Trenchless innovations from Germany

Prof. Jens Hölterhoff
Chairman of GSTT –
German Society for Trenchless Technology

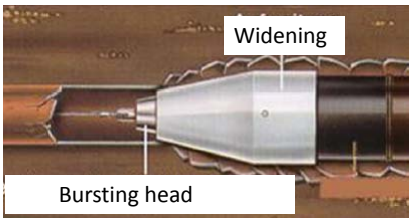
Trenchless innovations from Germany

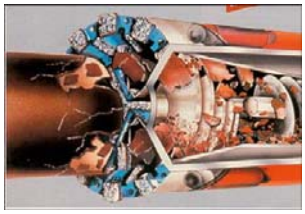
- New technology for replacement of old pipeline systems
- CIPP - Cured-in-place pipe rehabilitation
- Jacking Pipes - vitrified clay pipes
- Pipe jacking Systems - Guided auger boring for non displaceable soils
- High speed pipe and cable plowing technology for open terrain
- Manhole rehabilitation technologys
- Software for infrastructure networks

Trenchless innovations from Germany

- 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.





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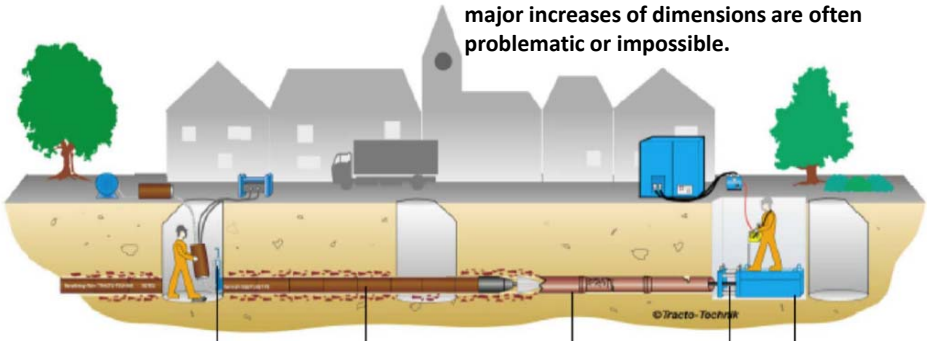
Trenchless innovations from Germany

- New technology for replacement of old pipeline systems

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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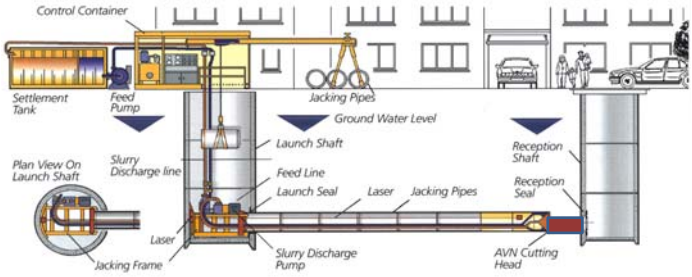
Trenchless innovations from Germany

- New technology for replacement of old pipeline systems

Pipe Eating systems

technical perfected systems

…but too long construction time



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Trenchless innovations from Germany

- New technology for replacement of old pipeline systems

The 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%.

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Trenchless innovations from Germany

- New technology for replacement of old pipeline systems

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 Σ **11.5 d**

Pipe-eating method with guided auger system:
set up 2.5 d, pipe eating 6.0 d, dismantling 1.5 d Σ **10 d**

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

Invention method with PE Long pipes:
set up 1.0 d, pulling process 1.0 d, dismantling 0.5 d Σ **2.5 d**

60 - 80 % lowered construction time!

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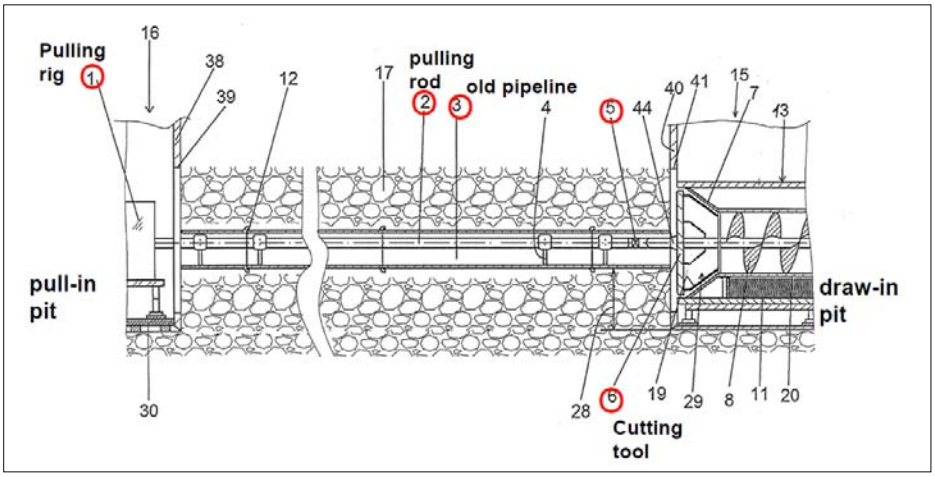
Trenchless innovations from Germany

