

# TRENCHLESS

i n t e r n a t i o n a l

In this issue | Australia | US | Poland | Germany | Canada | South Africa | Bulgaria | Denmark | UK



Microtunnelling

Water

Relining tools

July 2011

Issue 12

The official magazine of the ISTT





## FIRST RAILROAD CROSSING USING DIRECT PIPE®.

The Netherlands are expanding their gas transport network by building the North-South Route. Not far from the small city of Raalte in the province of Overijssel the pipeline route crosses the Zwolle Almelo railway line. This means that the jobsite team has to deal with settlement-prone conditions. A 516 meter (1,693ft) long 48" polypropylene coated steel pipeline string has to be installed with a shallow alignment and with close to zero subsidence under the busy railway tracks.

Thus, Dutch construction company A. Hak Drillcon decided to deploy the innovative Direct Pipe® method from Herrenknecht.

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Finally, Direct Pipe® proves once again to be an overall success when laying large pipeline diameters safely, efficiently and with great precision in difficult conditions. An unprecedented advance rate of almost 10 meters (32,8ft) per hour has been achieved when installing 92 meters (302ft) of pipeline in a single shift operation of 10 hours. The Pipe Thruster has pushed the complete pipeline together with the Microtunnelling machine forward with only 180 tons (397,000lbs).

This first railroad crossing using Direct Pipe® marks another milestone in pipeline construction.

### RAALTE | THE NETHERLANDS

#### PROJECT DATA

#### CONTRACTOR



**M-1493M, AVN1000XC**  
Diameter: 1,295mm  
Max. torque: 150kNm

A. Hak Drillcon

#### H-096, Pipe Thruster HK500PT

Max. push/pull force:  
500t (5,000kN)  
Pipeline diameter: 48"  
Pipeline length: 516m

Geology: sand, gravel, loam





**Sam Ariaratnam**  
ISTT Chairman



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**I WANT TO** welcome all of you to the summer season. For those of you that had to endure a long and harsh winter, this must bring a lot of relief. I know that many of you are quite busy, as this is generally the most active time of the year in terms of construction-related activity. For us academics, we generally use this time of the year to work on our research activities and write technical papers. It certainly is a nice reprieve from lecturing and classroom-related commitments.

It was great to see so many of you at the 29<sup>th</sup> International No-Dig Conference this past May in Germany. In fact, our ISTT Board of Director's Meeting was attended by a record of 25 out of 26 Affiliated Societies. Berlin was an excellent destination to showcase the latest innovations in the trenchless industry. I want to personally congratulate German Society for Trenchless Technology (GSTT) leaders Chairman Dr Jens Hoelterhoff, and Executive Director Dr Klaus Beyer, for their vision and dedication in organising such a successful event. In total, there were 173 exhibiting companies representing numerous technologies and a technical program with 51 peer-reviewed papers from 17 countries. The event attracted approximately 5,700 visitors. Having No-Dig co-located with Wasser Berlin International 2011 definitely brought added atmosphere to our event. A special thanks goes out to our many corporate sponsors including platinum sponsor, BKP Berolina, for their support of the 2011 International No-Dig.

My Chairman's Dinner was held in the historic Funkturm Berlin (Radio Tower Berlin) that was constructed between 1924 and 1926. Located on the exhibition grounds, this Berlin landmark tower reaches a height of 150 m and has magnificent views of the city. The restaurant that held the dinner was at a height of 55 m, accessible by an elevator travelling at speeds up to 4 m per second. It was a great evening of camaraderie among members of the international trenchless community.

The No-Dig Gala Dinner was held in the Great Orangery of the Charlottenburg Palace built in the early 18<sup>th</sup> Century. Guests were greeted by royal guards as they entered the reception area. The food and ambience was magnificent and we were all entertained by special performers. At the Gala Dinner, the 2011 ISTT Awards were handed out in six categories. You can read about all of these award winners in greater detail in the magazine. Special thanks to our Gala Dinner sponsor, Sekisui SPR, for a wonderful evening. It was a great honour to have the Chairman of the Board of Sekisui, Mr Naotake Okubo, and Managing Executive Officer, Mr Kozo Takami, in attendance. They were just two of the distinguished guests that attended the Gala Dinner.

We are all looking forward to the 30<sup>th</sup> International No-Dig Conference to be held in Sao Paulo, Brazil, from 12-14 November 2012. However, over the next 16 months leading up to the International No-Dig there will be a number of trenchless events hosted by our Affiliated Societies. In the next quarter, there will be trenchless shows in Singapore (SIWW/SgSTT: 4-8 July), South Africa (SASTT: 23-24 August), Colombia (CISTT: 31 August-2 Sept), Czech Republic (CzSTT: 12-14 Sept), and Hong Kong (CHKSTT: 28-29 Sept). I hope that you get a chance to attend one or two of these events. ☛

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# Renewal for the future



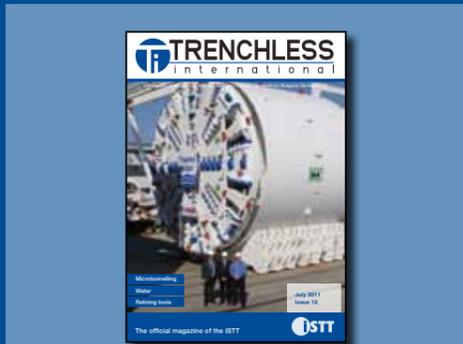
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The cover shows the 100 m Herrenknecht boring machine that Thames Water will use to construct a 4 mile tunnel under Englands River Lee. Read more on page 32.

