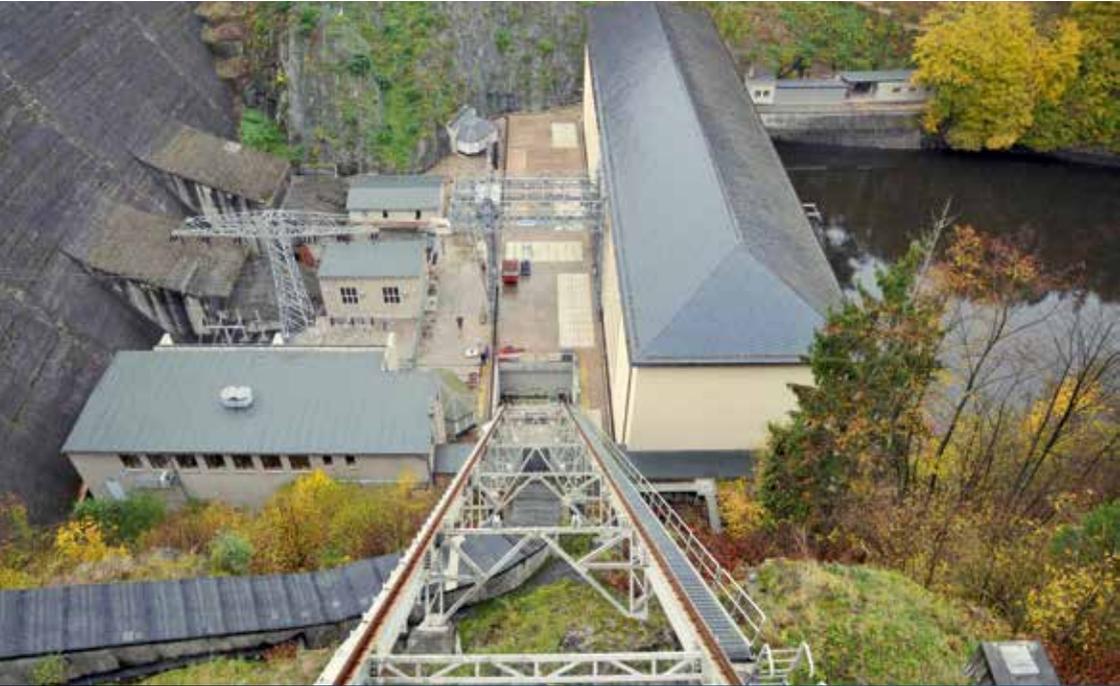


The Bleiloch Reservoir Adventure

Trenchless rehabilitation with “power” all along the line





The Bleiloch reservoir dam – with the new Trelleborg liner “in the pipeline”

CIPP lining project using the epros®DrainLiner method by Trelleborg

In 2010, the sewer cleaning contractor Woitas Rohr- und Kanalreinigung from Apolda submitted a tender and was awarded the contract for the work sections of repair/renewal of the wastewater treatment plant next to the power station and rehabilitation of all drainage pipes along the transformer route. The installers relied on the cured-in place pipe (CIPP) lining system from Trelleborg Pipe Seals with its many successful applications worldwide.

The installation time window was short – with no room for a second chance, because part of the electricity remained cut off during installation – meaning a loss for the operator Vattenfall. This situation urged Trelleborg as the manufacturer and Woitas as the installer team to deliver utmost precision – and to take alternative precautions to be prepared for the unexpected.

The Bleiloch Reservoir

The Bleiloch Reservoir dam has impounded the waters of the river Saale for almost 80 years. The 28-kilometre-long reservoir lies near the towns of Gräfenwarth and Schleiz. Its construction lasted six years – the dam wall itself is 65 metres in height and 205 metres in length. It came into operation on the 2nd day of December 1932. Its German name reminds of the lead mining activities dating back to times before the river was dammed up.

Today, it is part of Germany's largest connected reservoir system, which covers an overall length of 80 kilometres and comprises five reservoirs in the upstream portion of the river Saale. The Bleiloch Reservoir has a storage capacity of 213 million cubic metres and thus forms Germany's largest artificial lake.

