

Trenchless Innovations from Germany 


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Shanghai




Dr.-Ing. Klaus Beyer
Executive Director

German Society of Trenchless
Technology e.V. (GSTT)



Trenchless Innovations from Germany 

- PRT – Pipe Replacement Technology
- CIPP - Cured-in-place pipe rehabilitation
- Jacking Pipes - vitrified clay pipes
- Pipe jacking Systems - Guided auger boring for non displaceable soils
- High speed pipe and cable plowing technology for open terrain
- Manhole rehabilitation technologies



Trenchless Innovations from Germany



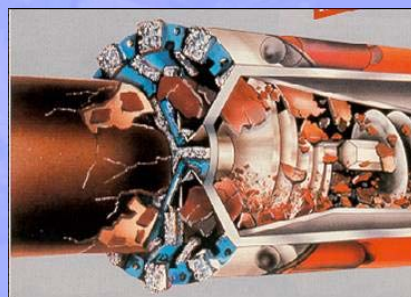
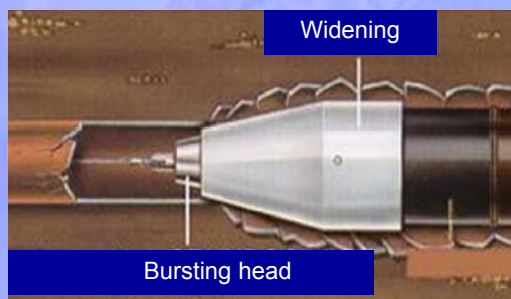
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PRT – Pipe Replacement Technology



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

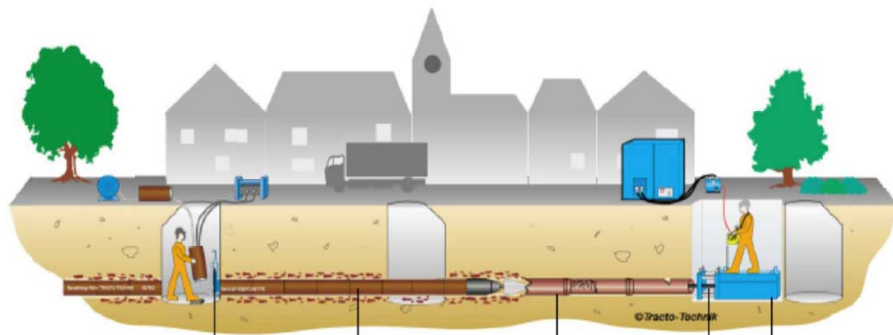


PRT – Pipe Replacement Technology

made
in
Germany

Pipe bursting method

A prerequisite to utilize this method is that the surrounding ground can be displaced; major increases of dimensions are often problematic or impossible.



Strech (tension) unit

New pipe

Old pipe

Pull rod

Static pulling device

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INGENIEUR CONSULTING

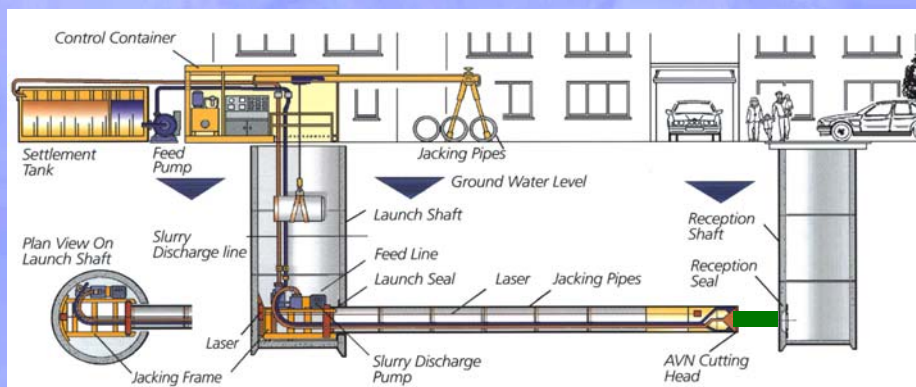
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PRT – Pipe Replacement Technology

