



Case study

Main-to-House practise test – premiered in Rheinberg, Germany

Introducing epros® DrainMtH

Trelleborg Pipe Seals Duisburg is among the leading specialist companies in innovative technologies for the upkeep of sewer systems.

The new main-to-house sewer rehabilitation method by Trelleborg solves some of the – still unsolved – problems in trenchless relining of lateral connection pipes.

THE SYSTEM

The epros®DrainMtH system is a method for the trenchless rehabilitation of property drainage lines by means of the cured-in-place pipe (CIPP) lining technology. The difference from the usual method is the lining direction: It works from the main pipe to repair lateral connection pipes and at the same time cures the connection from the main to the lateral. (MtH: Main to House)

THE PROJECT

The project task was to rehabilitate a sewer length of about 280 metres including approximately 10 lateral pipes with lengths varying between 2.75 and 4.0 metres.

The manholes in the main line were intended to be renovated in a second step. The project was tendered out by the authorities and awarded to the bidder offering the best price. Nothing unusual so far.

Background

The MtH (main-to-house) method enables the relining of lateral connections from the main line to homes for pipes having nominal diameters of 200 mm or more.

It has already been marketed and used successfully by Trelleborg Pipe Seals in the USA since early 2012. The results prove the system's effectiveness in renovating lateral pipes from the main line.

First presented to the public at the 2012 IFAT Trade Fair and launched into the German market in summer 2012, the new system was used under real project conditions for the very first time in Germany on a site near the town of Rheinberg in November.

BENEFITS OF THE MTH SYSTEM

- No-Dig method
- No need for an access point in the lateral
- No need to enter private property
- Max. rehabilitation length: 30 - 40 m / 98 - 131 ft
- Max. line distance between access manhole and lateral junction: 150 m (492 ft)
- Connection angle: 30° - 90°
- Easy to position and operate



THE LOCATION



THE CHALLENGE

Hard-to-access inspection holes or openings made it difficult to place the liners for inversion into the lateral pipes. It then became really tricky and cumbersome when two specific laterals offered no access at all, neither inside nor in front of the house, for inserting the DN 150 pipe liner.

This challenging part of the project was taken on by Fleer-Tech GmbH from Lehrte coordinated by Dipl.-Ing. Olaf Stock as the site manager. Fleer-Tech GmbH is a renowned pipe and sewer rehabilitation company. In said two special cases, they decided to rely on the new Mth method developed by Trelleborg Pipe Seals Duisburg GmbH in order to accomplish what would become the very first Mth application within Germany.



MTH PACKER SYSTEM

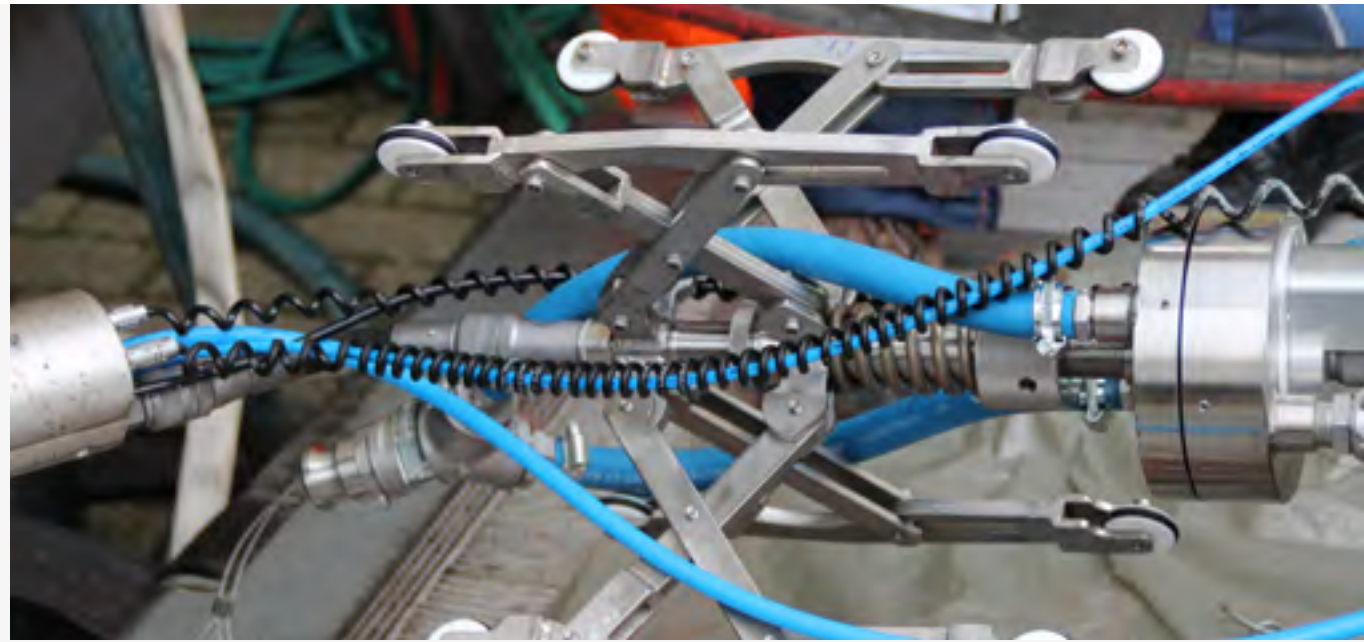
The Mth system is substantially composed of the Mth packer with calibration hose, and of wheelsets or runners on the inversion side and steam joint side. Another major component is the camera attached to the Mth packer for exact positioning of the system within the main line or in front of the lateral junction prior to the inversion of the Mth liner. Further, the system includes a Mth inversion tube accommodating the Mth liner.