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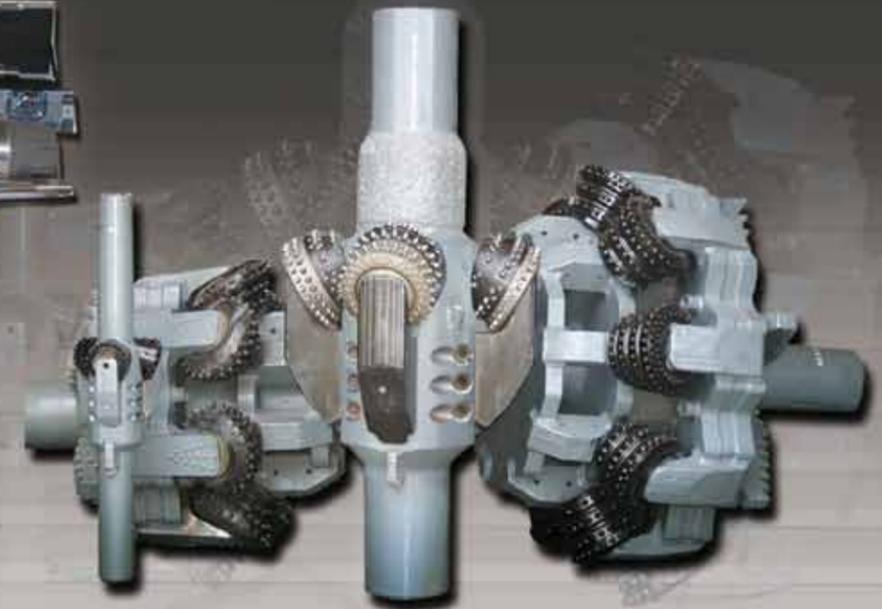
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**John Hemphill**  
ISTT Executive Director

THIS YEAR, ISTT celebrates its 25<sup>th</sup> anniversary. It is fitting that the 2011 International No-Dig was held in Germany. Since trenchless burst on to the scene as an underground construction option in the 1970s, Germany has been a leader in the adoption of trenchless methods and a pioneer in the development of many trenchless technologies – including micro-tunnelling. Representatives from Germany were active participants in the first No-Dig conference held in 1985 – a year before ISTT was officially established. Germany was also one of the first societies to become an affiliated member of ISTT.

Members of the trenchless community in Germany have held key leadership positions in the organisation of early trenchless events and in the formation of ISTT. Dietrich Stein was a charter member of the ISTT Board and served as its Vice President in the late 1980s and Rolf Bielecki served as Chairman of ISTT from 1996–98. Today, the German Society for Trenchless Technology (GSTT) has the good fortune to have Professor Jens Hoelterhoff as its Chairman and Dr Klaus Beyer as its Executive Director. I have enjoyed working with them, and with Dagmar Eichhorn, these past few months in the preparation of the 2011 No-Dig in Berlin.

The 2011 International No-Dig, held in conjunction with Wasser Berlin, continues the string of highly successful International No-Dig events. The 2011 No-Dig attracted a large audience from the underground construction industry to view the latest in technological developments and innovation. All told, more than 27,000 people attended the event, of which more than 5,000 were estimated to have visited the more than 130 No-Dig exhibitors. Over the course of three days, authors from 17 countries presented a total of 50 technical papers on a variety of trenchless topics to a knowledgeable and engaged audience.

Those who attended the Gala Dinner in the Orangerie of the Charlottenburg Castle were in for a special treat. The setting was spectacular and the entertainment was most original. The food was delicious and the company outstanding. ISTT is grateful to the Dinner's sponsor, Sekisui SPR, and to the many conference sponsors, including platinum sponsor, BKP Berolina, for their support of the 2011 No-Dig.

The highlight for ISTT was the presentation of the 2011 ISTT Awards. Each year, ISTT recognises special achievements in the trenchless field. For 2011, ISTT presented awards in six categories: The Project Award, New Installations went to PBG SA and Hobas Polska System for the Czajka Microtunnelling Project in Warsaw, Poland; the Project Award, Rehabilitation went to Stroitelna Mehanizatsia for the Rehabilitation of the Sofia Water Main in Bulgaria; the Product Award went to Hydrascan Limited United Kingdom for the Typhoon pipe cleaning system; the Academic Research and Training Award went to Professor Boasong Ma, China University of Geosciences – Wuhan for the establishment of a university level training course on Trenchless Technology; and the Student Paper Award went to Haitao Lan from the College of Engineering, China University of Geosciences-Wuhan for his paper on development of a model that improves the estimate of rotational torque and the selection of reamer size for large diameter pipe installations using HDD.

A hearty congratulations to GSTT and thanks from the ISTT community for hosting the 29<sup>th</sup> International No-Dig on this special year. We look forward to the next No-Dig to be held in Sao Paulo, Brazil from 12–14 November 2012.



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# World wrap

## Montreal pipes get a fix

Insituform Technologies has been awarded a \$US12.2 million contract with the City of Montreal, located in Quebec, for the rehabilitation of sewer pipelines. Insituform expects to rehabilitate over nine miles of wastewater pipelines, ranging from 10–42 inches in diameter. Work on the project is expected to be complete by the end of 2011.

## Relining in Wigtownshire

Scottish Water is carrying on with its £3.5 million upgrade of water mains infrastructure in Wigtownshire, located in Scotland. The project includes the rejuvenation of 369 miles of pipes, including replacing and at least 4,350 m of relining work taken out by Reid Pipeline Services as a subcontractor to Farrans.

## Bore to tackle London's sewers

A 100 m boring machine will be reassembled under east London and used to dig the UK's deepest tunnel ever at a rate of 17 m a day. Thames Water will be transporting the machine from Herrenknecht, in Germany, to construct the 4 mile £635 million Lee Tunnel.

## Pennsylvania pipe rehab receives funding

Approximately 36,000 ft sewer lines and manholes in Brackenridge Borough, Pennsylvania, will receive rehabilitation and spot repair after a \$US3.6 million grant from the Pennsylvania Infrastructure Investment Authority.

