

Trenchless Innovations from Germany

made in Germany

Technical-Scientific Conference  
21<sup>th</sup> May 2014

IEexpo  
中国环博会  
Presented by IFAT CHINA • EPTEE • CWS

Shanghai

Dr.-Ing. Klaus Beyer  
Executive Director

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

GSTT



GSTT – German Society for Trenchless Technology e.V. made in Germany

*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 for 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.*

GSTT

**iSTT – International Society for Trenchless Technology**

Approx. 3.500 members in approx. 55 countries (Societies in 27 regions)

**GSTT**

**Trenchless Innovations from Germany**

made in Germany

- New technology for replacement of old pipeline systems
- 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
- Software for infrastructure networks

**GSTT**

## Trenchless Innovations from Germany



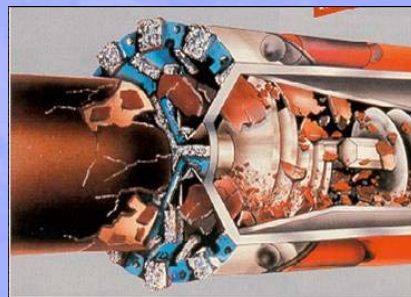
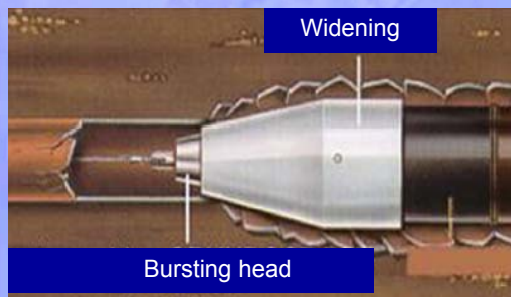
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## New technology for replacement of old pipeline systems



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

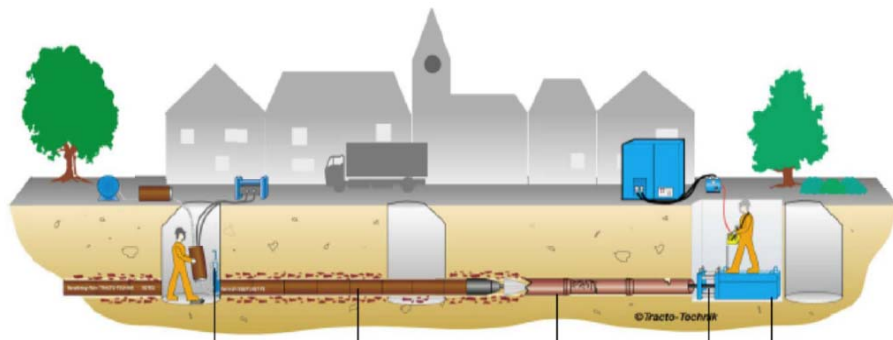


## New technology for replacement of old pipeline systems

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### 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.



Stretch (tension) unit    New pipe    Old pipe    Pull rod    Static pulling device

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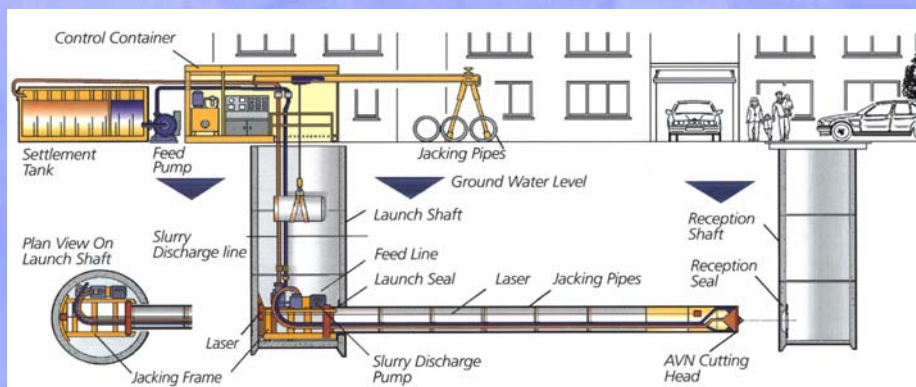
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## New technology for replacement of old pipeline systems

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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%.