- New technology for replacement of old pipeline systems



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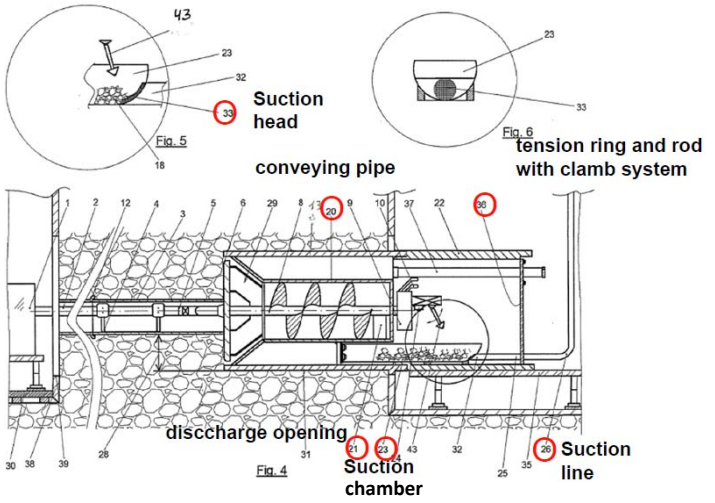
Trenchless innovations from Germany

- New technology for replacement of old pipeline systems



removal of drilled material is done over a vacuum suction conveying

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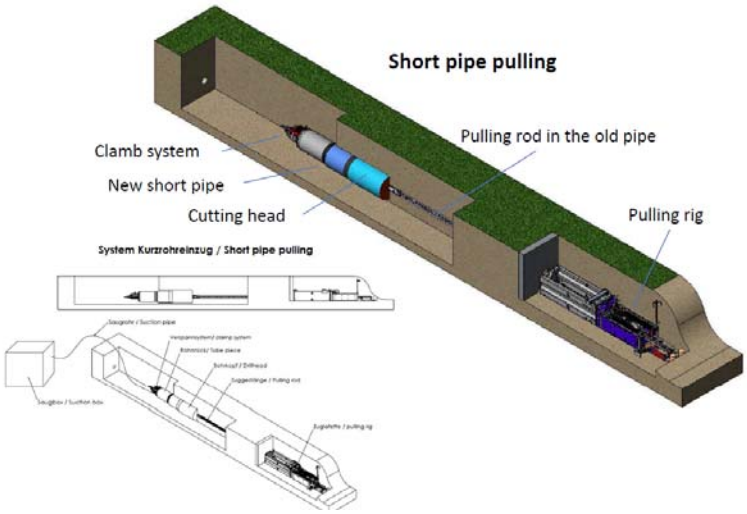
- New technology for replacement of old pipeline systems



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Trenchless innovations from Germany

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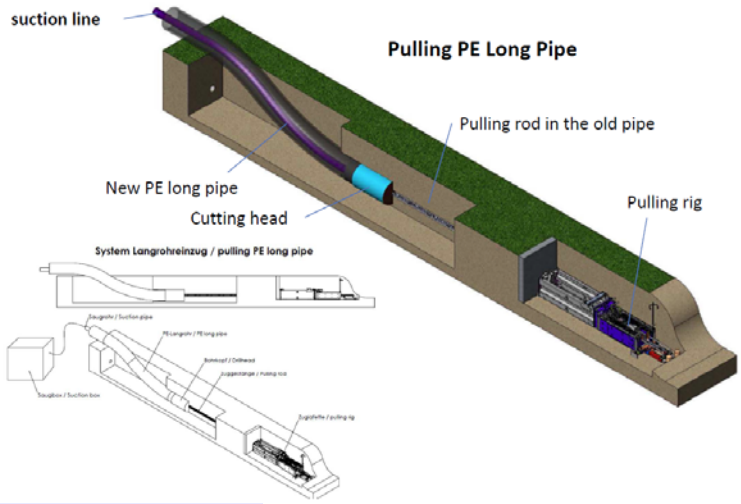

