Trenchless Innovations from Germany

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Dr.-Ing. Klaus Beyer
Executive Director

German Society of Trenchless Technology e.V. (GSTT)
The German Society for Trenchless Technology advocates the pioneering trenchless technology that combines economic efficiency and environmental protection.

This modern approach for installing underground supply lines can be utilized for drinking water, wastewater, gas, heating, telecommunications or electricity lines.

GSTT’s goal is to promote this modern technology that has been proven and tested worldwide over 30 years. Together with international partners, GSTT is continuously working on advancing the science and the practice of trenchless technology for the public and environmental benefit.
Trenchless Innovations from Germany

- Inspection
- Repair / Renovation
- Renewal / New Construction
CCTV-Inspection for small diameter HD pushing with water

Pan & tilt camera, turn off able

Operating range DN 80 – 200
Able to negotiate bends
45° from DN 80

Able to negotiate bends
87° from DN 100

Camera diameter
56 mm.
CCTV-Inspection for Sewage Laterals with documentation

Lindauer Schere & ASYS 3D
(scissors from the German town Lindau)

- Bendable pan and tilt colour camera for the holistic recording and documentation of lateral sewer
- Retractable guide device allows always a free and clear camera image
  → completely panned by
- 90° degrees and circled 360 degrees
- Inspection of branched pipe systems from DN 100 to DN 200
- Range up to 40 m in the lateral pipe (pushing technology)
- Range up to 120 m in the lateral pipe (water high pressure technology)
- 3D-sewage measurement ASYS 3D

CCTV-Inspection for small diameter HD pushing with water

made in Germany
CCTV-Inspection for Sewage Laterals with documentation

Trenchless Innovations from Germany

- Inspection
- Repair / Renovation
- Renewal / New Construction
LATERAL PREPARATION SYSTEM

SEWER to LATERAL (STL)
WOLDWIDE UNIQUE SATELLITE SYSTEM
for cutting, inspection and cleaning
from main sewer (DN 200 mm – 600 mm)
to lateral (DN 100 mm – 150 mm)

Winner of the
NO DIG
AWARD 2015
LATERAL PREPARATION SYSTEM

1. Positioning at lateral

LATERAL PREPARATION SYSTEM

2. Insertion into lateral
3. bending inside connection

4. start working (cutting, cleaning, reopen the lateral)
Alphaliner 500G with double wall construction:
- A special, patented double wall construction
- Extremely tight, resin rich back wall with closed foil shell
- Covering of the structural load-bearing core of the Alphaliner
- Protection against environmental influences
- Perfect long-term safety
- Extension of the service life
- DIBt approval Z-42.3-447

CIPP - Cured-in-place pipe rehabilitation with double wall

Alphaliner 1800 for diameters up to DN 1800:
- Unique glass fibre material based on the innovative “Ultrapipe”
  ECR glass fibre
- Higher transparency, better and quicker curing
- Different layout of the random and transverse fibre orientation to create technical properties

<table>
<thead>
<tr>
<th>Alphaliner 1800</th>
<th>Technical data</th>
</tr>
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<tbody>
<tr>
<td>Elastic modulus short-term value acc. DIN EN 1228</td>
<td>20380 MPa</td>
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<tr>
<td>Elastic modulus short-term value 5% quantile acc. DIN EN EN 1228</td>
<td>16304 MPa</td>
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<td>Elastic modulus long-term value acc. DIN EN 1228</td>
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<tr>
<td>Elastic modulus short-term value 5% quantile acc. DIN EN ISO 178</td>
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<td>Bending strength short-term value</td>
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<td>Bending strength long-term value</td>
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<td>Reduction factor 50 years</td>
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<td>Wearout value as per CEN/TR 18728</td>
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<td>Wear layer</td>
<td>0.6 mm</td>
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<tr>
<td>Grouping DWA-M 144-3</td>
<td>MKG 24</td>
</tr>
<tr>
<td>DIBt approval</td>
<td>Z-42.3-447</td>
</tr>
</tbody>
</table>
CIPP - Cured-in-place pipe rehabilitation of pressure pipes

- A new company in the RELINE UV®-Group since January 2017
- APTEC = Advanced Liner Technology for Pressure Pipes
- Development and manufacturing of UV light-curing GRP hose liner for rehabilitation of pressure mains
- Offering system solutions for no-dig rehabilitation of
  - Pressure drainage pipelines (sewerage, fire water mains, industrial and raw water)
  - Gas pipelines
  - Potable water pipelines

The Primus Line® system is a trenchless technology for the rehabilitation of pressure pipelines for different applications such as water, gas and oil.