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Pipe Eating systems

technical perfected systems
...but too long construction time



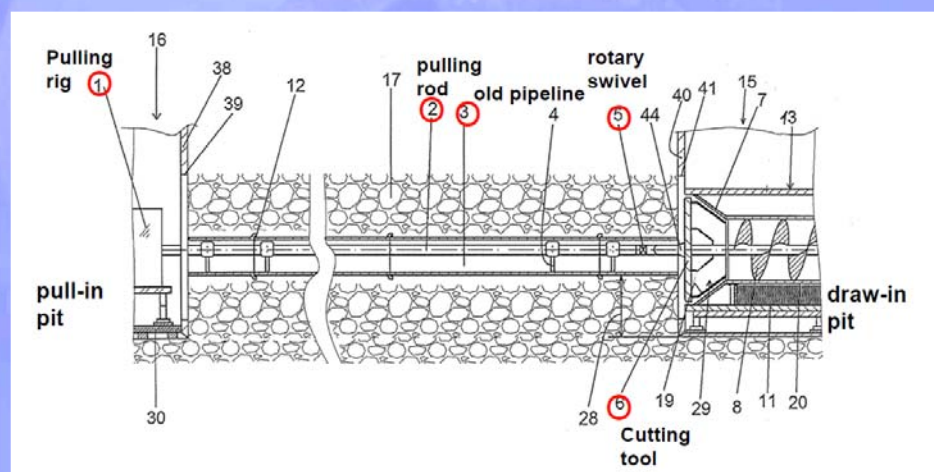
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Pipe Eating systems

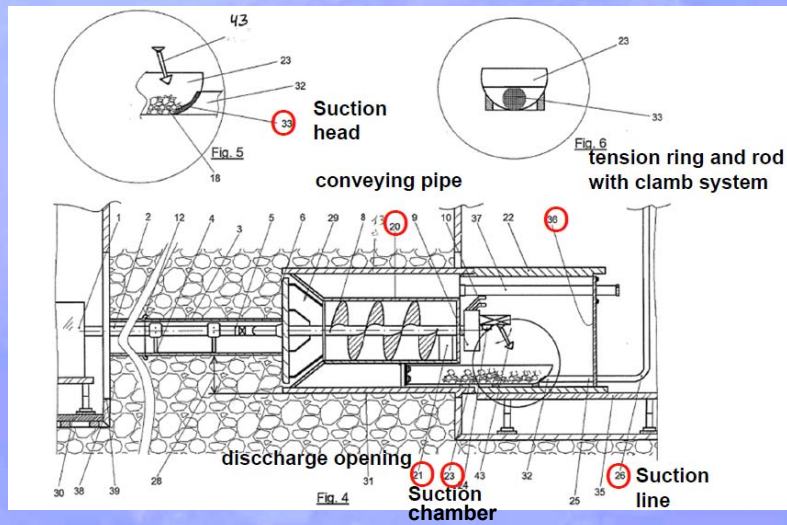
The new inventive technology will especially be utilized when regular pipe - bursting can no longer be applied, because the soil cannot be displaced or because a necessary dimension enlargement is not sufficient displaced, or respectively if there is a guideline that the old pipe must be removed completely.

With this new technology it is possible to lower the construction time by 60 - 80%.



PRT – Pipe Replacement Technology

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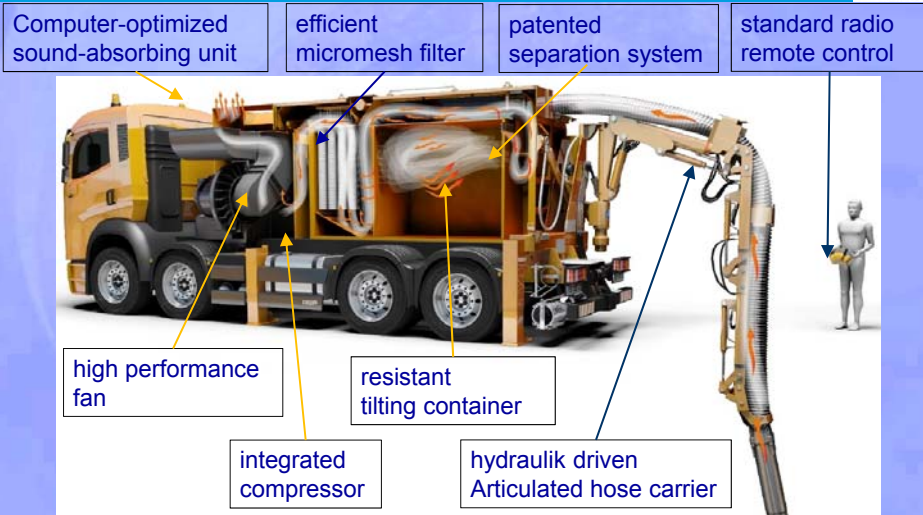
removal of drilled material is done with a suction excavator

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PRT – Pipe Replacement Technology

made
in
Germany



Suction Excavator - patented suction principle

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Suction Excavators – a wealth of applications

made in Germany

BUILDING SECTOR

EMERGENCY SERVICE

TREE RENOVATION

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Suction Excavators – a wealth of applications