The Bleiloch Reservoir Adventure

Current use of the Bleiloch Reservoir

Today, Vattenfall AG operates a pumped-storage power plant at the foot of the dam wall. Peak output is 80 Megawatts, this is equivalent to about 67 Gigawatt-hours per annum. This output would cover the entire energy demand of about 25,000 families at any day or night time.

In the field of regenerative energy production, Vattenfall is the largest German operator of hydroelectric power stations, and also responsible for the repair of the dams and reservoirs. In addition to power supplies, the Bleiloch Reservoir is important for flood control: At the beginning of the thaw and rainy periods, the storage ponds collect a large portion of the water masses. The inflow into reservoirs may increase tenfold within just a few days. In 2010, for example, the water level in the Bleiloch Reservoir rose by about four metres during the same weekend.

Basic situation

Within the scope of the EU Water Framework Directive (WFD) from 2000, to meet the „good ecological status“ goal for the water bodies by the year 2015, the state government of Thuringia provides funds to support appropriate sewage treatment across the whole region, which means fully biological purification of foul waters. And this in turn requires the upgrading or replacement of existing small sewage treatment plants.

Such a small sewage treatment plant is located on the reservoir premises directly at the foot of the dam wall. The project was to replace it by a new fully biological sewage treatment facility while renewing the incoming foul water sewers. The second construction phase included the relining of the drainage pipe serving the transformer section. But neither the condition, nor the actual route of the drainage line towards the dam wall and the rocks were known.

The contract was awarded to Woitas Rohr- und Kanalreinigung, a specialist company familiar with challenging project conditions. So Woitas opted for Trelleborg's epros®DrainLiner method in this particular project, which was finally completed to the satisfaction of all parties involved, including Vattenfall.



*Woitas from Apolda
taking in deliveries*

The trenchless rehabilitation process by Trelleborg allows patch repairs with short liners or rehabilitation with full-length liners or sealing entire surfaces, depending on which method is selected. In the case of the Bleichloch Reservoir, the contract provided for sustainable renovation of the entire pipe run.

The epros® DrainLiner system, which has general technical approval by the German Institute for Construction Engineering (DIBt) and is listed by the German Sewer Construction Quality Protection Association (Güteschutz Kanalbau e.V.), is made up of thoroughly matched components offering a reliable solution that has proven its worth in many applications.

Roland Woitas, operations manager and certified sewer rehabilitation consultant: „We decided to use the DrainLiner system from Trelleborg, because it had proved to be extremely reliable already in our past operations. Due to the narrow deadlines, utmost flexibility was critical. We had already positive experience with both the system and the service from Trelleborg in this respect.“



The construction site below the dam wall

The technical solution: an environment-friendly resource-conserving no-dig rehabilitation process.

This type of sewer rehabilitation uses a resin-wetted single-coated flexible needle-felt liner tube, which is inserted through a manhole or opening in the pipe by means of a pressurizing drum (inversion unit) or by building up a static head of water. The applied pressure causes the liner to invert into the pipe. As a result, the resin-wetted inner surface of the liner comes into contact with the host pipe wall and the coated side faces the service flow.

The inversion phase is followed by the cure phase during which the air or water pressure inside the inverted liner is maintained and presses the liner against the pipe wall until the resin reacts and hardens. After final cure, the water or air pressure is removed from the pipe-in-pipe system thus created, which ensures perfect structural stability of the host pipe while meeting the performance requirements of a new system in terms of leak tightness, chemical resistance and mechanical strength (DIN EN 752).

Installation on site

The Bleiloch Reservoir adventure started for all parties involved 65 metres below the road Schleizer Strasse and 260 steps below the dam wall where the actual place of installation was located. Highest safety precautions were taken to prepare for the inspection of the pipe line. Although the high-voltage overhead power line next to the pipes was cut off for the installation days, special protective equipment had to be used during all operations.

