



INPIPE

Fast, smooth and environmental friendly NO-DIG
renovation of pipe networks and culverts

Fast, smooth and environmental friendly!

Our modern society is totally dependent on well operating pipe networks. But all over the world outdated pipes and culverts causes stops, collapses and leakage due to ground movements, intrusions from roots, deposits and wear.

Digging up old pipes and replace with new ones is time-consuming and expensive method, not least for the environment.

But there is another way. Renovate the pipe from the inside in a fraction of time. The benefits are obvious: Speed and no residents complaining about noise and difficult accessibility to their houses. No residents affected by strenuous long-term water and sewer stoppages. No exhausts from heavy traffic jams. No long downtime for industries. No unnecessary stress on the environment. Just faster, easier and safer. That's the Inpipe method.

Using air and light to renovate the pipes –is the most effective NO-DIG option and most energy-efficient method. The installation takes place between existing manholes, shafts or other openings. A glass-reinforced, flexible liner is inverted or winched in place and pressed by compressed air tightly against the old pipe wall. The Inpipe liner is cured in place

using a unique UV light technology. The result is a durable, completely seamless fiberglass pipe without risk of leakage. A single installation unit carries all the equipment needed. The rehabilitation is done in a day and the pipe can be used the same day and lasts for more than 50 years.

Inpipe installation step by step



The old pipe is cleaned with high pressure water and inspected with a robot camera. The factory-made, ready to use glass fiber reinforced liner, is inverted (1) or winched (2) into the old pipe and pressed against

the wall using compressed air (3). When the liner is in place inside the old pipe it is hardened with UV light and gets its structural strength (4). Finally the laterals are opened using a robotic cutter.



The most effective NO-DIG renovation

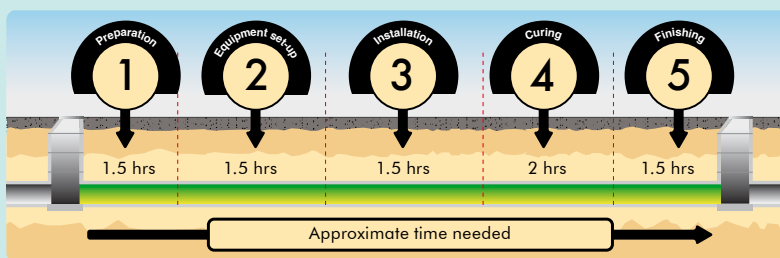
In busy streets and urban areas, it pays off to use the fast and best rehabilitation method. Especially for longer distances, the difference is obvious. Inpipe System provides up to five times faster hardening process than NO-DIG methods using heat curing. Overall we often do the job in half the time. When others are still working we have already started our next installation.

One single installation vehicle holds all the equipment. You

can quickly get started and the job can be done directly from restricted spaces such as manholes. The system can also be used off road.

Inpipes short installation time not only saves hours of work, money and the environment, it also means that traffic problems and traffic jams can be avoided almost completely. The contractor can ensure that water and sewage works satisfactorily in the day's most important hours.

120 meter Ø300 mm pipe in less than 8 hours



Fast renovation with Inpipe.

Example: Renovation of 120 meter pipe Ø300 mm is finished in less than 8 hours

Benefits offered by Inpipe System

- Suitable for most pipes and dimensions. Dimensional differences in the same pipe can be renovated
- Minimal impact on environment
- Works regardless of outdoor temperature
- Installation can be done from restricted spaces
- Off road equipment can be used in inaccessible areas
- The pipe is finished in a day and can resume operation the same day



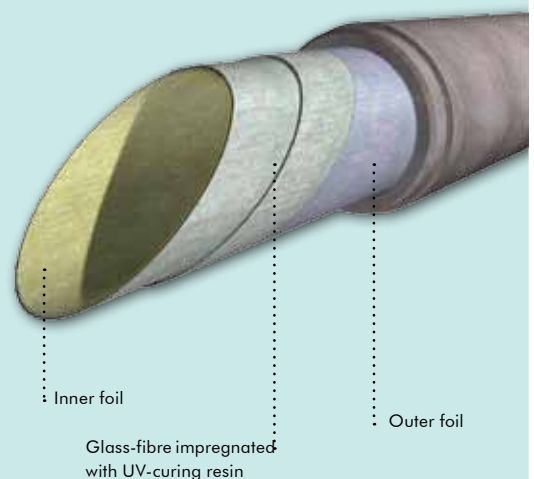
Inpipe liners – higher quality, better results