## Trenchless rehabilitation in India

Rehabilitation works on sewers have successfully been completed in Kolkata. As part of a €20 million project undertaken by Angerlehner Hoch and Tiefbau Gesellschaft mbH, the project included the rehabilitation of approximately 6.6 km over two streets, 152 manholes and three splitters.

## Water main rehabilitation in Omaha, Nebraska

Sanexen installation crew has successfully rehabilitated a leaking section of 8 inch water main using Aqua-Pipe, a structural CIPP lining technology. The faulty section of pipe was causing major problems to the University of Nebraska Medical Center (UNMC), especially because the section of pipe lay under a service tunnel on Emile Street – an area that is a critical access point to the UNMC personal and emergency vehicles.

## Pure win for Qatar

Pure Technologies will be wading in new territories with a leak detection contract in Qatar, the first Middle East commercial contract for the company. The project is part of three inspection and engineering projects for water and wastewater pipelines worth approximately \$US6.5 million.

## No-Dig South Africa

The Southern African Society for Trenchless Technology (SASTT) will be hosting No-Dig South Africa 2011, to be held in Pretoria from 23–24 August 2011. Read more on page 29.

Keep up to date with this news and more by subscribing to the *Trenchless International* online update.

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### Washington's 20-year project to start off with a tunnel

Washington's Clean Rivers Project will commence with the design and construction of the Blue Plains Tunnel, located in Washington DC, US. A \$US330.5 million contract has been awarded to Traylor Brothers-Skanska-JayDee joint venture by the District of Columbia Water and Sewer Authority. Costing \$US2.6 billion, the 20-year Clean Rivers Project is being undertaken to reduce combined-sewer runoff to the Anacostia and Potomac Rivers and Rock Creek by 96 per cent.

### Spring cleaning for Scottish Water pipes

Scottish Water will be improving more than 5 miles of water pipes and mains as the company kicks off two major projects in Maybole and Rothesay. Large sections of wastewater pipes will be cleaned and relined with cured plastic in Rothesay to tackle problems caused by saltwater intrusion. The project will be running alongside Scottish Water's work on the Maybole fresh water scheme, which involves relining about 2.7 miles of existing mains with a thin polyurethane coating.



### Naperville's new-look pipes

The City of Naperville Department of Public Utilities-Water has started work on a sanitary sewer and manhole rehabilitation project, located in Illinois, US. The project contractor will use cured-in-place pipe to complete the work. The sewer being rehabilitated will help transfer wastewater from the City of Warrenville, and the northwest portion of Naperville, to a large wastewater pumping station located at River Road.

### Joint venture promotes US, Asia partnership

Insituform has announced the creation of two joint ventures with Kuala Lumpur-based Wasco Energy. Bayou Wasco Insulation Technologies LLC, will be based in New Iberia, Louisiana, to provide offshore insulation services. Meanwhile, WCU Corrosion Technologies will be based in Singapore to provide the product and service offerings of Corpro Companies and United Pipeline Systems, each an Insituform subsidiary, throughout Asia.



### Breaking ground in Waller Creek

Construction work has kicked into gear for Austin City Council's \$US49.5 million Waller Creek Flood Control Tunnel Project, located in Texas, US. Groundbreaking work has started on the project designed to remove almost 28 acres of downtown land from the 100-year floodplain and create a safer area for redevelopment. Crews will create an entrance shaft and construct a 26 ft diameter, almost mile-long tunnel.

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### Berlin a success

The Trenchless Technology sector enjoyed the success of the 29<sup>th</sup> International No-Dig Conference and Exhibition in Berlin.

The conference, which was run in conjunction with Wasser Berlin, was highlighted by the Construction Site Day and Gala Dinner and Awards Night.

Make sure to check out the *Trenchless International* website for photos from the event.

### Wastewater upgrade in Wales

Welsh Water has commenced a scheme, involving construction and modification of new and existing manholes and associated pipe work, in the town of Buckley, located in Wales, UK, to alleviate flooding and deliver environmental benefits.

The utility company will increase capacity on the local wastewater network, which will enable it to deal with larger volumes of stormwater during periods of heavy rainfall.

Welsh Water is investing £1.3 billion in its water and sewage network between 2010 and 2015.



### Acquisition furthers trenchless services in US

SAK Construction has expanded its Trenchless Technology services in the US with the acquisition of Pipenology, a California-based contractor.

The acquisition expands the company's Western US presence, which currently includes major contracts in California, Nevada, Utah, Colorado, New Mexico, Arizona and Texas.

### Relining, replacing, rejuvenating in Scotland

Moray's water supply network, located in Scotland, will receive a £4.5 million upgrade by Scottish Water, including the refurbishment of 120 miles of water main.

Some pipe is being replaced, while other sections are being relined or flushed clear to remove naturally-occurring sediment that has built up over many years.



### Progress for London's pipes

Thames Water has published a report on its four month public consultation for the proposed Thames Tunnel, to be located in London, UK.

The report stresses that no final decisions have been made and that there will be a further phase of consultation later in 2011, before which Thames Water will present revised and updated plans with additional detail for each preferred site.

The report found the majority of people who expressed an opinion supported the tunnel as the best way of addressing the problem of sewage overflow into the water and the 'Abbey Mills' tunnel route was the preferred option.

### Contract to address flooding in the UK

Thames Water has appointed Black & Veatch to appraise flooding resilience at a number of its key water treatment assets within London and the Thames Valley, UK.

The work is part of a £4.9 billion investment program, from 2010-15, to help protect infrastructure and maintain water security for the utility's 8.7 million customers within the region.



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### Companies join forces to provide trenchless services

Cured-in-place pipe lining, pipe-bursting, swagelining and manhole rehabilitation are amongst the technologies available through a new partnership between SAK Construction and Choice Facility Partners.

