatal) resins have long been used in large quantities for civil sewer relining programmes,

Atlac vinyl ester resins are proving to be the material of choice in industrial plant relining projects using CIPP (cured-in-place-pipe) technology.

The benefits of relining are clear: no serious disturbance to normal production and operational processes - no trenching or digging up of damaged sewer lines. The use of Atlac resins ensure optimum liner performance by both hot cure and UV cure.



Installation of Aarsleff CIPP-liner at Danisco.

Atlac E-Nova RE 2145 at Danisco Aarsleff CIPP secures drainage

As one of the world's leading suppliers of ingredients to the food industry, to Danisco Cultor A/S, in Grinsted (Denmark), it is essential that all aspects of production are secured against potential system failure.

For rehabilitation of the sewer pipeline, Aarsleff CIPP was chosen, because this method ensures fast and safe rehabilitation without inconveniencing or delaying regular production

processes. A very important part of the Danisco site infrastructure is a "main road" which traverses the entire production area. The sewer pipe, 406m long by 400 mm diameter collects and drains off the wastewater from the entire area. Atlac E-Nova RE 2145 was chosen as the most suitable resin, offering maximum chemical resistance. The rehabilitation was carried out during the planned shut-down period in Easter 2005.

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Invisible Atlac

Dear reader, in this issue of Global Solutions there are no spectacular tanks hanging in cranes or huge diameter pipes. Why, because this time we are focusing on the invisible work area of Atlac: the world of industrial sewer relining.

DSM has teamed up with Europe's leading relining companies to offer industrial companies a way to renovate their sewers without digging them up and rebuilding. Based on the chemical composition of the effluent, our corrosion experts advise our partners on which resin to use in their fibre reinforced liners. Together we are constantly improving these systems to further widen applications for this unique technique - illustrated by the cases in this issue. Happy reading!

Jan Lodewijk Lindemulder
Business Manager Tanks Pipes & Relining

Sewer pipe rehabilitation with UV-light: Brandenburger GRP-liner chosen for historical city of Hamburg

Fast installation time, minimal disturbance to the neighbourhood and traffic, and excellent mechanical properties meaning reduced liner thickness. These are some of the special selling points of UV-curable glass fibre reinforced liners. Their application is no longer limited to small diameters of circular profiles as was clearly demonstrated earlier this year in the ancient city of Hamburg when, within just two days, a 119 metres long sewer line of class VI a (570/860 / egg-profile) was renovated with two GRP-liners from Brandenburger. Not only was the liner installed within this tight timeframe, but all side-connections were also opened.

Since 1996 Brandenburger is active in rehabilitation of sewer lines owned by the Hamburger Stadtentwässerung (HSE). The installed liners are 34 and 85 meters respectively and both have a wall thickness of 11 mm. They were pre-impregnated with DSM light curable ISO/NPG Palatal resin at the impregnation line of Brandenburger in Landau, Pfalz, Germany.

The liner was transported to Hamburg in a special, light tight box to prevent premature polymerisation of the resin. It was then drawn through the old sewer and expanded by air pressure so it fixed to the inner wall. The liner was then completely cured by moving a track of 6 UV-lamps of 1000W each at a defined speed of 30 metres/hour. Total curing time was just two hours for the shorter and six hours for the longer liner. Quality checks carried out by Ingenieurburo Siebert showed that all HSE requirements - water tightness of the liner, liner thickness, flexural strength and flexural modulus - were all easily fulfilled.



Installation in historical city of Hamburg

Innovative Berolina pipeline uses Atlac E-Nova RE 3475

Berolina liner uses Atlac E-Nova RE 3475 to ensure maximum protection of eco-sensitive oil pipeline.

MITTELPLATE ISLAND

Mittelplate oil drilling and production island is located in the southern part of the Wadden Sea National Park in the North German state of Schleswig-Holstein. Since 1987 the Mittelplate field has been Germany's biggest offshore facility. This summer it will see a major shift from dependence on barges for oil transportation,

when a new oil export pipeline system is installed. The pipelines will convey crude oil and water between the offshore site and the onshore process facility. It will be a welcomed development, especially as the island is a protected bird sanctuary.

LINER BASED ON ATLAC E-NOVA RE 3475

To protect the outside of two 8400 m long PE-lined steel pipelines (DN 150 and DN 250), a 5 mm GRP-protection liner was selected based on Atlac E-Nova RE 3475 resin. This UV-curable vinyl ester urethane resin gives maximum protection through its combination of excellent chemical resistance behaviour and mechanical properties. As Mittelplate island is located in a nature reserve, maximum safety requirements had to be fulfilled. The total production and installation processes were controlled by German Lloyd and extra working routines had to be developed. This included checking the GRP-protective outer liner of every pipe section using eddy currents. Installation of the pipes will be carried out using special equipment from driving drilling rigs. The new pipeline will not only improve the reliability of the export route from the offshore facility but it will reduce the number of barge movements in the North Sea and the attendant risk of oil spills in an environmentally sensitive area.

