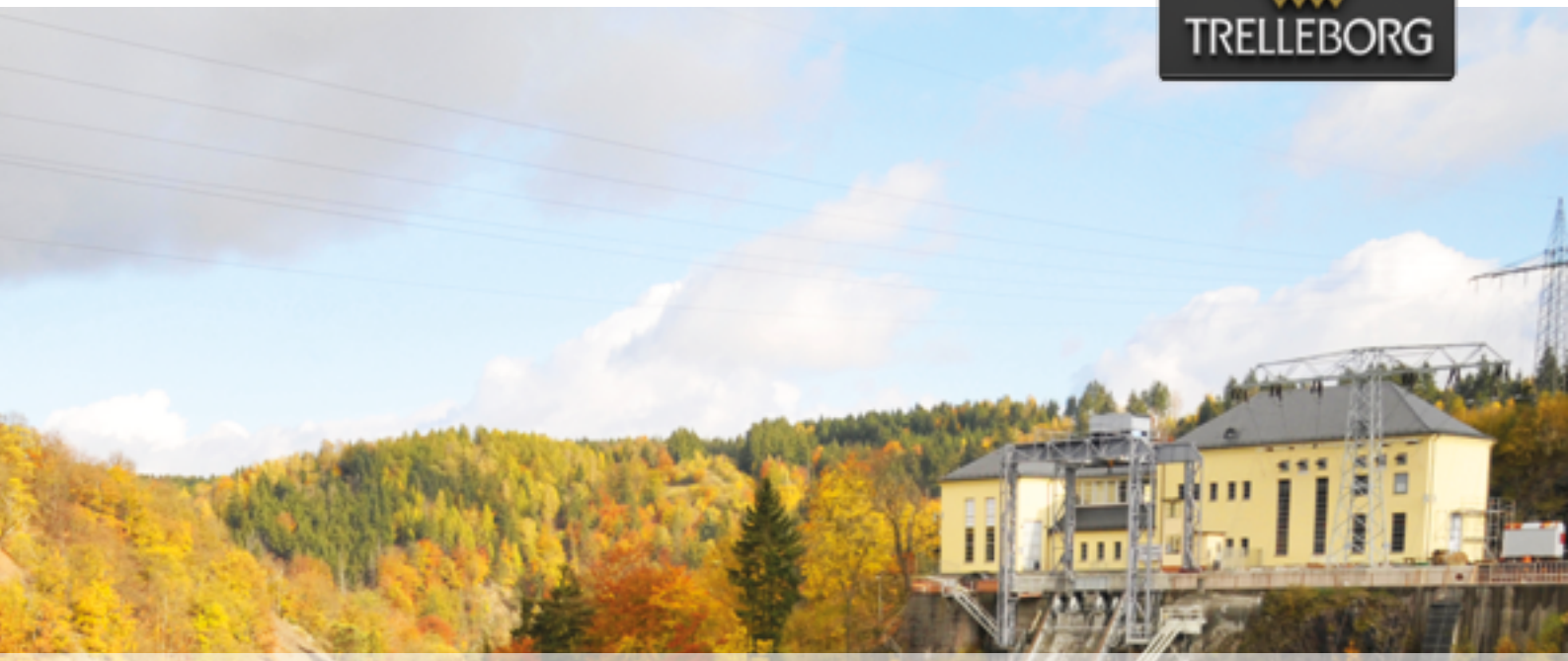


Case study

Trenchless Pipe Rehabilitation Under “High Voltage”