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Trenchless innovations from Germany

- New technology for replacement of old pipeline systems

Suction excavator truck

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Trenchless innovations from Germany

- New technology for replacement of old pipeline systems

Pulling rig

Clamb system

Pulling rod

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

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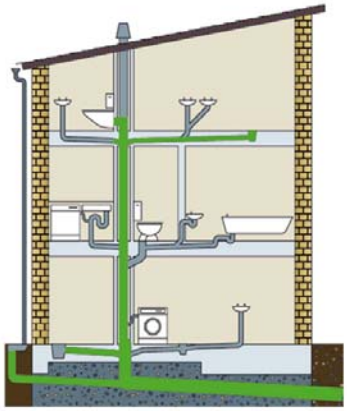
Trenchless innovations from Germany

- 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) ≥ 93°
- Fire safety class B2 DIN 4102-1



Brawoliner

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Trenchless innovations from Germany

- 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

BRAWO® HT Resin

- Excellent mechanical properties
- High abrasion and chemical resistance
- No shrinking
- High heat resistance (HDT) ≥ 93°
- Fire safety class B2 (DIN 4102-1)
- Environmentally friendly

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

Brawoliner

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Trenchless innovations from Germany

- 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.

Brawoliner

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Trenchless innovations from Germany

- 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 minutes)

For unblocking the lateral connection an 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.

Brawoliner

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Trenchless innovations from Germany

- 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 DN1500 (unique with Approval of the German General Building authority DIBt, Berlin) unique material properties,

such as long-term e-module of > 13.000 N/mm²

The standard product iMPREGLiner GL01 is a high-quality product with excellent material properties
long-term-e-module: 7.300 N/mm²

IMPREG GROUP

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Trenchless innovations from Germany

- CIPP - Cured-in-place pipe rehabilitation

Problems when developing the GL13 for pipe rehabilitation > DN1200

- 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

Trenchless innovations from Germany

- CIPP - Cured-in-place pipe rehabilitation

Solution: Reduction of the wall thicknesses through increasing the material properties of the liner material

➡ Specific adjustment of the glass fibres

➡ Improvement of the glass-resin-relation

Trenchless innovations from Germany

- 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 DN1300. Particularly suitable for rehabilitation of high wall thicknesses.

Available 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) with cable lengths 300 m
  - 300 m cable length - 6 x 2000 W

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 500m³/hour

RELINEGROUP

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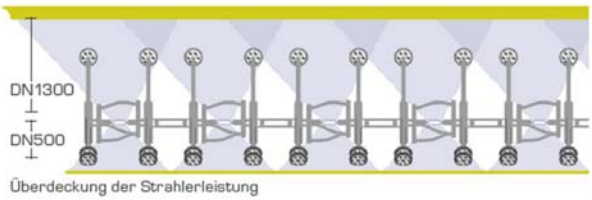
Trenchless innovations from Germany

- CIPP - Cured-in-place pipe rehabilitation

REE2000: The Specialist

- Maximum curing performance 6 X 2.000Watt
- Gradual power switching
- Radiated liner length approx. 3.5m



Überdeckung der Strahlerleistung

RELINEGROUP

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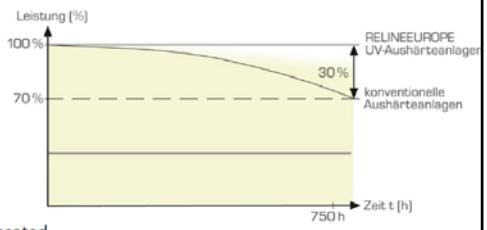
Trenchless innovations from Germany

- CIPP - Cured-in-place pipe rehabilitation

Electronic performance monitoring:

UV lamps lose up to 30% power with increased operating time;
In the case of REE2000, the ratio of voltage/current rating is kept constant (Ohm's law) and, thus, the following advantages are achieved:

- Age-related power loss is balanced out
- Electrical resistance of the curing cable is compensated
- Verification through independent lamp performance measurement



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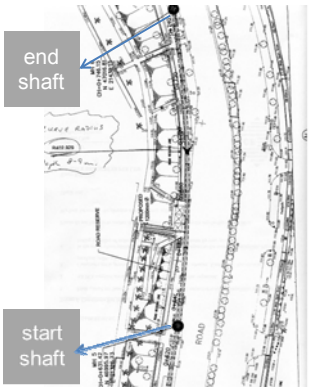
Trenchless innovations from Germany