An Example: Advance length 60 meters, d = 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

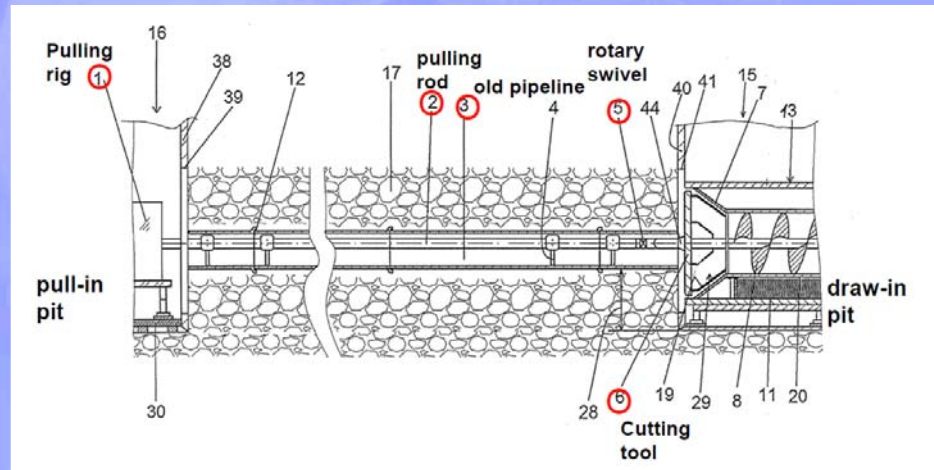
The new Invention method with PE Long pipes:

set up 1.0 d, pulling process 1.0 d, dismantling 0.5 d  $\Sigma$  2.5 d

60 % - 80 % lower construction time!

## New technology for replacement of old pipeline systems

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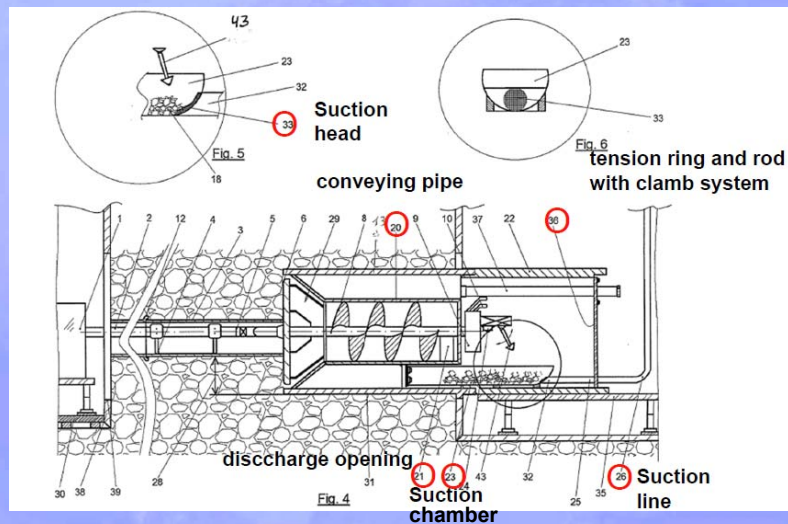


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## New technology for replacement of old pipeline systems

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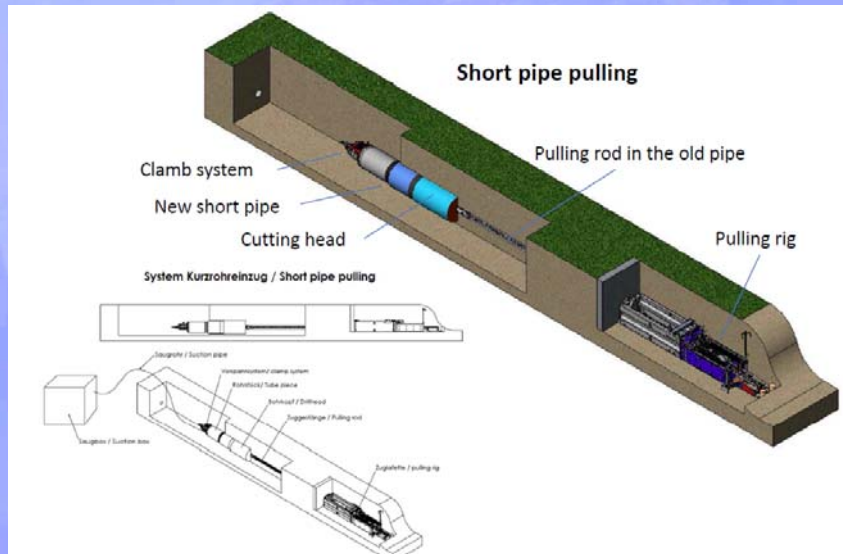
removal of drilled material is done with a vacuum excavator