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CIVIL ENGINEERING

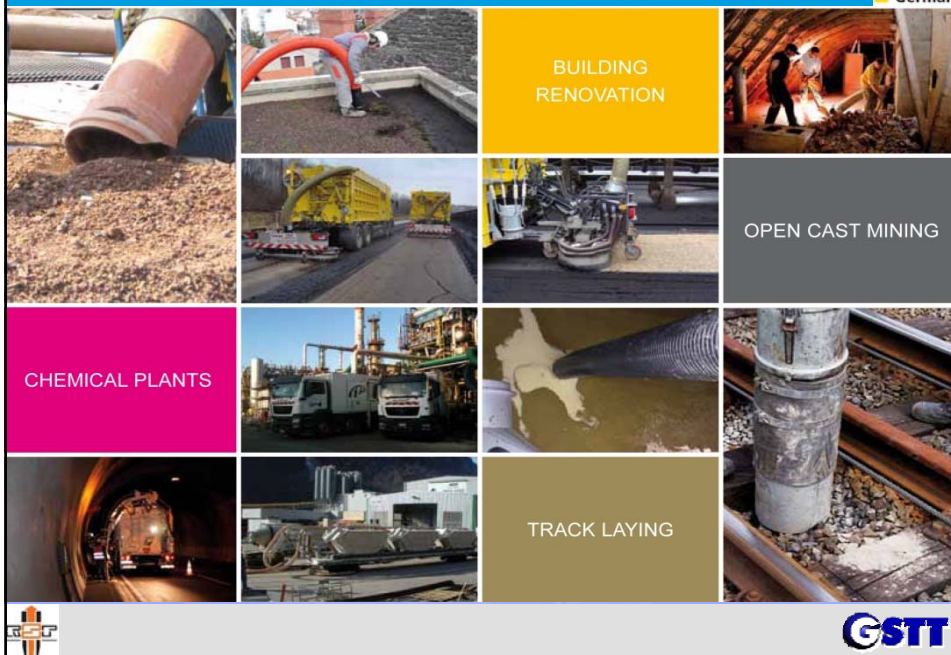
DISPOSAL

CLEANING OF FLAT ROOFS

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Suction Excavators – a wealth of applications

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Germany



OPEN CAST MINING

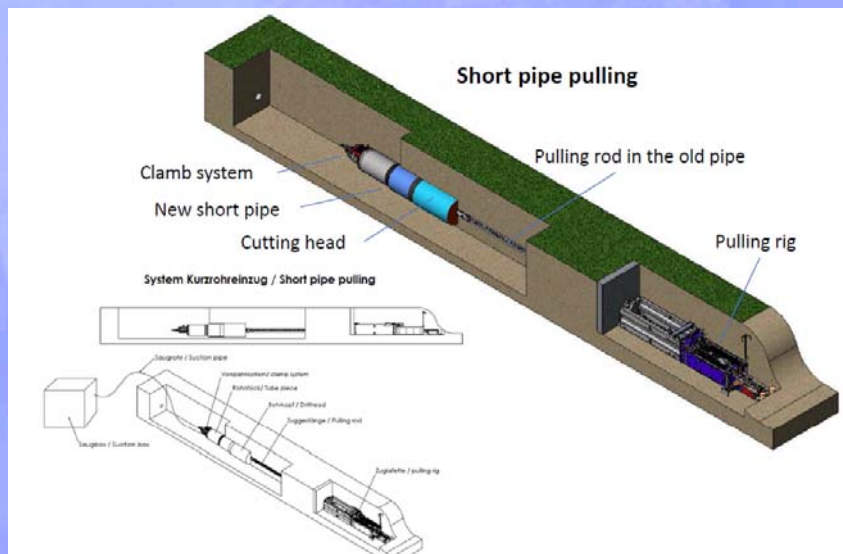
CHEMICAL PLANTS

TRACK LAYING



PRT – Pipe Replacement Technology

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Clamb system

New short pipe

Cutting head

System Kurzrohreinzug / Short pipe pulling

Short pipe pulling

Pulling rod in the old pipe

Pulling rig

Saugrohr / Suction pipe

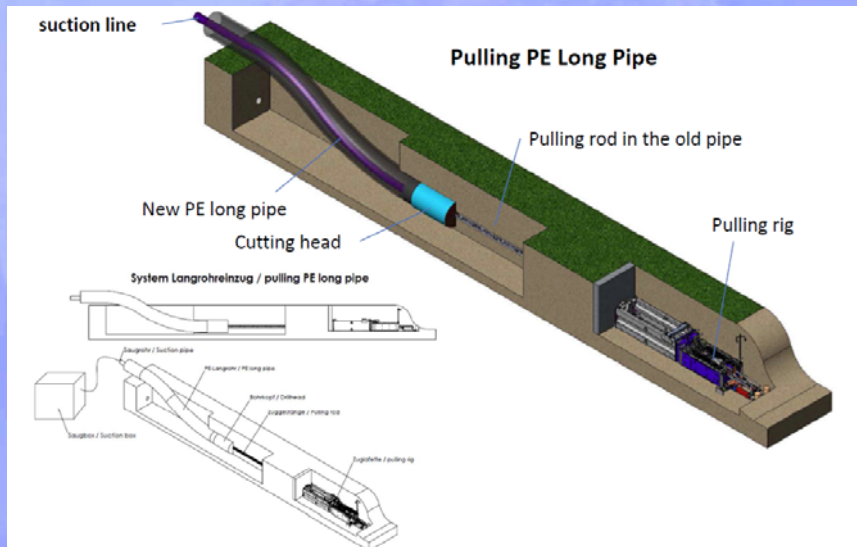
Diagram of a roof truss showing various components labeled with letters A through Z. The diagram includes a ridge beam, rafters, purlins, and various bracing members.