Especially, the transport of materials became a timing problem: As an alternative to the 260 steps, the premises had a freight elevator allowing the materials and equipment items to be transported down to the lower level. However, the final transport distance for all materials – from the elevator to the place of installation – had to be covered on foot.

To reach the start manhole for the liner, the team needed to pass under two overhead power lines, one of which remained operative all the time. For safety reasons, it was necessary to build a shielded tunnel passage in the form of a Faraday cage. An additional safety precaution was to have all the work permanently supervised by one person with a relevant electro-technical training background.

As it was impossible during the preparation phase to estimate the actual extent of the intervention, it was necessary to provide additional material and workforce to be prepared for the unexpected: so Trelleborg Pipe Seals supplied materials for a pipe length of about 30 metres and placed ready a larger inversion drum (type II) for lending. Woitas put together an installation team of five.



The Faraday cage for high-voltage protection



Camera inspection for identifying the extent of damage



Uniform distribution of the resin

It was not possible until the day before the operation to inspect the host pipe run and measure its exact dimensions: the pipes were found to have all a diameter of 150 mm, the lining length totalled approximately 11 metres. The team had two days available for the entire operation. No complications were expected from the types and extents of damage detected.

By way of precaution, as the actual condition of the pipe run was unknown beforehand, and in order to provide for all contingencies, Roland Woitas decided to use the epros®DrainPlusLiner, a polyester needle-felt liner tube with a polyurethane film coating. This highly flexible liner accepts up to two changes in diameter, e.g. from DN 100 to DN 150, and negotiates bends of up to 90 degrees.



At the inversion manhole



Calculating the resin usage amount



Measuring the resin temperature



*After inversion:
liner end in the manhole*



*During application: epros®HWB90
hot water boiler for curing*

The lining specialist contractor selected a hot-cure epoxy resin system from Trelleborg, which promised an optimal time window for impregnation and installation while curing within just 60 minutes after inversion due to the input of heat and would then develop its optimal mechanical properties immediately after.

On the first working day, both the installer team and the work materials had to cope with bad weather and temperatures as low as just a few degrees above zero. This was a particular challenge for the material, which is normally quite slow and sluggish under such conditions. But Woitas' decision proved to be the right one: The Trelleborg liner tubes remain flexible even at lower temperatures – so the DrainPlusLiner could be easily and smoothly processed.

The appropriate resin amount was calculated according to the resin usage formula delivered with the resin and was mixed from the components according to specifications.

The liner tube was properly prepared, i.e. it was measured, cut to size and carefully wetted out by vacuum-assisted impregnation. For this purpose, a vacuum unit is connected to remove the „air“ from the pores of the needle felt while the resin is worked into the liner tube. This ensures complete wetting out of the material – an important step for long-lasting stability of the final post-cure liner.

The liner tube was installed by means of the epros®InversionDrum type I. This small-size inversion unit, which is designed for sewer laterals and liner lengths up to about 30 m, did a perfect job thanks to its good manoeuvrability and manageable weight, especially under these difficult conditions of confined site access and manual transport distances.

The hot water supply caused the cure time to be 60 minutes only, as expected for the selected resin system. The final step was to cut open the closed end of the liner to bring the fully renovated pipe system back into operation.

The Cured-In-Place Pipe Lining Result

Timing/complexity

Despite difficult transport and site access conditions, the „Bleilochtal Reservoir Trenchless Rehabilitation“ project was completed within 2 days only, inclusive of prior inspection and final CCTV.

Team/competence

The successful outcome was achieved due to the interaction between a well-trained team of practice-approved specialists, a sophisticated technical system and a tested certified method.

Sustainability/benefit

The rehabilitation process produces a high quality and a sustainable effect: It creates a permanent bond between the liner tube and the host pipe. The bonded liner provides structural stability together with the host pipe, protection against infiltration and exfiltration, as well as appropriate resistance to many chemical environments and mechanical stress. The slight reduction in pipe diameter is made up for by a jointless pipe showing improved hydraulic properties.

The renovation of non-man-entry sewer lines with full-length CIPP liners has established itself as a sophisticated economical and technical alternative to traditional repair techniques involving digging up the ground.