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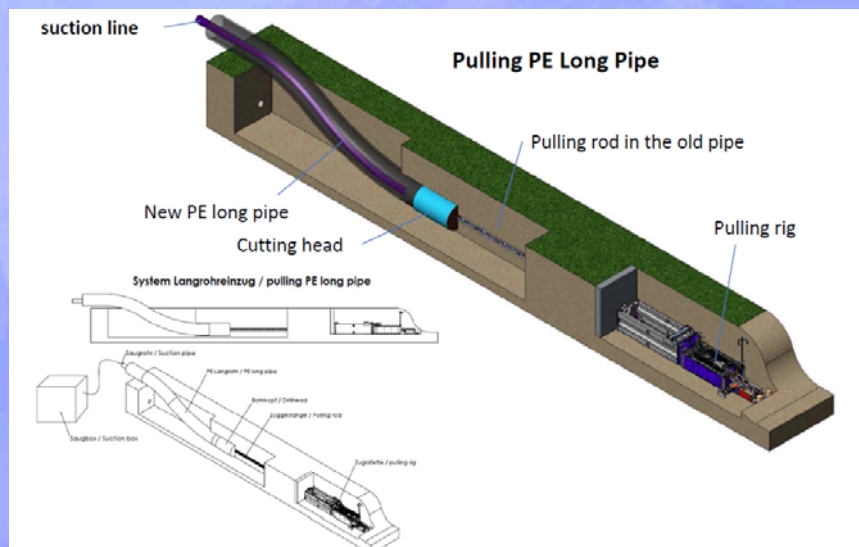


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## New technology for replacement of old pipeline systems

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## New technology for replacement of old pipeline systems

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in  
Germany



vacuum excavator truck



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## New technology for replacement of old pipeline systems

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Pulling rig

Pulling rod



Clamb system



Hydraulic aggregate

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

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## Trenchless Innovations from Germany



- New technology for replacement of old pipeline systems
- CIPP - Cured-in-place pipe rehabilitation
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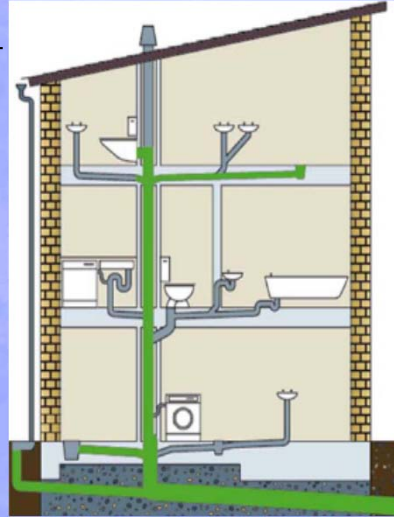
## CIPP - Cured-in-place pipe rehabilitation

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Germany

### BRAWOLINER® HAT - 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 safely class B2 DIN 4102-1



Brawoliner

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## CIPP - Cured-in-place pipe rehabilitation

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Germany

### BRAWOLINER® HAT - The Liner



- Flexible seamless liner
- Bends up to  $90^{\circ}$
- 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® HAT 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

Brawoliner

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## 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



### **BRAWO® VortexCutter**


Innovative cutter for opening lateral connections and for surface preparation of pipes.

- For all pipes starting from DN 50
- Bends and diameter changes are no problem
- Suitable for all connection angles
- Minimum opening time (less than 15 min)

For unblocking the lateral connection and opening is cut into the lined connection. Then the grinding tool is brought into the opening. Due to the rotation, the grinding panels are grinding the connection until it is fully opened.