The packer carries the control unit supply hose, which contains pneumatic and electric lines for operating the system, and is also equipped with the hose connection port for the steam-air mixture.

A winch is used to bring the packer into the correct position, which is then also checked by the colour camera attached to the packer.

The wheelsets, which are adjustable to the current pipe diameter, and the optimized centre of gravity ensure the perfectly balanced movement and positioning of the packer within the main line.





The winch at the finish manhole enables smooth progress of the packer on its way to the point of repair. The system design includes a specific steam generator (epros®SteamGen M 150) tailored to the curing needs and technical parameters of the MtH system.

BASIC CONDITIONS

When planning the relining job, it is important to pay special attention to the following: Connection angles of lateral pipes may range between 30 and 90 degrees. The maximum distance between the start manhole and the main/lateral interface may be up to 150 metres. The maximum installation length for the steam-proof MtH liner may be up to 30 metres. These are the only restrictions, i.e. almost all applications are possible.

SITE INSTALLATIONS

A project-specific MtH truck was used to transport the various modules of the MtH system as well as the epros®SteamGen M150 steam generator and the liner impregnation/wetting equipment to the rehabilitation site.

The narrow road required special attention to traffic management. The traffic control plan was implemented in coordination with the town of Rheinberg, securing at any time the safe passage of residents.

Occupational health plays a key part in the CIPP business. Appropriate measures were taken, e.g. safe-entry tripod installation and fall protection anchorage. Operatives put on their personal protective equipment to protect themselves from hazards associated with the confined space.

PREPARATORY WORK

In a first step, as an indispensable condition for installing the MtH system, both the main pipe and the lateral pipes to be relined were of course cleaned and CCTV-inspected to identify the current damage



Optimal wetting behaviour of the EPROPOX HC120 resin systems

Impregnation of the main pipe liner

pattern, determine the exact positions of the lateral junctions and verify the cross section of the main line.

The result showed the main pipe not to be the normal DN 300 concrete pipe that would be needed to accommodate the 292 mm MtH system with the liner already inserted. In fact, the main pipe was a special sewer with a much smaller size of 280 mm in “net” diameter.

At first a big surprise to the people on the site, but not an unsolvable problem for the technical staff of Trelleborg and the installation team of Flee-Tech.

The wheelsets of the standard MtH packer were simply adjusted to the new size. This caused nothing more than a brief delay.

THE MATERIALS

The method used the “epros®DrainFlexLiner“ base material with the two-component epoxy resin system “epros®EPROPOX HC120“. The latter is a pure unfilled resin providing excellent mechanical properties and high chemical resistance. It was designed specifically for steam cure applications and has a general technical approval for the eprosDrainLiner method (DIBt Approval No. Z-42.3-488).

The two resin components were supplied in separate containers (15 kg of component A, 4.95 kg of component B, hardener) and then mixed at the



Manual adjustment of the main pipe liner to sewer size

appropriate ratio (100:33) with a double stirrer without any air entrapment.

Due to its specific viscosity, the resin system is easy to process and penetrates quickly into the base material. Its comfortable pot time of approx. 2 hours (120 minutes) at an ambient temperature of 25 °C and its short cure time of 45 minutes with steam or hot water of 80 °C were very useful for the general circumstances prevailing in Rheinberg. The long-term flexural modulus of $\geq 2.500 \text{ N/mm}^2$ is another impressive feature.