This allows for the basic renovation of entire pipe runs in need of repair and thus to extend their service lives for another life cycle of at least 50 years.

Resource-conserving approach

The epros® DrainLiner system from Trelleborg is not only an environment-friendly alternative to traditional trench-type repair techniques with no need to interfere with existing infrastructures, but the example of the Bleilochtal Reservoir rehabilitation project has shown that the use of such a no-dig method may even be the one and only way to minimize time, cost and nuisance to third parties.

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative engineered solutions accelerate performance for customers in a sustainable way.

Trelleborg Pipe Seals Duisburg, a daughter company, 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 Duisburg 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.

The advantages of the epros®DrainLiner process (additional information)

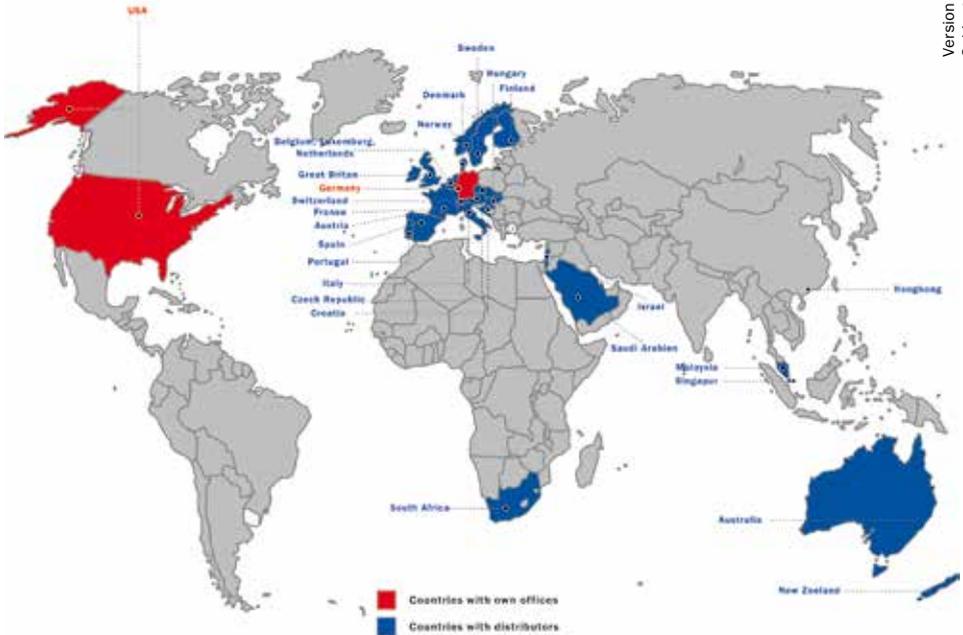
The epros®DrainLiner process is certified by DIBt (German Institute for Construction Engineering).

epros®DrainLiners from Trelleborg Pipe Seals are available in different material qualities and wall thicknesses and allow bends of up to 90 degrees to be relined. The material remains flexible even at lower temperatures and is very user-friendly in terms of wetting and handling.

The liner system can rely on a broad range of specifically designed resins for custom-tailored application. Depending on the type or cure method, they offer time savings of up to 50% in comparison with many other resin systems in the market. All resin systems offered under the brand name of epros® are easy to handle on moist supports due to their viscosities and compatibilities. They show virtually no shrinkage and stand out for their good mechanical properties and chemical resistance after final cure. Long pot times and short cure times make them even more user-friendly and economical.

Trelleborg offers 15 DIBt-approved liner/resin combinations and seems to be the supplier with the currently widest product range in the field of trenchless rehabilitation by cured-in place pipe liners.

epros®DrainSystems from Trelleborg Pipe Seals are an environment-friendly alternative to conventional pipe line rehabilitation involving digging up the grounds, because they contribute a lot to energy savings and climate protection by avoiding dust from open construction and carbon dioxide emissions from traffic disruption. And they do away with the need for interference with existing infrastructures. This saves the client time and money and reduces equipment needs to a strict minimum.



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