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PRT – Pipe Replacement Technology

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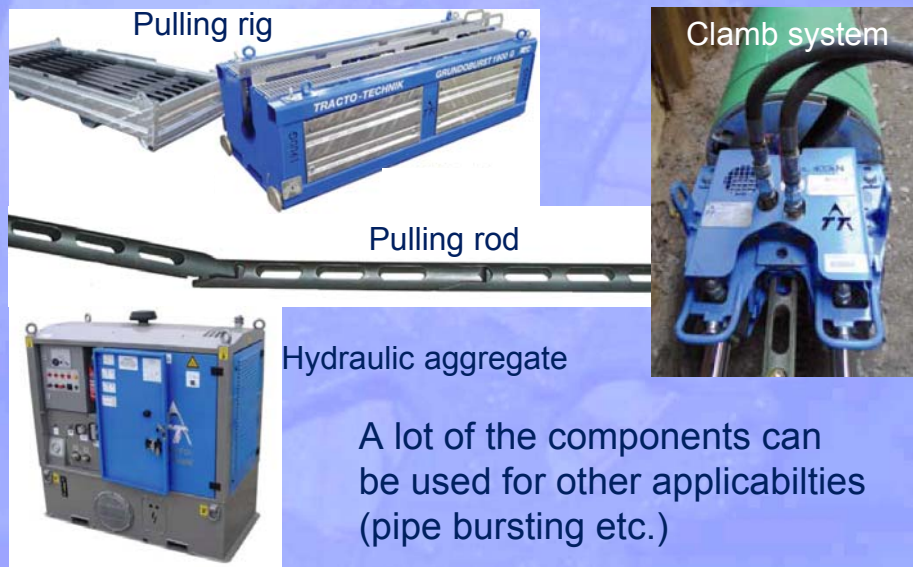


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PRT – Pipe Replacement Technology

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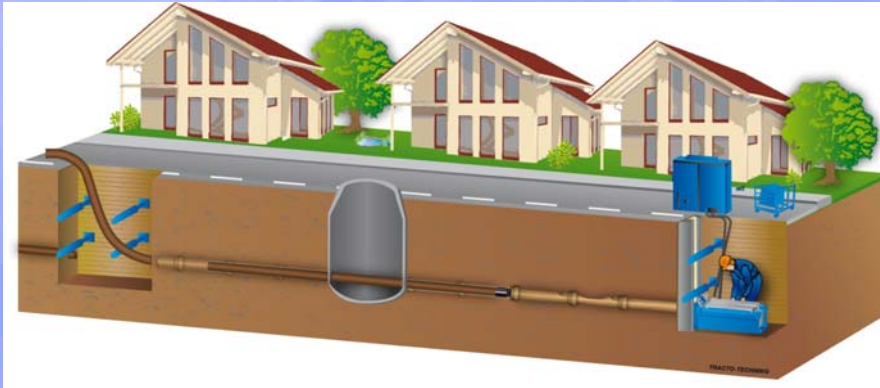


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Pipe Replacement with pipe bursting

made
in
Germany

GRUNDOBURST Pulling Rigs



Pipe diameters from DN 50 up to DN 1000



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Pipe Replacement with pipe bursting

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Germany

GRUNDOBURST Pulling Rigs



Bursting brittle pipe materials



Cutting tough pipe materials



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PE close-fit pipe lining

made in Germany

GRUNDBURST with PipeREDUCER

New PE-pipe PipeREDUCER QuickLock rods old pipe GRUNDOBURST rig


In the process of pulling in, the PE pipe string is reduced by 5 - 12 %, due to cold deformation. When the pulling-in operation is completed, the pipe string can relax against the wall of the old pipe in a close fit (memory effect).

Trenchless Innovations from Germany

made in Germany

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CIPP - Cured-in-place pipe rehabilitation - TV-Inspection



PANORAMO

unique scanner technology for
highly-efficient sewer pipe inspections

The PANORAMO principle

Two high-resolution digital photo cameras with 185° fisheye lenses, which each take images at distances of 5 cm.