The orange-coloured calibration hose is a robust “heavy duty” PVC film tube. The non-textile sewn tube is predominantly used in main lines and specifically made for high curing temperatures (up to 80 °C water / 100 °C steam) in nominal diameters between DN 100 and DN 300. In this application it was used for protecting the MtH inversion hose, and for the LinerEndCap.

THE MTH LINER IMPREGNATION

The mixed resin was poured into the MtH liner tube cut to the appropriate length. The MtH liner is a well proven material based on the DrainFlexLiner, which is another recent development by Trelleborg.

The rollers of the impregnation and calibration table of the electrically operated “epros®ImpregnationUnit” were adjusted accurately to the required precise wall thickness and operated together with a vacuum to distribute the resin across the liner tube.

The well-trained operatives exercised utmost care to prevent entrapped air (bubbles) from impairing the quality of the finished liner and to ensure the epros®vacuum unit removes excess air from the liner material.

The “main pipe liner” required special attention. It had to be wetted to its full extent and then reduced to the required dimension for the main line cross section.

The challenge was to avoid excessive overlap and thus to prevent excessive restriction of the cross section.

THE DRAIN LINER ENDCAP

The steam outlet valve was integrated into the End-Cap fixed with a special glue at the end of the wetted liner tube.

The patented closing mechanism with the LinerEnd-Cap at the end of the MtH tube makes it possible to install the tube without an additional calibration hose in the same way as a closed-end liner.

The LinerEndCap at the end of the MtH liner will be removed in a specific operation after completion of the curing phase only.



Integration of the steam outlet valve



LinerEndCap with steam outlet valve pull rope

THE INVERSION PROCESS

The fully prepared MtH liner was pulled into the packer system, which was then adjusted to the main pipe dimension. All system components are designed to pass through a standard manhole cover of 600 mm in diameter.

Extra comfort is provided by an articulated joint in the packer, which can be unlocked at the press of a button and will be locked back in place automatically. This ensures smooth insertion of the packer into the main pipe even in confined space conditions.

The packer together with the inversion hose containing the wetted MtH liner was gently pulled by the winch within the pipe down to the point of repair and then roughly positioned in front of the lateral junction.

POSITIONING THE MTH LINER

The exact alignment of the basket carrying the MtH liner was operated from the control unit in the truck with the help of the camera attached to the packer.

For this purpose, the packer was first of all pushed beyond the lateral to be relined and then pulled back until the packer basket entered the lateral junction and was locked in place.

Air pressure was built up to invert the MtH Liner into the lateral pipe. The operator at the control desk could observe the progress of inversion and, where necessary, intervene by raising or lowering the air pressure.

CURING THE LINER

Thanks to steam cure, time is of less importance. The pot time of the resin has been adjusted to give enough scope for bringing the packer into its exact position at the lateral junction.

The liner was cured with a steam/air mixture. This cure method is a proven technology which has been used successfully for years. It allows the MtH liner to be installed in lateral connection pipes with many bends while ensuring rapid cure.

The project team used the “epros®SteamGen” type M150 steam generator, which is appropriate for curing liners with nominal sizes ranging between DN 100 and DN 300.

A specific issue for all steam-curing systems is the formation of condensation, which may prevent the liner from being completely cured in the invert.

The MtH system design solves this issue by ensuring permanent discharge of the condensed water through the epros®DrainMtH condensate ejector line in the epros®DrainMtH Packer for perfect final cure.

PROCESS DOCUMENTATION

An important aspect in relining lateral connection pipes, especially in the private sector, is to provide conclusive documentation.

So the temperature and pressure during the curing process were recorded via sensors and constantly compared with the defined target values.

All reports were put together in the end and handed over to the client.