Choice Facility Partners, a Houston-based co-operative that aims to streamline bidding and contracting processes for infrastructure in the US, handles contracts for projects for a variety of non-profits, including cities, counties, school districts, colleges and universities.

SAK Construction was selected through a competitive bidding process as Choice Facility Partners' 'contract partner' in the master category of Trenchless Technology rehabilitation.

### More capabilities for wet infrastructure modelling

Innovyze is hoping its enhanced *CapPlan Sewer* asset management capabilities will improve wet infrastructure modelling and management application.

The company's sixth version allows utilities to plan system improvements by scoring the probability and consequence of failure for each underground asset. Consequence of failure ranking draws on data such as service to critical facilities, total flow carried, population served, adjacent vehicular traffic, and other related geospatial factors.

*CapPlan Sewer V6* is able to run on either the ArcGIS-based InfoSWMM or stand-alone H2OMAP platform.



#### Correction:

In *Trenchless International* April it was incorrectly stated that the EXPERT statue is awarded at the 9<sup>th</sup> International Trenchless Engineering Conference. The award is called the 'TYTAN', we apologise for this error. For more information visit [www.konferencja.inzynieria.com/inzynieria](http://www.konferencja.inzynieria.com/inzynieria) email [agata@inzynieria.com](mailto:agata@inzynieria.com) or call +48 12 351 10 90

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# Business marketing: the value of advertising online

by Zelda Tupicoff

Does your marketing plan include a budget for online ads? Find out why placing advertisements online is no longer an optional extra.

**REMEMBER WHEN YOU** first developed your company website? Just like email, your website has revolutionised the way you sell your company, products and services to the world. Search engine optimisation can only take you so far and to reach highly engaged individuals searching for vital information, it's important for your company to be advertising on the websites that matter in your industry.

## But what are the benefits of advertising online?

### Timely promotion and flexibility

The immediacy of online advertising ensures that products can be introduced to the market very quickly. There is also design flexibility so web adverts can be eye catching and alternate between different banners. This also allows you to test different messages in short periods of time to see what is most effective.

### Tracking capabilities

The best thing about online advertising is its ability to track the performance of your campaigns. Through using online advertising your company has the ability to track every single click and every single user to see if they end up becoming customers. It is worthwhile downloading Google Analytics – it's free and will allow you to track the pathway visitors are taking to your site and their movements within your site. Are your online ads generating traffic? Which sites referring visitors to your site? Google Analytics can help give you the answers.

### Cost effective

Banner advertisements offer great value due to low production costs. If you have advertised before then you know that just one advertisement may not have the phones ringing hot, so think about what your aims are and perhaps look at booking a series of advertisements and combining this with strategically placed editorial content. Most websites have packages available and these should offer the best value and exposure over varied periods of time.

### High volume

The sheer volume of visitors to industry websites means that by advertising you are highly visible to many new readers and potential leads. Most industry websites offer site visitors a free subscription to their e-newsletter, which is often sent weekly or fortnightly to thousands of subscribers. By signing up these e-newsletter subscribers have demonstrated a high-level of engagement so advertising in e-newsletters is highly coveted and tends to be a more exclusive and expensive online advertising option.

### Test the market

Advertising online is a great way to cost-effectively test if a particular market is a good fit for your product or service. If you have a well-designed online advertisement and you are advertising on the right industry website then you should get some decent traffic – and those all important leads.

### Entire industry coverage

The best way to get entire industry coverage is to take out advertising in print, online, and have an event presence. Having a presence in all three will ensure your brand is at the fore of a highly targeted audience. If your company can only initially afford one or two of these promotional opportunities – the results will speak for themselves and you will have a clear case to argue for an increase in next year's marketing budget.

TIP: If you are taking out multiple advertisements then you should be rewarded with a discount, but also ask about securing some editorial coverage to maximise your impact.

### Highly targeted

Visitors to industry websites are usually looking for information to help them do their job better, so they are highly engaged. Every person who views your advertisement is a prospective customer and you need to convey instantly that your product or service is what they need.



Zelda Tupicoff.

## Creating an online campaign

This package complements your print and event marketing and establishes you as a leader in the industry. It includes leading positions across your industry website and e-newsletter and ensures that everyone knows who you are and what you have to offer.

### Product sales

Aimed at getting results, this option gives you strategic placement of your advertising across your industry website and e-newsletter, as well as being able to include product stories on the industry website, which will help drive traffic through product related searches, allowing you to reach an even wider audience of people looking specifically for the products you are supplying.

### New product launch

Get out there fast with this time-sensitive option, which will help you create a buzz. This includes strategic positions combined with a headline banner and a newsletter story about your product launch.

### Event promotion

Holding an event? This is designed to help you promote it. As well as strategically placed ads on your leading industry site, ensure you get an event listing on the events page and see if the salesperson can organise a news story before and after the event.

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WEBSITE	SIZE	PRICE per month
Headline Banner Maximum of 3 ads on rotation -- one displayed at a time	Leaderboard: 728 pixels x 90 pixels	\$US400
Inline Banner Maximum of 3 ads on rotation -- one displayed at a time	Full banner: 468 pixels x 60 pixels	\$US250
Right Banner -- up to 3 banners with 3 banners on rotation	Side squares: 250 pixels x 250 pixels (can be less than 250 high)	\$US200
Background Banner -- 1 ad on both sides	Background: 164 pixels x 472 pixels (X2)	\$US1200

E-NEWS	SIZE	PRICE per month
Headline Banner -- one displayed at a time	Leaderboard: 728 pixels x 90 pixels	\$US400
Left Top (displayed directly after news article) -- one displayed at a time	Full banner: 468 pixels x 60 pixels	\$US300
Left Bottom (displayed directly after events news) -- one displayed at a time	Full banner: 468 pixels x 60 pixels	\$US200
Right Banner -- up to 3 in one of two configurations (can be less than 250 high)	Side squares: 250 pixels x 250 pixels (can be less than 250 high)	\$US250

Combine any two units for a 5% discount  
Combine any five units, or any one unit with any print advertising – 10% discount

## Larger geographical audience

There is always a portion of international readers opting for online subscriptions over print, so being seen on your industry website is a great way to ensure you are reaching an overseas audience that may not be familiar with your products and services. It never hurts to be noticed by the big overseas players in the market – who

knows, they might want to make a purchase, invest or even buy your company.