Industrial relining resins		
Resin Type	Chemical nature	Application
Atlac E-Nova RE 2145	Epoxy Bisphenol A Vinyl ester urethane	Hot cure, thixotropic
Atlac E-Nova RE 3475	Epoxy Bisphenol A Vinyl ester urethane	UV-cure, thickenable
Atlac 580T	Vinyl ester urethane	Hot cure, thixotropic
Atlac 584 CT	Flexibilized vinyl ester urethane	Hot cure, thixotropic, pre-accelerated

Atlac relining grades

Insituform CIPP: for difficult-to-access industrial pipes

Insituform® Technologies are pioneers of trenchless pipeline rehabilitation with over thirty years of experience worldwide. The traditional Insituform® CIPP technique can be applied to chemical sewers and process water lines in a wide range of diameters, pressures and temperatures.

It has the flexibility to negotiate the bends and elbows that are typically found in industrial

pipework, and provides a smooth, close-fitting, durable liner in pipes of both circular and non-circular cross-section. This wide range of uses is shown in the list of recent examples of industrial applications of this technique in Europe. In all cases DSM's resins were applied. The most important criteria for resin selection are the temperature and chemical resistance requirements for the system, as these factors ensure a long service life.



Installation of vinyl ester liner at SOLLAC.

INDUSTRIAL PIPE LINING CASE STUDIES

The first example is the renovation of twin 160m long, 1900mm diameter concrete outfall pipes at CORUS steel works in IJmuiden, The Netherlands. The project was undertaken using an unsaturated polyester resin specially developed for the Insituform® process.

Secondly, Atlac E-Nova RE 2145, vinyl ester urethane resin, with excellent heat and solvent resistance, was selected for a renovation at BRITISH PETROLEUM refinery in Lavera, France. Here 400 m of 600 mm diameter steel sewer with a badly disintegrated concrete lining was relined. The sewer transports hydrocarbon-contaminated effluent at relatively high temperature (55 °C).

The final example shows Atlac vinyl ester in a case at SOLLAC, a lamination factory in Dunkerque (France), where a structural rehabilitation of corroded reinforced concrete process-water lines was carried out using Atlac 580T. This job included the renovation of a 135 m long, 1800 mm x 1000 mm egg-shaped pipe section.

Inpipe's Railcare: the solution for railway access tunnels

Inpipe liners have been used for years for the pipe rehabilitation of sewer lines. But these liners are also being successfully used in the renovation of small tunnels running through elevated rail embankments.

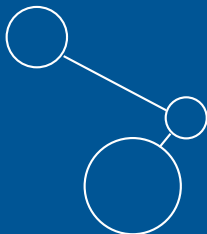
These tunnels are necessary to channel rainwater and are also used by animals as a safe crossing point. The shape of the tunnels can be variable and the diameter typically is 1 – 1.2 meters. Many of these tunnels are in very bad condition so rehabilitation is necessary to strengthen the tunnel walls and prevent collapse from the build up of static loads.

The success of the Inpipe liner, based on DSM's Palatal A400I-26, UV-curable isophthalic based unsaturated polyester, is down to the high flexibility of the system. The liner can be used in all configurations of pipes or tunnels; whether it's circular, square, egg shaped or any other shape. Fast curing speed is a particular benefit in short lengths and the relatively light equipment needed for the installation work makes it possible to use the system in areas with difficult access.



Renovated Railway tunnel.

Case Studies



GRP-liner before impregnation and installation in Berlin.

More information about the companies described in this issue of Global Solutions can be found on the following internet sites:

Berolina Liner: www.bkp-berolina.de

Brandenburger: www.brandenburger-gruppe.de

Inpipe: www.inpipe.se

Insituform: www.insituform.com

Per Aarsleff A/S: www.aarsleff.com

Saertex Multicom:

www.saertex-multicom.de

Huge profile in Berlin renovated using SAERTEX®-LINER.

Below the Grabbeallee, a two-lane main road in the city area Pankow in Berlin, runs an egg-shaped sewer line with the dimensions 1000/1500mm. Frisch&Faust Tiefbau GmbH in Berlin received the order in the middle of 2004 from Berlins Water Company to repair the corroded 80 metres long sewer. The sewer had also been cracked and damaged by mechanical stresses due to the tram traffic above.

For the fabricator of the liner, SAERTEX multicom in Saerbeck, it was a real challenge to produce a liner in these dimensions. The liner, like all SAERTEX®-LINER products, was produced in highly chemical resistant Advantex® Glassfibres. It has a dry weight of 3.9 tons and a wall thickness of 12 mm.

The liner was designed for steam curing and was impregnated using DSM's ISO/NPG Synolite resin. After delivery to the site, the liner was

drawn into the sewer channel by means of a special gliding foil to reduce the pull forces and to protect the liner.

After pulling in the liner and connecting the thermocouples for the temperature registration, the liner was then inflated by air pressure. As a result the liner was able to precisely follow the unusual shape of the old sewer channel.

Steam was then generated in accordance with a programmed heating profile, and the liner was cured within two hours. Following cure the inner-foil was removed and holes were cut in the liner walls to fit the side connections.

EVENTS CALENDAR

CONSTRUCTION MATERIALS 2005	22-24 August, 2005: Vancouver, Canada	http://www.civil.ubc.ca/conmat05
OFFSHORE EUROPE 2005	6-9 September, 2005: Aberdeen, UK	www.oe2005.co.uk
INT. PUBLIC WORKS CONGRESS & EX.	11-14 September, 2005: Minneapolis, USA	http://www.apwa.net
INFRA RAIL 05	13-15 September, 2005: Manchester, UK	www.infrarail.com
RPTC 2005 - PETROCHEMICALS	26-29 September, 2005: St. Petersburg, Russia	www.europetro.com

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