Inpipes system can be used for laterals, sewers and other gravity pipes, pressure pipes and rail and road culverts. Inpipe liner fits in almost anywhere, dimensions from Ø100 up to Ø1.600 mm, or equivalent circumference where the pipes are not round. Since the liner is manufactured in the factory according to customer order the strength, length, diameter and material can be custom made to any requirement.

The design with corrosion-resistant glass and polymers is forming a seamless pipe that is extremely strong and durable. Field tests for over 20 years and countless strength, wear and corrosion tests in the laboratory show that life expectancy is minimum 50 years. Furthermore the liner meets the market's strength requirements up to 100 years. Inpipe liner resists all known chemicals normally found in the pipe network. We can also offer special liners for particular types of aggressive environments.

Inpipe Liner

- Suitable for pipe sizes between Ø100 and Ø1600 mm or equivalent circumference
- Highly adaptable even for non-circular sections, or joints
- Seamless liner thus stops tree root intrusion and leakage
- Liner meets market requirements of minimum 50 years life
- Liner strength meets market requirements of 100 years according to certified test institutes
- Less reduction in pipe diameter than other systems
- Improved throughput capacity of the pipe



Technical characteristics

Strength

Inpipe liner has a very high strength. Another important feature is that the cured liner is not brittle, which prevents cracking. The liner can be compressed more than 30 percent and regains its original shape when unloading. This is especially important when displacement occurs due to ground movement (frost, etc).

Wall thickness

The Inpipe liner has a very high mechanical strength and can be made very thin and still meet the desired strength requirements.

Shrinkage

Thanks to the effectiveness of UV technology Inpipe liners hardly shrink at all after installation, leaving a minimal gap to the host pipe.

Area Reduction

Thanks to the combination of thin liner and minimal shrinkage after relining the pipe area reduction is minimal, typically only between 4 and 8 percent.

Surface roughness

After relining the pipe has a very smooth inner surface ($R_a < 0.5 \mu\text{m}$) which is comparable to polished steel.

Hydraulic Capacity

The combination of a small area reduction, very smooth surface and no joints means that the throughput is high in the new pipe.

Abrasion Resistance

The Inpipe liner has been tested on several independent research institute with very good results.

Large Dimensions

The Inpipe product program offers larger liners for pipes and culverts in dimensions up to $\text{Ø}1600 \text{ mm}$, corresponding to circumference 5020 mm.

Different shapes

The flexible design of the Inpipe liners means it can be used for practically all existing types of pipes and culverts.

Tree root intrusion

Inpipes liner with its minimal shrinkage leaves an almost non-existent gap between the original pipe and the liner. The liner has no seams. Any tree root intrusion is therefore effectively stopped.

Inversion

Inpipe offers a unique method to invert the liner into the host pipe meaning that remaining water in the pipe is pushed out simultaneously. In this way the liner is aligning very close to the wall of the host pipe.

Flex Liners

Flex Liner means that one liner can be used in pipes and culverts of varying sizes. Most common problem is that sewers have been partly replaced with other pipe sizes than the original dimension. Flex Liner is a must for the renovation of older types of stone culverts of varying sizes. These culverts are often extended with round pipes at both ends.

Flex Liner can be used for dimensional changes of around 25% in smaller pipes and up to 50% on bigger dimensions.



Effective protection against leakage of sewers

Leaking sewers are a major contributor to groundwater pollution and other environmental problems. Also inward leakage in the pipes, ie when groundwater enters the sewer, is a problem, because it increases the volume to be treated in treatment plants. This increases both energy consumption and use of chemicals significantly.