These pipe section sequences are transmitted digitally to create a true 3D interior view of the complete sewer pipe, both in and against the direction of travel.



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CIPP - Cured-in-place pipe rehabilitation - TV-Inspection



PANORAMO

unique scanner technology for
highly-efficient sewer pipe inspections

Big advantage:

it is possible to evaluate the condition in the office at any time


The viewer can move freely in the sewer pipe without any viewing restrictions, stop at any position, pan round 360°, zoom, look into inlets and even look backwards.

All objects, such as displaced joints, protruding pipe connections etc. can be viewed in detail from all sides.



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CIPP - Cured-in-place pipe rehabilitation 



New development for an economic and safe installation of grp liners up to DN1600


➔ **iMPREGLiner GL13**

Since spring 2013 production of iMPREGLiner GL13* production up to **DN 1600** unique material properties (since Mai 2014), such as long-term e-module of $> 13.000 \text{ N/mm}^2$.



The standard product iMPREGLiner GL01 is a high-quality product with excellent material properties with long-term-e-module of 7.300 N/mm^2

*unique with Approval of the German General Building authority DIBt, Berlin

CIPP - Cured-in-place pipe rehabilitation 

- Problems when developing the GL13 for pipe rehabilitation $> \text{DN}1200$
- Handling of material and equipment on the job site (weight, uv light source, transport, ...)
(for example a jobsite in Germany: 42 m DN 1600 weighs 4,4 t, wallthickness 9,5 mm)
- Full cure of the liner laminate in bigger DN and thus bigger wall thicknesses.

CIPP - Cured-in-place pipe rehabilitation



Solution:

Reduction of the wall thickness through increasing the material properties of the liner material

- ➡ Specific adjustment of the glass fibres
- ➡ Improvement of the glass-resin-ralation



CIPP - UV curing technology



The REE 2000 system offers the world's most high-performance UV curing technology for rehabilitating all diameters up to DN 1300.

Particularily suitable for rehabilitation of high wall thickness.

Aviable in 2 versions:

- Mobile (portable components)
 - for 150 m cable length – 6 x 2000 W
 - for 250 m cable length – 9 x 400 - 600 W
- Professional (truck installation)
 - 300 m cable length – 6 x 2000 W



CIPP - UV curing technology

made
in
Germany

Technical data:

- 9 x 400 – 600 W curing power including digital curing camera
- 6 x 2000 W curing power including digital curing camera
- Cable length 150 m, 250 m or 300 m
- 1000 W lamps, can be switched in 100 W stages above 400 W; 2000 W lamps can be switched from 1000 W to 2000 W
- Professional control, monitoring, recording and documentation
- Accessories
- Power supply 40 KVA
- Min. 5 t cable winch
- Air supply 500 m³/h



RELINEGROUP

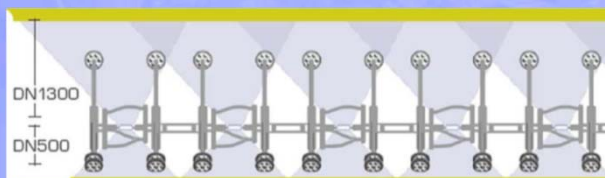
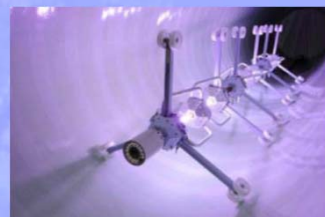
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CIPP - UV curing technology

made
in
Germany

The REE 2000: The Specialist

- Maximum curing performance 6 x 2000 W
- Gradual power switching
- Radiated liner length approx. 3,5 m



Overlay of the radiated power

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CIPP – Lateral detector

made in Germany

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.

branch

embedding

Lateral Detector

main pipe

Inliner

U/V

route

IBAK robotics

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CIPP – Lateral detector

made in Germany

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.

Gefordert durch:
Bundesministerium für Wirtschaft und Energie
aufgrund eines Beschlusses des Deutschen Bundestages

IBAK robotics

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CIPP – Lateral detector



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

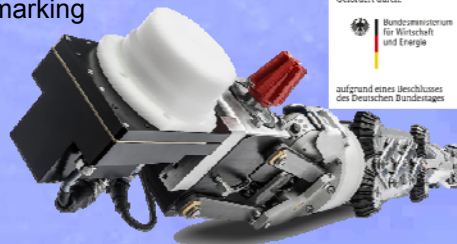
The sections graphic from the camera inspection serves as basis

- it is not necessary to scan the entire pipe again.

It is possible to find dry branches as well as those with water behind the liner.

The operator receives a visual reference of where the optimal opening point is.