- Long installation lengths of up to 2,500 m per pull and bends of up to 45 degrees
- Pressure rates with up to 82 bar, independent from host pipe
- Small footprint and minimal equipment requirements
- Factory produced product: No curing, steaming or adhesion process
- Life span of 50 years
Rehabilitation of pressure pipes with The Primus Line® system

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CIPP - UV curing technology for Drinking Water

**SAERTEX-LINER® H₂O**
The world's first curable GRP-Liner for the trenchless rehabilitation of potable water pipes: *Third party approved, environmentally friendly & sustainable!*

Structural classification of the Liner
- according to DIN EN ISO 11295 / AWWA M28

Certifications:
- NSF / ANSI Standard 61
- DVGW – W 270 and KTW Guideline,
- Ordinance 2914:2011

Due to high mechanical properties
- Very thin walls are used
- High pressure applications are possible

Diameter range
- 8 - 48 in (200 - 1200 mm)

The Liner can withstand external and internal pressure, including a vacuum.
New UV System for Renovating Drinking-water Pipelines

With the revolutionary nUVision concept for light curing of drinking-water pipelines, I.S.T. is putting a patent-protected technology on the market that allows for cables up to 1,000 meters in length.

UV-Patch System for short liners

allows the rehabilitation of damaged pipe sections
From DN 150-600 (6” – 24”)

• max. occupancy with short liners up to 100 cm (40“)
• 3 UV-bulbs (250 watts each)
• articulated joint for better inserting through manhole into the channel
• curing time of only 8 minutes
STREET TO HOME

For lateral relining from of the main pipe
The system allows inverting GRP-Liner against flow direction
with open-end-method:
Positioning unit and inversion unit are placed into the main
pipe (> DN 250 relined)
from two opposing manholes.
From there, after coupling of the units, the rehabilitation
of the lateral (> DN100) is carried out.

CIPP – Lateral detector

IBAK – Lateral Detector Sensor system for locating branches in rehabilitated sewer pipes
Proceeding: An antenna is routed along the liner wall.
The output signal of the sensor changes depending on the structure detected behind the wall.

[Diagram of lateral detector with labels: branch, embedding, main pipe, Inliner, Lateral Detector, U/V route]
**CIPP – Lateral detector**

IBAK – Lateral Detector  
Sensor system for locating branches in rehabilitated sewer pipes

With this innovative technology it is possible to locate and cut open branches (size DN 80 or larger) to be opened after liner insertion.

**CIPP – Liner end sleeve for the connection of liner systems**

- Seal against residual intrusion between liner / old pipe
- Mechanical protection against high pressure cleaning
- German DIBt approval
- Sealed against sewer infiltration water up to 1 bar
- Jetting resistant according to DIN 19523 testing
- Fast and easy installation process
Heating and Cooling with Waste Water

- Innovate – Regenerating - Economical
- Reducing the use of Fossil Fuels
- Major reduction of CO2 Emmisions
- Waste Water a home made Energy Source
- Recycling Industrial Waste heat Energy

Manhole rehabilitation technologies

- Cleaning equipment

M-Coating ready to begin, after cleaning with the TSSR
Manhole rehabilitation technologies

M-Coating
Automatic shaft renovation
Spray motor
- Thickness 5 – 100 mm
- Depth until 30 m
- Diameter 0.5 – 3.0 m
- Anticorrosion
- Structural renovation

Manhole rehabilitation technologies

M-Coating after partial coating with ERGELIT
Manhole rehabilitation technologies

GRP – Liner with UV curing technology
in different shapes of usual manholes
Manhole rehabilitation technologies

Trenchless Innovations from Germany

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- Renewal / New Construction
So far only pipe bursting and modified micro tunneling systems (pipe-eating method) are available for a pipeline corridor, trenchless replacement of old pipelines.