epros®DrainPlusLiner | Installation Under Difficult Conditions

Introducing epros®DrainLining

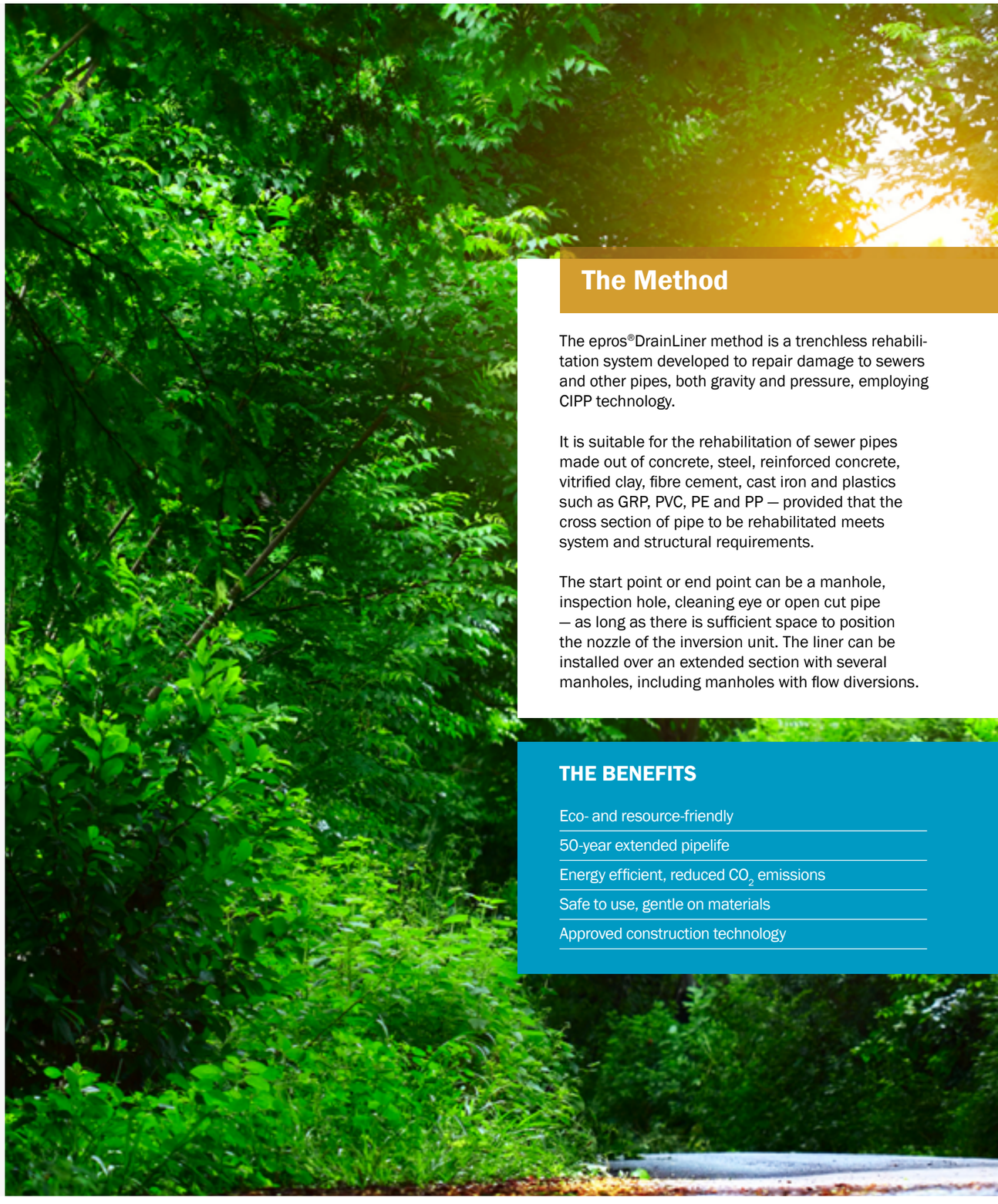
A practical and economical alternative to traditional dig-and-replace methods, the epros®DrainLiner method is a trenchless rehabilitation system developed to repair damage to sewers and other pipes, both gravity and pressure, employing CIPP technology. The carefully matched components of the system have been tried through countless successful installations worldwide, have been proven safe to use, and promise optimal results.

The Bleiloch Barrage Adventure

In 2010, the sewer cleaning contractor, Woitas Rohr- und Kanalreinigung, from Apolda was awarded a tender contract to repair and renew sections of a wastewater treatment plant situated next to a water barrage and power station. The contract also included the rehabilitation of all drainage pipes along the transformer route.

The location of the work site next to the power station meant that parts of the power station needed to be turned off during installation — making the time frame for installation short, with no room for error, as further shutdowns would cost the energy company, Vattenfall AG, money.