## Just online, all online?

So, you're a convert – you have decided your company needs to start advertising online. But what about your magazine advertising and exhibiting at prominent industry trade events? The good news is

that online advertising is the perfect complement to your other marketing efforts. Online advertising is rarely enough on its own but by combining it with print and event participation in a strategically planned campaign, your company will receive maximum industry coverage and make a significant impact.

## Writing your advertisement

Perhaps you have tried online advertising and you didn't get the great results you expected? Be warned: the advertisement you run in your print campaign will not be suitable for online. If you use the same sort of advertisement you are unlikely to get the traffic you deserve. For best results you should make an offer and be instructive (find out, how to, click here). Through the use of 'active words' (for example: order, reduce, choose, use, apply) you can entice people to click your advertisement and learn more about your offer/product/company.

## Want help?

Great Southern Press specialise in marketing solutions for companies in the trenchless industry and can create effective marketing campaigns for companies that include online advertising. Find out more query@gs-press.com.au or +61 3 9248 5100.

### Branding campaign

This package complements your print and event marketing and establishes you as a leader in the industry. It includes leading positions across your industry website and e-newsletter and ensures that everyone knows who you are and what you have to offer.

- 3 month web headline
- 2 issues e-news headline
- 1 issue e-news left top
- 3 issues e-news right
- 2 issues e-news left bottom
- 1 month web online
- 2 month web right
- Dedicated online editorial coverage of your activities

### Product sales

Aimed at getting results, this option gives you strategic placement of your advertising across your industry website and e-newsletter, as well as being able to include product stories on the industry website, which will help drive traffic through product related searches, allowing you to reach an even wider audience of people looking specifically for the products you are supplying.

- 2 issues e-news left top
- 2 month web online
- 3 issues e-news right
- 3 month web right
- 1 issue e-news left bottom
- 1 e-news article

### New product launch

Get out there fast with this time-sensitive option which will help you create a buzz, this includes strategic positions combined with a headline banner and a newsletter story about your product launch.

- 3 issues e-news right
- 3 month web right
- 2 issues e-news left bottom
- 1 issue e-news left top
- 1 e-news article announcing launch

### Event promotion

Holding an event? This is designed to help you promote it. As well as strategically placed ads on your leading industry site, ensure you get an event listing on the events page and see if the salesperson can organise a news story before and after the event.

- 3 issues e-news right
- 3 month web right
- 2 issues e-news left bottom
- 1 issue email left top
- 1 e-news article pre event
- 1 e-news article post event

# Industry publisher recognised

*Trenchless International* publisher and Managing Director of Great Southern Press (GSP) Chris Bland has been elected to the board of Publishers Australia.



Trenchless International Publisher and Managing Director of Great Southern Press Chris Bland.

**SPECIALISING IN WORKING** with companies and associations to drive industry growth in the energy and infrastructure sectors, in the past eight years Chris has taken GSP from a small one-title publisher to a modern media company with over ten integrated print and online titles and a series of events.

Chris' appointment is recognition of GSP as one of the leaders in the Australian media industry. GSP has set a

new standard with its unique approach to industry engagement through association partnerships and this election is further evidence of the success of this model.

Chris said "We've been heavily involved for many years with the associations we publish for, such as ISTT and the ASTT, so it's great to bring this perspective to our own industry association, as well as hopefully gaining a better understanding of the board perspective."



# Trenchless, eh!



*Trenchless International* is pleased to announce a new Canadian office, based out of Toronto, Ontario, with Associate Editor Sarah Paul heading it up.



Trenchless International Associate Editor Sarah Paul.

Sarah has been with Great Southern Press for two years working on publications such as *Trenchless Australasia*, *Trenchless International* and most recently has joined the *Pipelines International* team.

Sarah is looking forward to showcasing the trenchless industry in North America

through the publication and meeting you at North American events.

Sarah can be contacted on + 1 416 551 9113 or spaul@gsp-press.com

Kate Pemberton will continue to edit both *Trenchless International* and *Trenchless Australasia* magazines.

# Mears internationally certified



Mears Group, Inc., a leader in horizontal directional drilling (HDD), through its commitment to continual improvement, has gained the internationally recognised ISO 9001:2008 Quality Management System certification.

**SENIOR VICE PRESIDENT** of HDD Neil Smith said "After a thorough assessment of our processes, and by engaging every employee in this special project, the ISO 9001:2008 certification chal-

lenge allowed our company to step up to a much higher standard of quality and excellence that permeates not only the mentality of our entire team, but mostly the way we do things at Mears."

Mears Group has accomplished the ISO 9001:2008 quality certification for its HDD division (Certificate No. 45626) as well as its Integrity Solutions division (Certificate No. 45396).

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# Trenchless champions

The 2011 International No-Dig Gala Dinner and Awards night was an enchanting evening, held in the Charlottenburg Castle in Berlin. Trenchless Technology received the royal treatment with some great projects and people recognised for their outstanding achievement in the industry.



## Project of the Year - New Installation

**Winner: PBG SA and HOBAS Systems Polska**

The PBG Group installed a large collector system, owned by MPWiK-Warsaw and located in an urbanised area of Warsaw. The Czajka micro-tunnelling project installed a pipeline system that collects wastewater previously untreated and transports it to a new wastewater treatment plant.