A prerequisite to utilize this method is that the surrounding ground can be displaced; major increases of dimensions are often problematic or impossible.
Pipe Eating systems
technical perfected systems
…but too long construction time

An Example: Advance length 60 meters, $d = \text{days}$

Pipe-eating method with slurry system:
set up 3.5 $d$, pipe eating 6.0 $d$, dismantling 2.0 $d$ $\Sigma 11.5 \, d$

Pipe-eating method with guided auger system:
set up 2.5 $d$, pipe eating 6.0 $d$, dismantling 1.5 $d$ $\Sigma 10 \, d$

The new Invention method with short pipes*:
set up 1.0 $d$, pulling process 2.5 $d$, dismantling 0.5 $d$ $\Sigma 4 \, d$
*for example polymer concrete jacking pipe

The new Invention method with PE Long pipes:
set up 1.0 $d$, pulling process 1.0 $d$, dismantling 0.5 $d$ $\Sigma 2.5 \, d$

60 % - 80 % lower construction time!
removal of drilled material is done with a suction excavator
PRM – Pipe Replacement Method
PRM – Pipe Replacement Method

Suction hose DN 100 for the Pneumatic conveying with quick coupling

Suction Excavator - patented suction principle

- Computer-optimized sound-absorbing unit
- Efficient micromesh filter
- Patented separation system
- Standard radio remote control

- High performance fan
- Resistant tilting container
- Integrated compressor
- Hydraulik driven Articulated hose carrier
Suction Excavators – a wealth of applications

CIVIL ENGINEERING

DISPOSAL

CLEANING OF FLAT ROOFS

PRT – Pipe Replacement Technology

Short pipe pulling

Clamp system
New short pipe
Cutting head

System Kurzschlauchzug / Short pipe pulling

Pulling rod in the old pipe
Pulling rig

PROF. HÖLTERHOFF
INGENIEUR CONSULTING
PRT – Pipe Replacement Technology

A lot of the components can be used for other applications (pipe bursting etc.)

PRM – Pipe Replacement Method

A lot of the components can be used for other applications (pipe bursting etc.)
HDD - Rock Drilling Rig

with Prime Double Rod System and „on board“ pump

- HDD-Compact Rig for rock drilling equipped with double rod magazine
- First rock drilling rig in this high-performance category (> 50 t)
- Inner and outer rods are independently driven by two flotable rotary heads
- high torque (up to 90,000 kN)
- Use of any common locating system possible
- Application with standard drill pipes
Guided Auger Boring with Front Steer and Optical Path in Extremest Ground Conditions
Guided Auger Boring with Front Steer and Optical Path in Extremest Ground Conditions

Here the construction as a pedestrian umbrella underpass

Trenchless underground cable construction

Requirements by Transition System Operator (TSO).

- Limited job site, construction roads, preparation area
- No heavy equipment between launch and reception point
- Steerable installation of casing pipes for AC & DC lines
- Length: 1,000m – 1,500m
- Depth: 1,5 m to 4 m, constant
- Diameter: approx. DN 250 – DN 400
- Casing material: plastic, non-conductive, e.g. PEHD
- Distance between lines: 1 m – 2 m, constant
Trenchless underground cable construction

Machine technology AVNS 350 XB

Principle
1. Pilot Bore with steel pipes
2. Removal of machine, jacking frame turned by 180°
3. Mounting of a pullhead for pull-in of casing pipe
Trenchless underground cable construction

Steel pilot pipes & connection principle

Pilot pipe length: 9 m
Interlocking position for Jacking frame

Guide pin
12 x M30 bolt
Cable channel
Seal

A Tiny Circle - the Construction Pit of the Future

Where the keyhole technique is applied, surface damage and consequential costs only too well known from open trench installation methods are insignificant. The performance of soil and surface works is safer, more productive and less elaborate. Inspection of the construction pit is not required.

Application range:
- installation of new property service connections with non-directional GRUNDOMAT impact moles
- installation of new property service connections with the directional drill rig GRUNDOPIT-K
- replacement of new property service connections with the cable winch GRUNDOTUGGER
- sleeve sealing of cast iron and steel lines
- repair of high pressure PE pipe lines
- insertion of survey slots
- pipe line inspection
- corrosion protection sacrificial anodes
Establishing a keyhole using a core drill

- the core drill CD 650 bores a hole of 650 mm in diameter in the road surface.
- after all other jobs are done, the bore core yielded in this working step is reinserted into the road surface, fitting perfectly.
- a suction excavator takes up the soil covering the main line
- installation of the Pit K rig and performance of the bore with wall duct into the basement
- connection with the main line is carried out above the surface.

Trenchless Innovations from Germany

We invite you, to visit the NO DIG BERLIN 2019 in conjunction with WATER BERLIN INTERNATIONAL.

Here you can see life the newest Trenchless Innovations from Germany

Symposium and Exhibition
26 – 28 March 2019
www.NODIGBERLIN.com
Berlin Exhibition Grounds

2017 would transported 600
Visitors with 15 busses
to 12 sitevisites
Thank you for your attention

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