This meant that Trelleborg, as the manufacturer, and Woitas, as the installer, needed to work together to execute this project without failure and while being prepared for the unexpected. For this, they turned to the tried-and-tested epros®DrainLining method.



The Method

The epros®DrainLiner method is a trenchless rehabilitation system developed to repair damage to sewers and other pipes, both gravity and pressure, employing CIPP technology.

It is suitable for the rehabilitation of sewer pipes made out of concrete, steel, reinforced concrete, vitrified clay, fibre cement, cast iron and plastics such as GRP, PVC, PE and PP — provided that the cross section of pipe to be rehabilitated meets system and structural requirements.

The start point or end point can be a manhole, inspection hole, cleaning eye or open cut pipe — as long as there is sufficient space to position the nozzle of the inversion unit. The liner can be installed over an extended section with several manholes, including manholes with flow diversions.

THE BENEFITS

- Eco- and resource-friendly
- 50-year extended pipelife
- Energy efficient, reduced CO_2 emissions
- Safe to use, gentle on materials
- Approved construction technology

The Bleiloch Barrage

Located near the towns of Gräfenwarth and Schleiz in Thuringen, Germany, the Bleiloch reservoir and barrage took nearly six years to build and has held back the waters of the river Saale for almost 80 years now.

Named after the lead mines that were situated in the area before the river was dammed up, the reservoir is today part of Germany‘s largest connected reservoir system, which covers an overall length of 80 kilometres and comprises of reservoirs in the upstream portion of the river Saale. The dam wall itself is 65 metres high and 205 metres long, and holds back 213 million cubic metres of water — making Bleiloch the largest reservoir in Germany by volume.

Current Use of the Bleiloch Barrage

Today, Vattenfall AG operates a pumped-storage power plant at the foot of the dam wall. Its peak output is 80 Megawatts – equivalent to about 67 Gigawatt-hours per year and enough to supply 25,000 families with all the energy they need, day or night.

The Bleiloch Barrage is also a crucial player in flood control for the region as its storage ponds are able to collect large amounts of water during thaw and rainy seasons. In fact, the inflow into the reservoir can increase tenfold within just a few days. In 2010, for example, the water level in the Bleiloch Barrage rose by about four metres in just one weekend.

Responsible for the Bleiloch Barrage is Vattenfall, Germany’s largest operator of hydroelectric power stations.

Basic Situation

In 2000, an EU Water Framework Directive (WFD) was passed stipulating that all water bodies must meet a “good ecological status” by 2015. The state of Thuringia has thus provided funds to replace and/or upgrade sewage treatment facilities across the region, and in doing do, ensure the biological purification of wastewater.

One such sewage treatment facility that needed work was located directly at the foot of the Bleiloch Barrage’s dam wall.

The first phase of the project was to replace the current treatment facility with a new biological sewage treatment facility as well as renew incoming wastewater sewers. The second phase was to rehabilitate drainage pipes serving the transformer section.

But neither the condition nor the actual route of the drainage line towards the dam wall and the foundation rocks were known.

The contract for this project was awarded to Woitas Rohr- und Kanalreinigung, a specialist company familiar with challenging project conditions and who recommended Trelleborg‘s epros®DrainLiner method to the client. They did so because the trenchless rehabilitation system by Trelleborg is suitable for many applications: it allows for patch repairs with short liners, is able to rehabilitate complete pipe sections with full-length liners, and is able to seal entire surfaces; depending on which solution is selected.

Made up of carefully matched components that have been tried-and-tested through countless successful installations worldwide, the epros®DrainLiner method is also approved by the German Institute for Construction Engineering (DIBt) and is listed by the German Sewer Construction Quality Protection Association (Güteschutz Kanalbau e.V.).

Roland Woitas, operations manager and certified sewer rehabilitation consultant, had this to say about their recommended choice of method: “We decided to use the DrainLiner method from Trelleborg because it had proven to be extremely reliable in the past. Due to the tight window for installation, a high degree of flexibility was also required – which our past experience with Trelleborg’s system and service showed that they had.”

The Technical Solution: An Eco- and Resource-Friendly No-Dig Rehab Method.