The pipe selected for this project was HOBAS CC-GRP pipe. This project established a number of records – world's largest CC-GRP pipe, length of total project (5,700 m) and length of single drive (930 m). The contractor was able to achieve tight grade tolerances of 0.55 per cent and high production rates of 36 m per day, at peak, at lower cost than open cut with minimal impacts on city life and the environment.

To read more on this project turn to page 36-38.

## Project of the Year - Rehabilitation

**Winner: Stroitelna Mehanizatsia AD**



Sofijska Voda, the operator of the Sofia water and sewer system, needed to restore a 1,220 mm diameter thin-walled steel water pipeline, which had been out of service since the mid 1990s. The 850 m project was located in a densely populated district with narrow rights-of-way.

The project had to be completed within 40 days, without unduly restricting access to residential property, and in temperatures that were routinely well below freezing. A semi-structural liner using cured-in-place pipe was chosen.

An additional challenge emerged when the contractor discovered the inversion system lacked the capacity to handle some of the sections to be rehabilitated. The contractor designed, built and tested a new inversion vessel and had it ready to use in three weeks. The project, which was completed successfully on time, has won over the customer on the merits of Trenchless Technology.

To read more on this project turn to page 42.



## Academic Research & Course of the Year

**Winner: University of Geosciences – Wuhan**



Professor Baosong Ma, University of Geosciences – Wuhan, has established a 40-hour course on the Science of Trenchless Engineering (STE). The course structure includes lectures, laboratories, and tutorials on all aspects of Trenchless Technology.

Since it was established in 2004, more than 300 undergraduate and 100 graduate students have taken the STE course. Professor Ma's STE course has an outstanding reputation and has contributed to the advancement of trenchless practices in China. In 2010, the course received awards for academic achievement from the Chinese Ministry of Education and China University of Geosciences – Wuhan.



## Product of the Year

**Winner: Hydrascan Limited**

Hydrascan Limited has developed the Typhoon, a pipe cleaning system that uses water pressure for propulsion and to clean water mains. Hydro jets power the Typhoon away from the launch point to a predetermined target area.

An onboard valve switches the pressurised water from propulsion to cleaning via a radially arranged system of manifolds and fan jets. The bulk of the water used in cleaning is recycled, solids are removed and the clean water reused in the next cleaning run. The cleaning system is fully adjustable and highly controllable. The system has a 500 m range, requires only one access point and can clean upstream and downstream as well as up to valve faces.

To read more on this product turn to page 43.

## Student Paper of the Year

**Winner: Haitao Lan, University of Geosciences – Wuhan**

Haitao Lan, a student in the College of Engineering, University of Geosciences – Wuhan, presents the results of his research to better characterise the predictability of torque requirements and reamer selection in large diameter pipe installation using horizontal directional drilling in rock strata.

Mr Lan developed a new predictive model for estimating rotational torque in large diameter HDD operations. The model included reamer size as a variable, which improved the accuracy of rotational torque estimates, and provides a means for analysing and selecting the appropriate reamer for projects with similar geological conditions.

Make sure to check out the ISTT website for more news on the 2012 International No-Dig, to be held in Sao Paulo, Brazil, from 12–14 November.



## Bob Westphal recognised: Person of the Year

A highlight of the NASTT No-Dig Show in Washington, D.C., was the recognition of Michels Corporation Senior Vice President of Construction Operations Bob Westphal as the 2011 Trenchless Technology Person of the Year.

Mr Westphal has been with Michels since 1965 and currently oversees Michels Pipeline Construction, Michels Directional Crossings, Michels Pipe Services and Michels Canada.

Michels Corporation President Pat Michels said "Bob has been a valued employee of the Michels family for more than 45 years and has been instrumental in Michels entering the horizontal directional drilling business. He is a highly respected individual in the trenchless technology industry and we are very proud of him and his accomplishments. We're extremely pleased that he is being recognised and is receiving this illustrious, well deserved award."

Mr Westphal was presented with his award at the NASTT Kick-off Breakfast. He was joined by his wife, Jone, his four sons and their partners, and other valued members of the Michels team.

"I am so very humbled by this," Mr Westphal said. "I am joining a very prestigious group of individuals who have been chosen over the years. When you are awarded something like this, there really aren't words that you can put forth to describe how you really feel."

Congratulations, Bob!

Michels Corporation has been pioneering innovative new technologies for more than five decades. With a proven track record of success, Michels has earned a sterling reputation while growing from a small pipeline construction company into one of the largest utility contractors in North America.

For more information, please visit [www.michels.us](http://www.michels.us) or email [corpinfo@michels.us](mailto:corpinfo@michels.us)



In the April edition of *Trenchless International*, it was incorrectly stated that Michels Corporation's headquarters are located in Brownsville, Texas. We apologise for this error. Michels Corporation's headquarters are based in Brownsville, Wisconsin.

# ISTTT



## Ian Vickridge retires

The trenchless society bid former China Hong Kong Society for Trenchless Technology (CHKSTT) Chairman Ian Vickridge farewell at a retirement dinner in April.

Mr Vickridge, who was also a technical secretary for the United Kingdom Society for Trenchless Technology, will spend the first part of his retirement trekking in Hong Kong.

CHKSTT Chairman Jon Boon said Mr Vickridge has been active in the industry for many years and has been a friend and advisor to many within the industry.

"The Hong Kong Society and the UK Society wish him well in his retirement."



## Experts to gather in Poland 2012

No-Dig Poland will be returning in 2012 from 16-19 April, to be held at The Uroczysko Hotel, Kielce, Poland.

The conference, which is organised by the Polish Foundation for Trenchless Technology (PFTT) and the ISTT, occurs every second year. In 2012, ISTT Chairman Dr Samuel Ariaratnam will be presenting.

During the conference, the 4<sup>th</sup> annual EXPERT Statuettes will be presented. The statuettes are awarded to companies for their innovations in products as well as technology for trenchless installation or refurbishment of underground networks. All companies, as well as institutions, are invited to take part in this competition.