- 1st step: it can be marked with a marking device that is adapted on the cutter robot
- 2nd step: the cutter automatically moves to the optimal opening point, and thus it can be reliably opened



Gebedort durch:
Bundesministerium
für Wirtschaft
und Energie
aufgrund eines Beschlusses
des Deutschen Bundestages

IBAK
robotics

GSTT

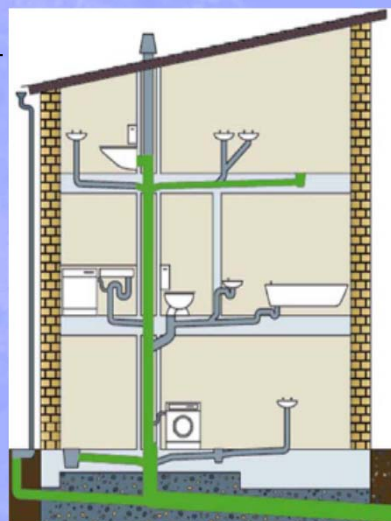
CIPP - Cured-in-place pipe rehabilitation



BRAWOLINER® HT - System

BRAWOLINER® offers an innovative Liner-System for rehabilitating buried pipes and pipes inside buildings without excavation.

- Complete rehabilitation from DN 50 to DN 250
- Suitable for almost all damage profiles and all pipe materials
- Up to 50 % cheaper than the open construction
- Life expectancy of over 50 years
- High heat resistance (HDT) $\geq 93^{\circ} \text{C}$
- Fire safety class B2 DIN 4102-1



Brawoliner

GSTT

CIPP - Cured-in-place pipe rehabilitation



BRAWOLINER® HT - The Liner



- Flexible seamless liner
- Bends up to 90°
- Minimum of folds
- Up to 2 changes of pipe diameter
- Hot curing with high steam or water temperature possible

(Certificated by the institut for the Environment and Hygiene, Gelsenkirchen, Germany)

BRAWO® HT Resin



- Excellent mechanical properties
- High abrasion and chemical resistance
- No shrinking
- High heat resistance (HDT) $\geq 93^{\circ}\text{C}$
- Fire safely class B2 DIN 4102-1
- Environmentally friendly



CIPP - Cured-in-place pipe rehabilitation



BRAWO® SteamUnit

With the BRAWO® SteamUnit BRAWOLINER® offers a comparably compact but efficient steam generator.

- Diesel-fired device
- Heat output of 56 KW
- Steam quantity of 50 kg per hour
- Steam temperatures of up to 159°C possible
- Rapid curing (only 80 min. heating time in combination with BRAWO® HT)

Thus the curing of longer piping sections in buildings or buried pipes is possible



CIPP - Cured-in-place pipe rehabilitation

made
in
Germany


BRAWO® VortexCutter

Innovative cutter for opening and for surface preparation

- For all pipes starting from
- Bends and diameter chan
- Suitable for all connection
- Minimum opening time (le

For unblocking the lateral co is cut into the lined connecti Tool is brought into the open the grinding panels are grind until it is fully opened.

The surface preparation of th also be done with this unit.

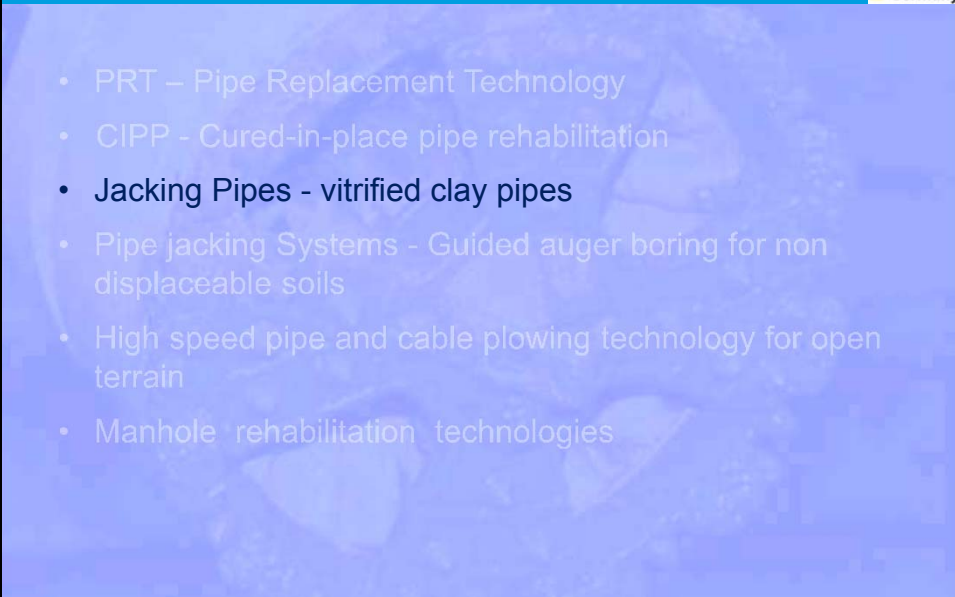


Brawoliner

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Trenchless Innovations from Germany