The surface preparation of the pipes for installing connection collars can also be done with this unit.



CIPP - Cured-in-place pipe rehabilitation 



New development for an economic and safe installation of grp liners up to DN1500


➔ **iMPREGLiner GL13**

Since spring 2013 production of iMPREGLiner GL13\* production up to DN 1500 unique material properties, 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  $7.300 \text{ N/mm}^2$

\*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, ...)
- Full cure of the liner laminate in bigger DN and thus bigger wall thincknesses



## 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 - Cured-in-place pipe rehabilitation



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 - Cured-in-place pipe rehabilitation

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### 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 - Cured-in-place pipe rehabilitation

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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

RELINEGROUP

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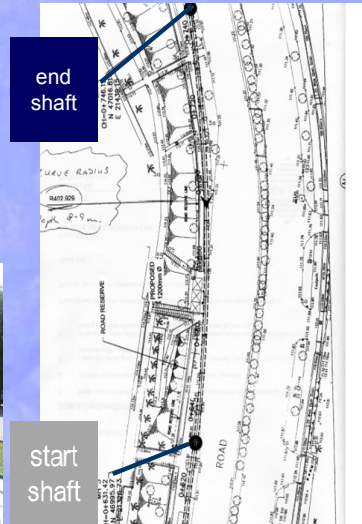
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## Jacking Pipes - vitrified clay pipes

made  
in  
Germany

- 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**

**GSTT**

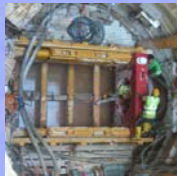
## Jacking Pipes - vitrified clay pipes

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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**

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## 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



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KERAMO**

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## 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



**STEINZEUG  
KERAMO**

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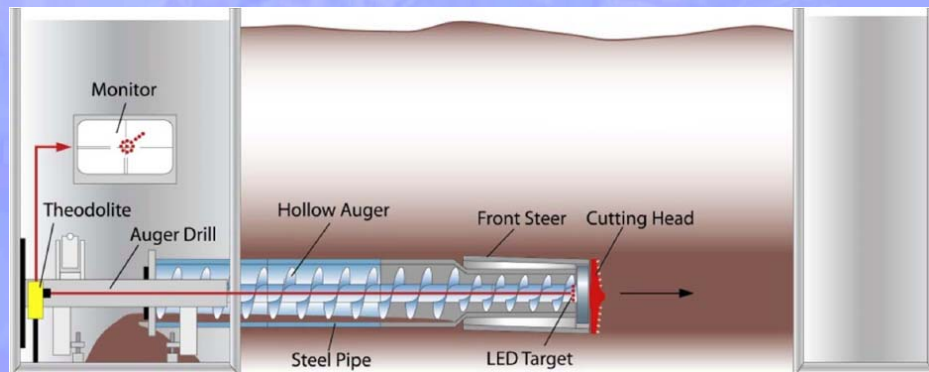


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## Front Steer

Guided auger boring in non displaceable soils and weathered rock



**Bohrtec**

**GSTT**

## 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:  $\pm 2$  cm

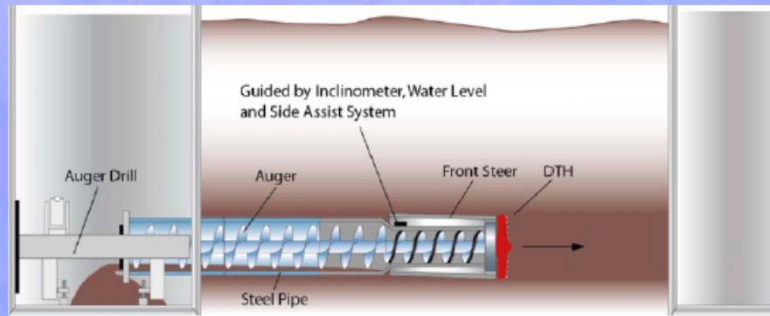


**Bohrtec**

**GSTT**

### Front Steer

auger boring with  
Down-the-Hole Hammer



**Bohrtec**

**GSTT**

### 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:  $\pm 2$  cm



Different Boring Heads

**Bohrtec**

**GSTT**



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High speed pipe and cable plowing technology for open terrain