The companies can submit for the following categories:

- Trenchless Installation in 2010-2011
- Trenchless Rehabilitation in 2010-2011
- The innovative solutions in the range of devices, products or technology used for trenchless installation or refurbishment as well as for diagnostics of underground networks in 2010-2011.

For more information on the event and how to submit your projects visit [www.nodigpolandtu.kielce.pl](http://www.nodigpolandtu.kielce.pl)



## NASTT No-Dig 2012: Call for Abstracts

NASTT is now accepting abstracts for its 2012 No-Dig Show to be held in Nashville, Tennessee, at the Gaylord Opryland Hotel and Convention Center, 11-15 March 2012.

Prospective authors are invited to submit a 300-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. Be quick: the abstracts must be submitted electronically via the No-Dig Show Web site at: [www.nodigshow.com](http://www.nodigshow.com) by 30 June 2011.

What has your society been up to? Send your news, events and updates to Kate Pemberton at [kpemberton@gs-press.com.au](mailto:kpemberton@gs-press.com.au) and let us know how you're supporting the trenchless industry.

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# ISTT No-Dig: Berlin



The 2011 ISTT No-Dig was held in Berlin, from 2-5 May, in conjunction with trade expo Wasser Berlin. The event was a resounding success including 173 exhibiting companies, 51 peer reviewed papers from 17 countries and memorable social events.



## ISTT Board Meeting

The ISTT Board Meeting attracted a record number of Affiliated Society representatives, 25 out of 26 societies were in attendance.



## Chairman's Dinner

The Chairman's Dinner was held at the radio tower restaurant, the Funkturm Tower, which stands 150 m high. The guests enjoyed beautifully prepared food, including the in-season asparagus, whilst appreciating stunning views of the sun setting over the city.



## The Exhibition

The conference and exhibition was held at the Messe Berlin fairgrounds. The expo attracted approximately 5,700 visitors. In the GSTT Hall, many companies shared beer and edible delights, as well as the latest trenchless products and services.



A thought provoking element of the event was the photography exhibition of underground spaces and people involved in the trenchless industry. Photographer Ulrich Winkler is pictured with GSTT International representative Dr Klaus Beyer.



## Construction Site Day

A highlight of No-Dig Berlin was the construction site visit day. The GSTT, together with Berlin Water, organised sites throughout the city to demonstrate trenchless installation and rehabilitation techniques in action. Over 650 people took part in the well organised and fascinating site tours.



## No-Dig Gala Dinner

The ISTT Gala Dinner, sponsored by Sekisui SPR, was held at the enchanting Great Orangery of the Charlottenburg Palace built in the early 18<sup>th</sup> Century. Guests were delighted by the food and entertainment. The 2010 ISTT award winners were also presented with their trophies. Turn to page 20 for more information.



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# Bursting the impossible



In Atlanta, Georgia, HammerHead and Brent Scarbrough & Company teamed up to complete a tricky sewer upside project, using pipe bursting.

**FOR FIVE YEARS**, the City of Atlanta had a problem: an ageing, 18 inch diameter sewer pipe that had been partially exposed due to erosion caused by a nearby creek. The plan called for a dramatic upside – to 28 inch diameter HDPE pipe – because decades of urban growth had rendered the original pipe's capacity seriously insufficient.

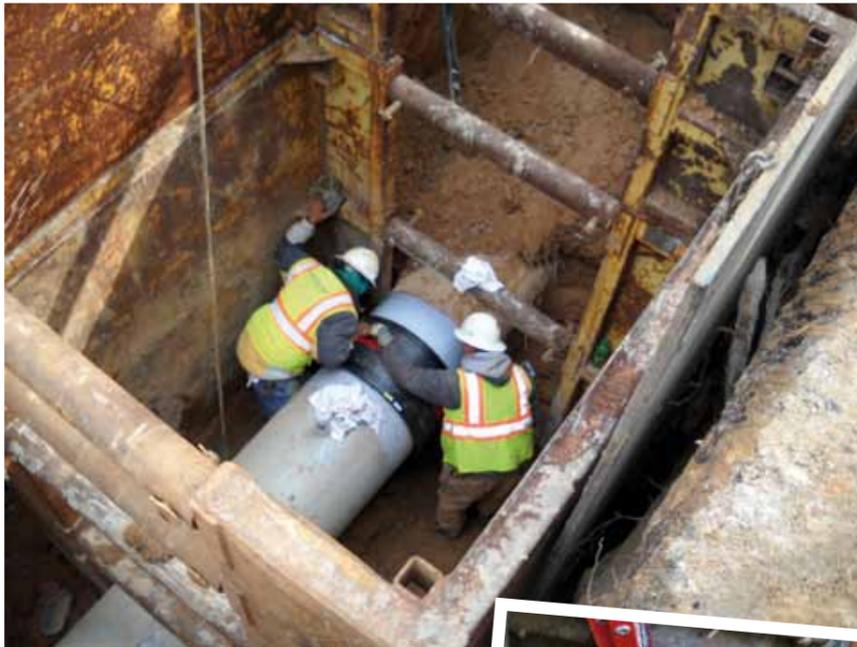
The substantial upside wasn't the only issue at hand. The existing 18 inch reinforced concrete pipe was as close as two feet from some of the largest Progress Energy overhead distribution power poles, which help provide power to most of northern Atlanta. In addition, a network of fiber-optic lines that supplies communications services to more than half of downtown Atlanta was buried in close proximity to the pipe. To make the project more challenging, also close by were an environmentally sensitive creek, a wildlife preserve, and an elite parochial school.

Atlanta city officials realised that replacing this line was going to be no easy task, as every contractor that they approached turned the project down due to the level of difficulty.