The epros®DrainLiner method uses a flexible needle-felt liner that is coated on one side. This liner is impregnated with resin before it is “inverted” into a manhole or pipe opening using an inversion unit that uses air pressure or by building up a static head of water.

As a result, the resin-impregnated inner surface of the liner comes into contact with the host pipe wall while the coated side of the liner faces the service flow. The inversion process is followed by a curing phase, during which the air or water pressure inside the inverted liner is maintained, pressing the liner against the pipe wall. Steam or hot water is supplied at a specified temperature to fully cure the resin.

After successfully curing and cooling down, the water or air pressure are is removed. The result is a pipe-in-pipe system that completely meets the structural design requirements of the host (former) pipe as well as the leak-tightness, chemical resistance and mechanical requirements that a new system would have had to meet (DIN EN 752).

The Installation Site

The installation site was located 65 metres below the access road and 260 steps below the dam wall. To prepare for the inspection of the pipe line, stringent safety precautions were taken. Although the high-voltage overhead power line next to the pipes had been cut off for the duration of the installation, the site crew had to wear special protective equipment at all times.

The Challenge

The first challenge faced was a question of time and how long it took to transport materials to the installation site. Although the site boasted a freight elevator that bypassed the 260 steps and allowed materials and equipment be brought to the lower level with ease, the final distance between the elevator and the installation site had to be covered on foot.

To reach the start manhole for the liner, the team then needed to pass under two overhead power lines, one of which had to remain operative all times. For safety reasons, it was thus necessary to build a shielded tunnel passage in the form of a Faraday cage. A crew member with relevant electro-technical training also had to be on site at all times to supervise the work and ensure that safety precautions were being met.

The next challenge faced was that it was not possible until the day before the installation to inspect the host pipe run and measure its exact dimensions and condition – making it impossible to estimate the actual extent of the work required. It was thus necessary to have enough material and manpower on hand, to be prepared for the unexpected.

Roland Woitas thus decided to use the epros®DrainPlusLiner: a polyester needle-felt liner with a polyurethane coating on one side. This highly flexible liner is able to navigate up to two changes in diameter and negotiate bends of up to 90 degrees.

The lining specialist contractor had also selected a hot-cure epoxy resin system from Trelleborg, which promised:

– ample time for impregnation and installation,

– a short curing time of just 60 minutes upon the application of heat, and

– optimal mechanical properties immediately after.

In order to be prepared for all eventualities, Trelleborg Pipe Seals delivered materials sufficient for a pipe length of about 30 metres and kept a larger inversion unit (Type II) on standby. Woitas also put together an installation team of five crew members.

During inspection, the pipes were found to have a diameter of 150 mm. The lining length totalled approximately 11 metres and no complications were expected from the type and extent of the damage detected. Yet, the weather on the day of the installation proved to be the next challenge with temperatures dropping to a few degrees above zero. This is quite often a challenge for lining materials, which are normally quite slow and sluggish under such conditions.

But Woitas' decision to use the epros®DrainPlusLiner proved to be the right one: the Trelleborg liner remained flexible even at lower temperatures and could be easily processed.

The resin was measured and mixed according specifications set out in the technical data sheets. The liner was also prepared according to instructions: it was measured, cut to size, and carefully impregnated with resin by applying a vacuum. This application of a vacuum in the process of impregnation is an important one as it removes air from the pores of the lining material and ensures that liner is completely saturated with resin — resulting in a long-lasting and stable end-product.

The prepared liner was then installed using an epros®InversionDrum Type I. This small-sized inversion unit, which is designed for sewer laterals and liner lengths of up to about 30 m, did a perfect job thanks to its good manoeuvrability and manageable weight, especially under the difficult conditions posed by the site.

Hot water was used to cure the resin and it took only 60 minutes, as expected for the selected resin system. The final step was to cut open the closed end of the liner to bring the fully rehabilitated pipe system back into operation.

The Results

TIMING/COMPLEXITY
Despite difficult site access conditions, the entire Bleilochtal Barrage Trenchless Rehabilitation project was completed in just two days, from pipe inspection to the final CCTV check.