winch rope of up to 130 m length

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

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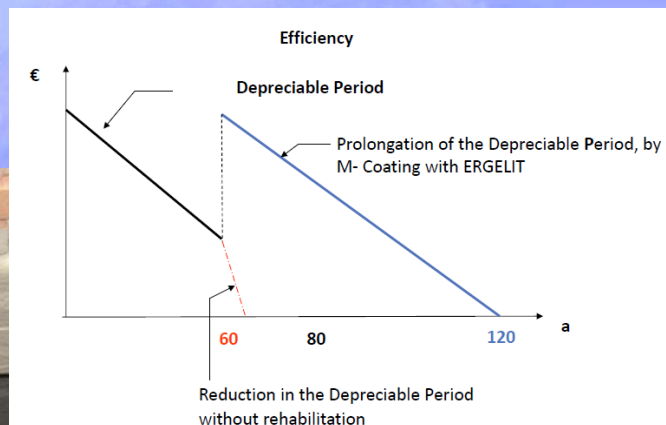
## Manhole rehabilitation technologies



### motar coating



**M-Coating after  
partial coating with  
ERGELIT**





Manhole rehabilitation technologies

made in Germany

motar 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

GSTT

Manhole rehabilitation technologies

made in Germany

motar coating equipment

Winch

Control cabinet

Mixer

Pump

TSSR

Remote control

Full equipt M-Coating

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

HERMES TECHNOLOGIE

GSTT

## Manhole rehabilitation technologies

made  
in  
Germany

### motar coating equipment



#### M-Coating Automatical 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

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Germany

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



HS Coating Head



MC

GSTT

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Software for infrastructure networks made in Germany

**BaSYS**  
Advanced Network Information System

25+ over 25 years efficient software for infrastructure-networks

**BaSYS** Barthauer Software **GSTT**

Software for infrastructure networks made in Germany

Investment safety through multi-platform concept:  
user interface CAD/GIS

**AUTODESK**

Autodesk AutoCAD Map 3D

**NEW: Works with**

**SuperMap** The Innovative GIS Provider

**BaSYS**  
Advanced Network Information System

Microsoft SQL-SERVER ORACLE  
database management system

**Communication and Interfaces**

- cctv data structures: ISYBAU XML, DWA M-150, EN 13508-2, WSAA, WRC4, WinCan, IBAK, Rausch, extensible
- definable data structures: Microsoft Excel, Microsoft Word, ASCII, XML, FME
- special application data: STANET, EPANET, MIKE URBAN, SewerCAD, WaterCAD

**BaSYS** Barthauer Software **GSTT**

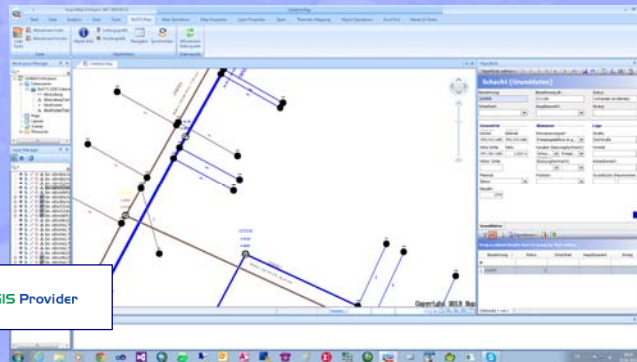


## Software for infrastructure networks



**BaSYS** Plan SP allows automatic plan initialisation from the data base on SuperMap Desktop GIS products.

- Automatic plan initialisation from the data base
- Planning design according to standard models
- Provides utilisation of all special fields of **BaSYS**
- Provides the access function from the graphic to **BaSYS**-Attributes



**SuperMap** The Innovative GIS Provider

Sewer network plan generated on SuperMap Desktop.Net with integrated BaSYS Object Assets Panel

**BaSYS** Barthauer Software



## 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](http://www.NODIGBERLIN.com)  
Berlin Exhibition Grounds

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



Trenchless Innovations from Germany



## Questions?

Dr.-Ing. Klaus Beyer

[beyer@gstt.de](mailto:beyer@gstt.de)



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## Thank you for your attention

Dr.-Ing. Klaus Beyer  
Executive Director

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