Winch for pulling in the packer



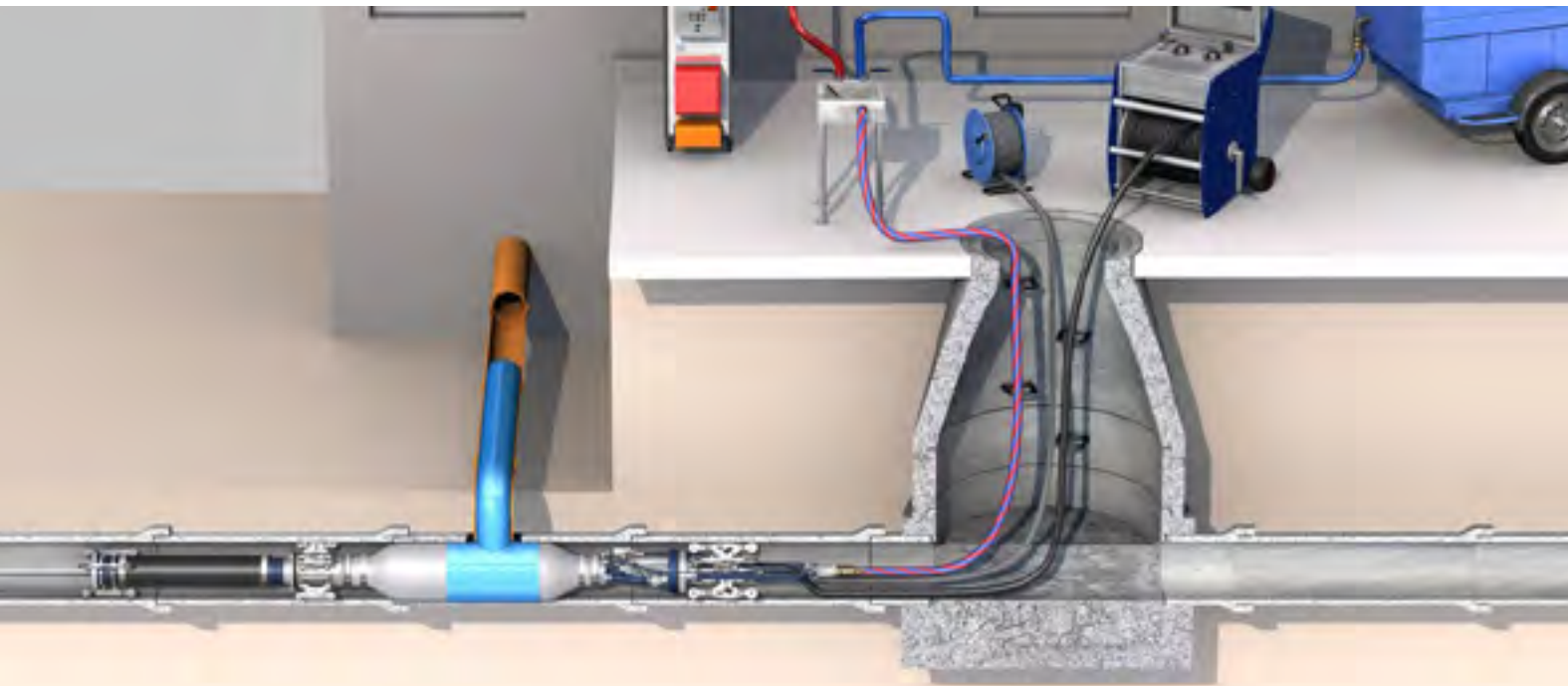
Insertion of the MtH system into the manhole/main line



Positioning the packer at the lateral junction



Venting from steam cure



CONCLUSION

The MtH method has now proven its worth in practical application also in Germany and opens up new ways to reline house laterals from the public side without direct contact or interference with the property owner.

Good preparations in association with the ease of installation and simple steam cure of the MtH liner allow installers to perform up to 3 lateral lining jobs a working day. The length of the liner to be installed is of limited importance to achieve this performance, and the quality is uniformly high.

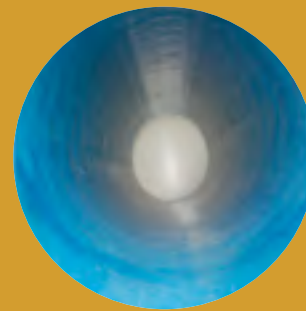
The MtH method also provides a solution for the main/lateral interface. The crucial advantage is the homogeneous integration of the lateral liner with the stabilizing “main pipe liner” in the main line. The main/lateral interface liner adheres to the main pipe without annular space and thus provides a perfect seal also for improperly connected laterals.

Using standardized liners is a cost-cutting factor in projects with a dense network of laterals. The wheelsets of the packer can be quickly adjusted to different pipe diameters. And also the MtH liner as such can be custom-tailored to the actual cross section of the main pipe directly on the

construction site and can be cut to the required length of the lateral host pipe.

The obvious goals of lateral pipe rehabilitation are achieved by the quick removal of sewer leakage and by sealing the annular space in the region of the main/lateral junction.

The MtH method means less encroachment on private property thus providing a resident-friendly solution, which leaves almost nothing to be desired.



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 \(handed over with training course\)](#)

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.





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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