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Germany



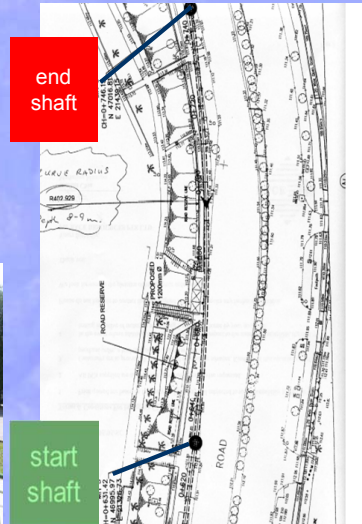
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Jacking Pipes - vitrified clay pipes

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in
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- WORLD PREMIERE in Singapore
- First curve jacking with vitrified clay jacking pipes DN 1200, length 115 m, radius 400m
- Construction company Swee Hong Singapore



STEINZEUG
KERAMO

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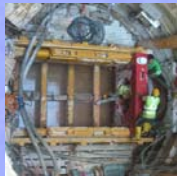
Jacking Pipes - vitrified clay pipes

made
in
Germany

- job site in north of Singapore (nearby border crossing for Malaysia)
- 6-lane, heavily traveled main road
- underground: slightly cohesive sand
- high ground water level
- 11 m deep shafts



start shaft



jacking pipe with equipment for
online load control system



end shaft

STEINZEUG
KERAMO

GSTT

Jacking Pipes - vitrified clay pipes



INTERMEDIATE JACKING STATION FOR VITRIFIED CLAY JACKING PIPE DN 1200



jacking pipe in
front of
intermediate
jacking station



jacking pipe
behind the
intermediate
jacking station



intermediate
jacking station



Jacking Pipes - vitrified clay pipes



INTERMEDIATE JACKING STATION FOR VITRIFIED CLAY JACKING PIPE DN 1200

- first Job site: Berlin (Germany), Grabensprung
- Length 156 m, DN 1200
- ground condition: sand and ground water level top of the pipe
- construction company: Braumann Tiefbau Germany



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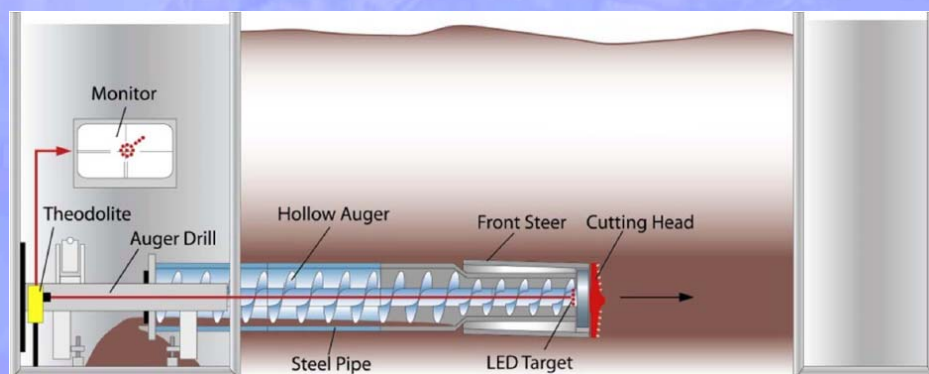


Pipe jacking Systems - Guided auger boring for non displaceable soils



Front Steer

Guided auger boring in non displaceable soils and weathered rock



Front Steer

Guided auger boring in difficult ground conditions

Project Hagen (Germany)

Length of jacking:
90 m

Encountered soils:
Sand stone and
clay stone
up to 80 MPa

Slope: 1.88 %

Accuracy: ± 2 cm

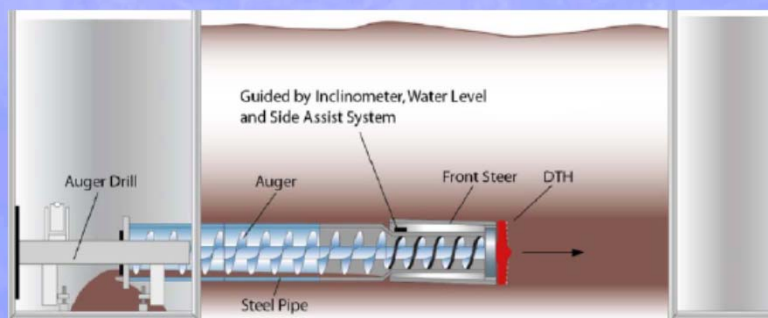


Bohrtec

GSTT

Front Steer

auger boring with
Down-the-Hole Hammer



Bohrtec

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Pipe jacking Systems - Guided auger boring for non displaceable soils made in Germany