- Jacking Pipes - vitrified clay pipes

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



STEINZEUG KERAMO

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Trenchless innovations from Germany

- Jacking Pipes - vitrified clay pipes
  - 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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Trenchless innovations from Germany

- 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

STEINZEUG KERAMO

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Trenchless innovations from Germany

- Jacking Pipes - vitrified clay pipes

INTERMEDIATE JACKING STATION

- 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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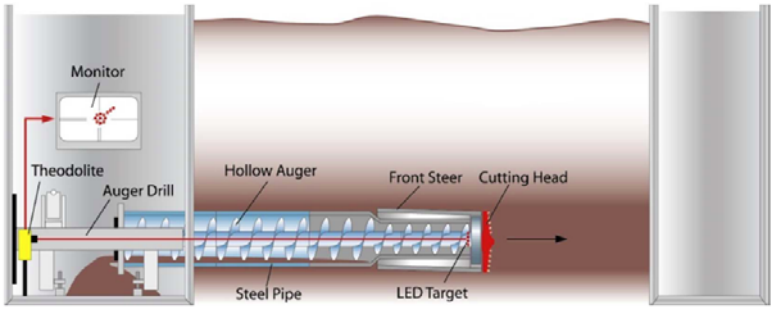
Trenchless innovations from Germany

- Pipe jacking Systems - Guided auger boring for non displaceable soils

Front Steer

Guided auger boring in non displaceable soils and weathered rock



Bohrtec

GSTT

Trenchless innovations from Germany

- Pipe jacking Systems - Guided auger boring for non displaceable soils

Bohrtec GSTT

Trenchless innovations from Germany

- Pipe jacking Systems - Guided auger boring for non displaceable soils

Front Steer

Guided auger boring in difficult ground conditions

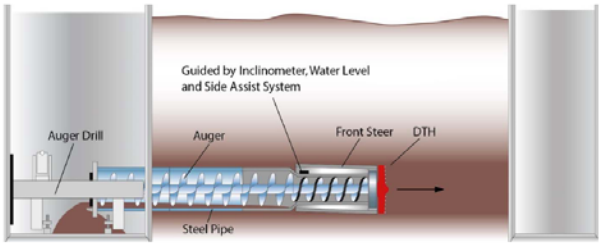
Project Hagen:
Length of jacking: 90 m
Encountered soils:
Sand stone and clay stone up to 80 MPa
Slope: 1.88 %
Accuracy: +- 2 cm

Bohrtec GSTT

Trenchless innovations from Germany

- Pipe jacking Systems - Guided auger boring for non displaceable soils

Front Steer
Auger boring with Down-the-Hole Hammer



Bohrtec GSTT

Trenchless innovations from Germany

- Pipe jacking Systems - Guided auger boring for non displaceable soils

Front Steer

Guided Auger Boring
in Hard Rock

Project: Muttsee
Driving length: 110 m
Encountered Rock:
Abrasive hard rock up to 200 MPa
Slope: 57 %
Desired accuracy: +- 10 cm

Different Boring Heads

Bohrtec GSTT

Trenchless innovations from Germany

- High speed pipe and cable plowing technology for open terrain

Hydraulic spider plow unit **pulling winch, pulling force up to 160 t**
winch rope of up to 130 m length

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

Trenchless innovations from Germany

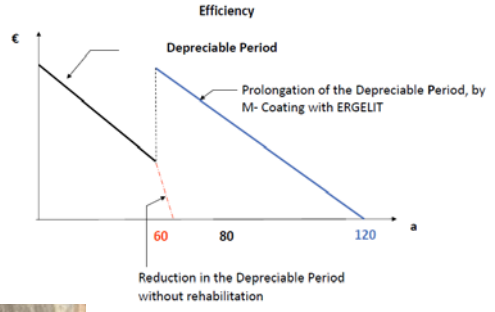
- High speed pipe and cable plowing technology for open terrain