TEAM/COMPETENCE
The successful outcome was achieved thanks to a combination out of a well-trained team of experienced specialists, a sophisticated technical system, and tried-and-tested certified products all working together.

SUSTAINABILITY/BENEFIT
The results of the rehabilitation project proved to be both high-quality and sustainable.

A frictional bond was created between the liner and the host pipe, ensuring structural stability and protecting against both infiltration and exfiltration. The final product was also resistant to many chemical environments and mechanical stress.

The slight reduction in pipe diameter was made up for by a jointless pipe showing improved hydraulic flow properties.

The rehabilitation of no-man-entry sewer lines using full-length CIPP liners has thus established itself as a sophisticated economical and technical alternative to traditional excavation repair methods. This trenchless repair method from Trelleborg allows for the basic renovation of entire pipe sections in need of repair and extends their service lives for at least another 50 years.

RESOURCE/FRIENDLY
The epros®DrainLiner method from Trelleborg is not only an landscape-friendly alternative to traditional excavation repair methods but is also resource-friendly. As proven with the Bleilochtal Barrage project, the method minimises time, cost and disruptions to the client's facility and business.

The Advantages of the epros®DrainLining Method

Certified by the DIBt (German Institute for Construction Engineering), the epros®DrainLiner method features a flexible liner made out of corrosion-resistant synthetic and/or glass fiber, impregnated with reactive resins, and “inverted” directly into a manhole or pipe opening using air pressure water.

The resin-impregnated inner surface of the liner thus comes into contact with the damaged host pipe wall while the coated side of the liner faces the service flow.

The resin-impregnated liner in the pipe section is then cured using hot water or steam. Depending on the resin system selected, it can also be cured at ambient temperatures.

The final product is a cured-in-place pipe that forms a frictional bond with the host pipe.

This pipe-in-pipe system completely meets the structural design requirements of the former pipe as well as the leak-tightness, chemical resistance and mechanical requirements that a new system would have had to meet (DIN EN 752).

The rehabilitated pipe section is then, as a last step, surveyed using a CCTV camera and the results documented. A leak test is performed in accordance with EN 1610.

FURTHER INFORMATION

www.trelleborg.com/en/pipe-seals/Products--and--solutions/Pipe--Rehabilitation

www.trelleborg.com/en/pipe-seals/Resources/Videos

Case studies

Technical Data Sheets

Method statement (handed over with the training course)

About Trelleborg Pipe Seals

Part of the wider Trelleborg Industrial Solutions Business Area of Trelleborg Group, Trelleborg Pipe Seals is a world leading supplier of new and rehabilitation sealing solutions for concrete and plastic pipes, manholes and connectors used for water, sewerage and drainage.

Trelleborg’s Pipe Rehabilitation operation is among the leading specialist companies in innovative technologies for the upkeep of sewer systems.

Thanks to highly qualified engineering services, the company has become a successful global player in its industry. The brand name epros®DrainSystems stands for 20 years of experience. The continuous research and further development of the technical systems is aimed at state-of-the-art trenchless non-demolition maintenance of pipe lines in sewage systems, buildings and industries.

The sophisticated and custom-tailored system solutions from Trelleborg are not only an economically attractive decision for installers, but most of all safe and reliable. The pipe rehabilitation solutions from Trelleborg Pipe Seals were tested and approved by the German Institute for Construction Engineering. The epros®DrainSystems, whether for patch repairs or manhole-to-manhole relining, whether for laterals or junctions, meet all stringent requirements and quality criteria for construction products.

The brand name epros®DrainSystems stands for products of world-renowned quality standards with a long service life. They help promote sustainability and save the environment.

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TRELLEBORG

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Our innovative engineered solutions accelerate performance for customers in a sustainable way. The Trelleborg Group has local presence in over 40 countries around the world.
Trelleborg Pipe Seals is a world leading supplier of new and rehabilitation sealing solutions for concrete and plastic pipes and manholes used for water, sewerage and drainage.
We deliver continuous innovation to customers across the globe, with a logistics and sales network. Comprising the most advanced polymer technology, our high performance seals ensure fulfillment of the highest possible reliability standards.

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