Front Steer
auger boring
In Hard Rock

Project Muttsee
Driving length: 110 m
Encountered Rock:
Abrasive hard rock
up to 200 MPa
Slope: 57 %
Desired Accuracy: ± 2 cm

Different Boring Heads



Bohrtec **GSTT**

Trenchless Innovations from Germany made in Germany

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GSTT

High speed pipe and cable plowing technology for open terrain



Hydraulic spider plow unit

pulling winch,
pulling force up to 160 t

For power and broadband cables over long distances as well as water and gas pipes up to 355 mm OD (in soft soils up to 450 mm OD) Daily performance (meters installed) with a plowing unit can exceed 5,000 m with only a small start and construction pit

FRANK
FÖCKERSPERGER

GSTT

High speed pipe and cable plowing technology for open terrain




Applicable also in difficult terrain

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FÖCKERSPERGER

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High speed pipe and cable plowing technology for open terrain

made in Germany



Applicable also in difficult terrain

FRANK FÖCKERSPERGER

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Manhole rehabilitation technologies

made in Germany

cleaning equipment

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



HERMES TECHNOLOGIE

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Manhole rehabilitation technologies

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motor coating equipment

Winch

Control cabinet

Mixer

Pump

TSSR

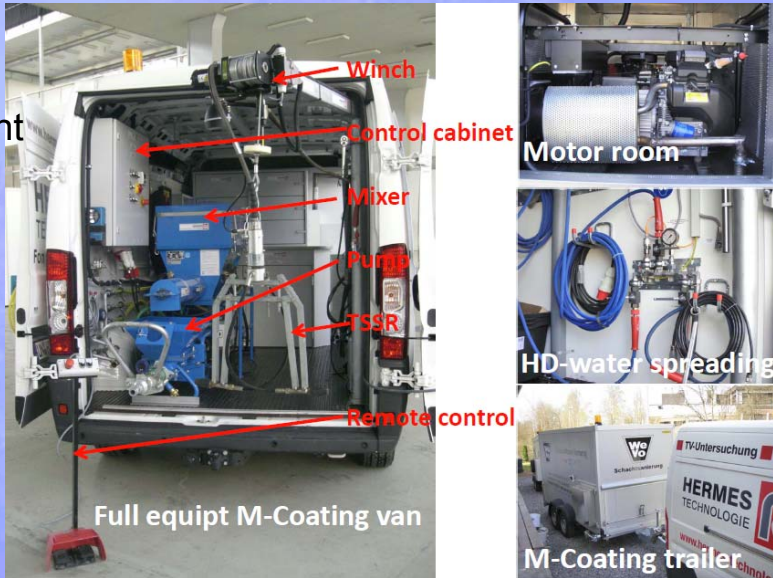
Remote control

Full equipt M-Coating van

Motor room

HD-water spreading

M-Coating trailer



HERMES TECHNOLOGIE

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Manhole rehabilitation technologies

made in Germany

motor coating equipment

M-Coating
Automatic shaft renovation

Spray motor

- Thickness 5 – 100 mm
- Depth until 30 m
- Diameter 0.5 – 3,0 m
- Anticorrosion
- Structural renovation



HERMES TECHNOLOGIE

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Manhole rehabilitation technologies

made in Germany

motor coating



M-Coating after partial coating with ERGELIT

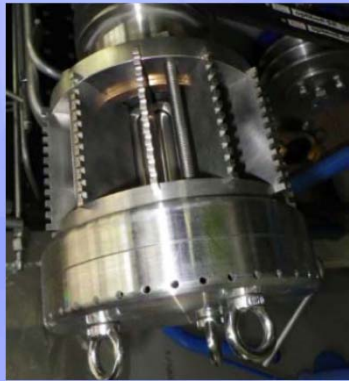
HERMES TECHNOLOGIE

GSTT

Manhole rehabilitation technologies



Automatically coating of hybrid-silicate ombran CPS
in the case of biogenic acid corrosion



HS Coating Head



Trenchless Innovations from Germany



We invite you, to visit the NO DIG BERLIN 2015 in conjunction
with WATER BERLIN INTERNATIONAL.
Here you can see life the newest Trenchless Innovations from Germany



Symposium and Exhibition
24 – 27 March 2015
www.NODIGBERLIN.com
Berlin Exhibition Grounds



Approx. 700 Visitors will
transported with 20 busses to
more than 15 sitevisites



Trenchless Innovations from Germany



Questions?

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Thank you for your attention

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