Spider plow unit
on a slope / escarpment

FRANK FÖCKERSPERGER GSTT

Trenchless innovations from Germany

- Manhole rehabilitation technologys
  - mortar coating



HERMES TECHNOLOGIE

GSTT

Trenchless innovations from Germany

- Manhole rehabilitation technologys

HERMES TECHNOLOGIE

GSTT

Trenchless innovations from Germany

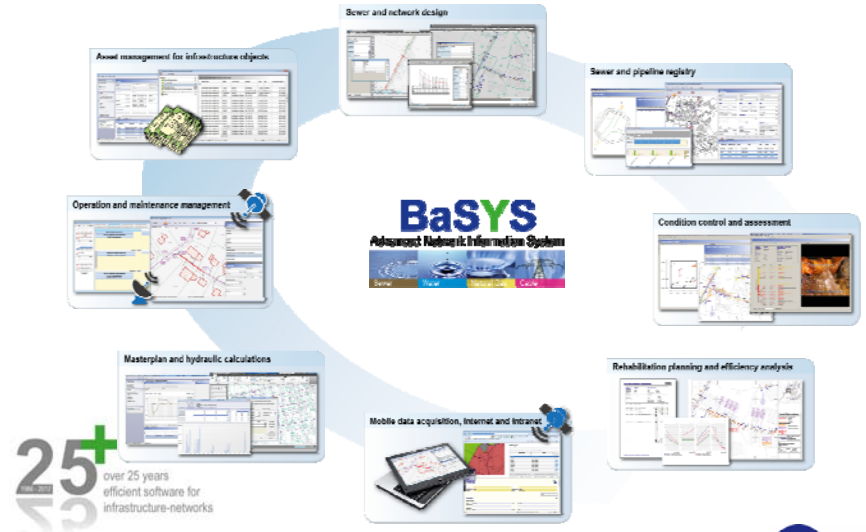
- Manhole rehabilitation technologys

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

MC GSTT

Trenchless innovations from Germany

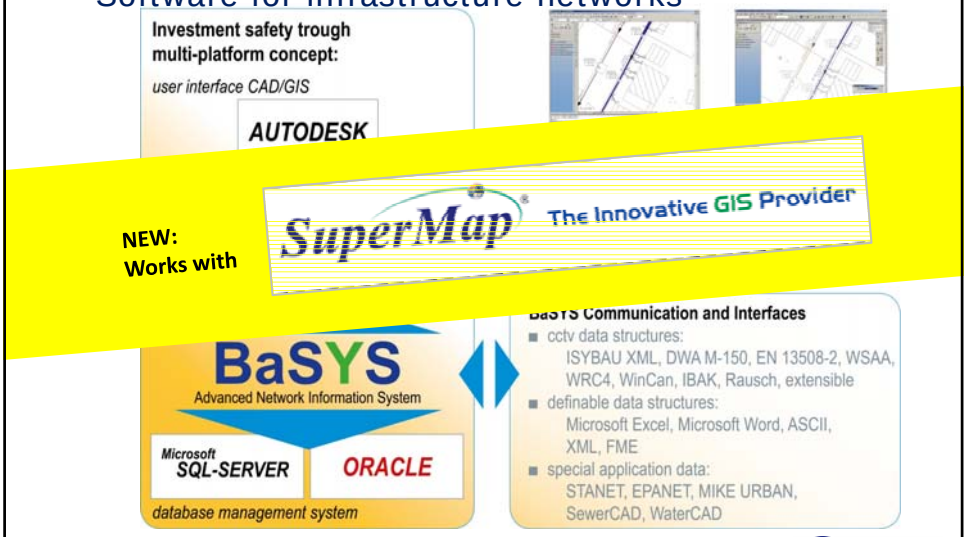
- Software for infrastructure networks



BaSYS Barthauer Software - the advanced Network Information System GSTT

Trenchless innovations from Germany

- Software for infrastructure networks



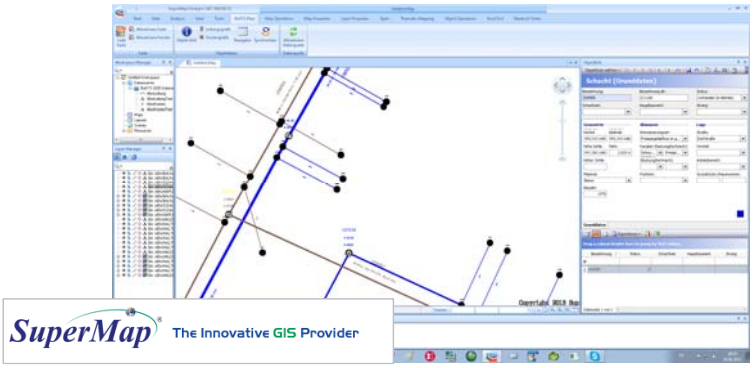
The worldwide unique BARTHAUER Multiplattform Concept

GSTT

Trenchless innovations from Germany

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



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

BaSYS Plan SP ***NEW***

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Trenchless innovations from Germany

Thank you for your attention !

Prof. Jens Hölterhoff - hoelterhoff@gstt.de

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