Inpipe stops tree root intrusion

Tree roots entering the drains and blocking them is a costly problem in both PVC and concrete pipes. In search of water and nutrient the roots enter through cracks, seams, gaps and even rubber seals. Once inside the tube roots grow quickly and cause a stop or interfere with the flow. But with Inpipes seamless liner roots cannot penetrate and future maintenance and renovation need drops to a minimum.



Rail- and road culverts repaired faster and safer

Older culverts require in many cases a special solution. They not only round, but also square and rectangular and built of various-sized, carved granite blocks. The culverts can be over a hundred years old and therefore not suited to today's axle weights. With increasing load the culvert blocks starts moving apart and filler material enters the ducts. It causes loss of throughput capacity of water and bumps that can lead to disruption of traffic. The more traffic is increasing all the more acute the problem of stabilizing the outdated culverts will be. Inpipe has a proper solution.

With Inpipe Liner System the tight liner will stabilize the old drum and prevent further degradation and leakages.

In addition, we solve the difficulty of fixating extensions to the old culvert. After relining a new strong and homogeneous pipe has been created ensuring that the different parts cannot be pulled apart. Because the system works off road the traffic will not be disturbed while renovation is in progress.

More than 600 installations of culverts have now been made with Inpipe Systems and often in rugged terrain. The development work has enabled us to deliver bigger dimensions also for other pipe networks besides sewers etc. As the culverts vary in size, they require a product that is flexible. Only Inpipe produces this flexible liner that in its largest dimension can expand up to Ø1 600 mm, corresponding to a circumference of 5020 mm for non-circular shapes.



Industrial applications

Inpipe has, thanks to the flexibility of installation and the ability to customize products, with great success been used at a huge number of different types of industries.

Typical applications are processing industries (pulp and paper, chemicals, metals), dairy and breweries, refineries, airports, power and automotive industry.



Major environmental benefits with energy-efficient Inpipe system

Energy efficiency has been a high priority during the development of Inpipe System. UV-curing is consuming less energy than the NO-DIG methods using heat curing. Inpipes installation is also faster thus reducing energy consumption further.

Using traditional digging and laying new pipes with the transports to and from the working area and traffic diversions

is creating huge emissions. In city areas blocked roads will create a massive traffic jam and immense increase of emissions. With Inpipe system you can avoid such problems. In total the fast, energy efficient and clean Inpipe installation is using only a fraction of the energy compared to traditional excavation.

Best Environmental Choice:

- No inward leakage thus reducing the use of chemicals at the treatment plant
- No leakage of environmentally hazardous substances into groundwater
- UV curing uses less energy than heat-based methods
- Quick installation reduces energy consumption
- Factory prepared liner means more efficient, cleaner and safer installation
- No fillers, asphalt etc needs to be manufactured and transported
- Lower energy consumption and emissions of toxic and carcinogenic substances due to less traffic jam
- Reduced emissions
- The old pipe network is re-used
- Long life of the renovated pipe
- Production after customer order means minimal waste

Quality assurance process – at all stages

The process behind Inpipe System is certified according to ISO 9001:2008. Each step of the development and production to marketing and installation is quality driven. We claim to that we have set “THE SPEED OF LIGHT” in the system. By that we mean that our fast UV-light technology and Inpipe liner interact with carefully worked out procedures, quality-controlled production, hard product testing, environmental awareness and a well-functioning education system for maximum customization.

Together with our partners we have balanced solutions for each problem area and can take total responsibility for the entire chain from pre-trial and choice of method, calculations, production, installation and follow up.

Inpipe® -liner is approved according to DIBT (Germany) and the Danish “No Dig” Certifying Authority.



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Inpipe offers the most effective energy saving and environmental NO-DIG system for rehabilitation of pipe networks. With the help of glass-reinforced liner and UV light curing, we create seamless, durable pipes in sizes up to Ø1600 mm. The system also includes carefully worked out procedures, quality-controlled production, hard product tests and well-functioning education system for our partners worldwide. Inpipe was founded in 1982 and is owned by ARKIL A/S. Our headquarters and production is located in Vilhelmina in northern Sweden.