The surrounding utility infrastructure mandated that a trenchless solution would be necessary to replace the 1,000 ft section of pipe. These obstacles, plus the close proximity of a creek and the position of the existing pipe under the edge of a road, made pipe bursting the most practical trenchless method.

Pipe bursting involves driving a powerful bursting head through an existing utility pipe, fracturing or cutting it in the process, then pulling in new pipe of equal or greater size. Pipe bursting is efficient because it follows the path of existing utilities, reduces utility strike risks, and eliminates up to 85 per cent of excavation work compared to open-cut methods.

Because the project involved a quintuple upside, it was classified by the International Pipe Bursting Association (IPBA) as a Class C or 'experimental' burst. A standard upside is 2 inches; expanding the pipe diameter 10 inches, from 18 to 28, amounts to a quintuple.

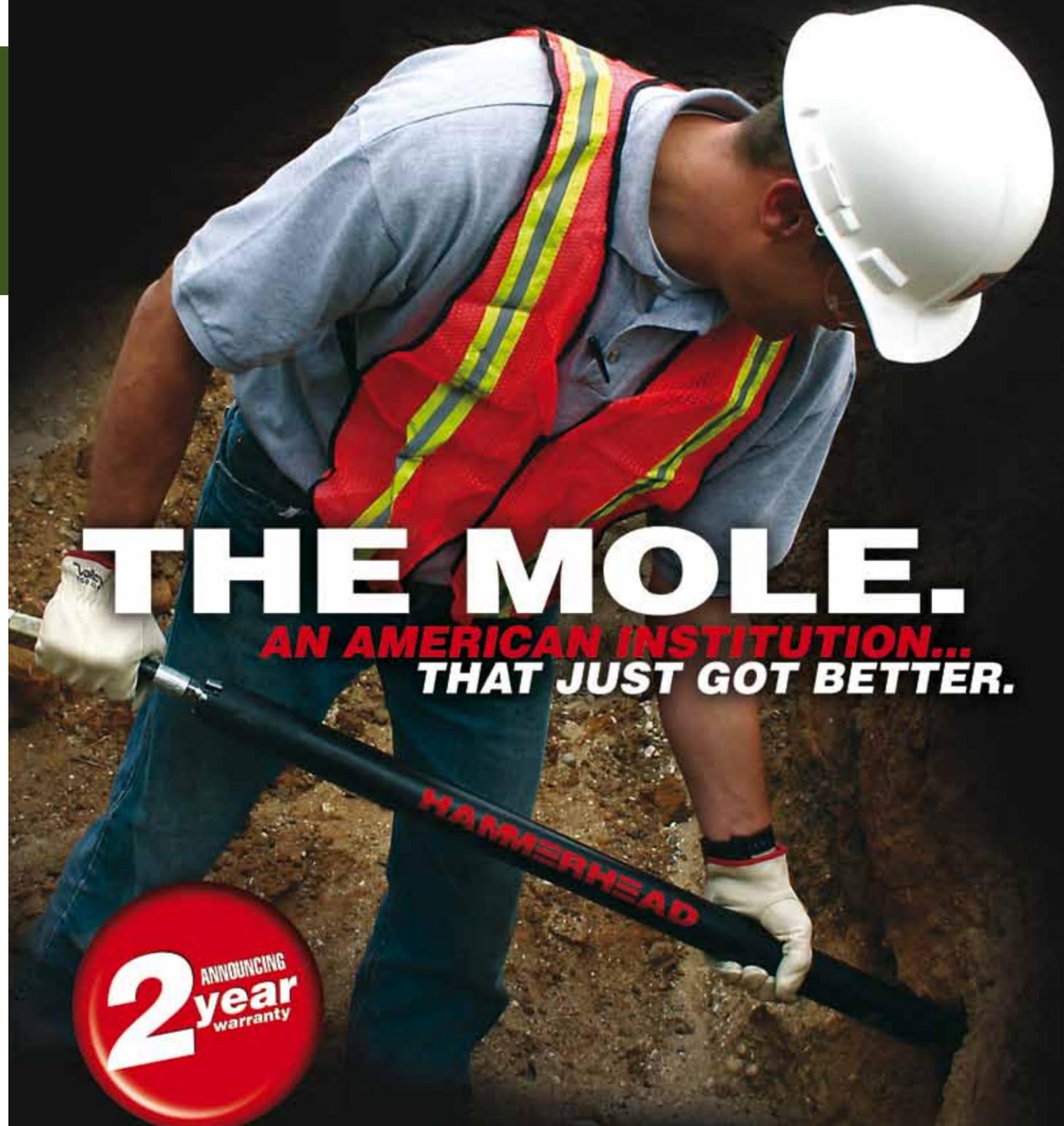


With so many challenges in addition to the upside, experimental was definitely an appropriate term for the project. Impossible was the term most contractors gave it when asked to submit a bid!

Brent Scarbrough & Company (BS&C) of Fayetteville, Georgia, was willing to take on the challenge. In fact, BS&C was the only contractor in the area that demonstrated the confidence and capability to get the job done, thus earning the contract from the City of Atlanta. In business since 1985, BS&C is one of the leading site development companies in the south east United States, providing a

wide range of services including erosion control, clearing and grading, and installation of sanitary sewers, storm drains, water lines and hardscapes.

The success of the project would require extensive planning and collaboration among the contractor, utility owner and equipment manufacturer. One of BS&C's first steps was to contact HammerHead Trenchless Equipment to discuss details of the replacement. A HammerHead technician was sent to assess the specifics of the job. →



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# No-Dig goes to South Africa

The Southern African Society for Trenchless Technology (SASTT) will be hosting No-Dig South Africa 2011, to be held in Pretoria, from 23-24 August 2011.



service. In many areas these lines were right on top of the sewer line, so fiber contractors were given time to place temporary lines next to the power lines in order to maintain service throughout the project.

Also taken into account was traffic flow in the area. In planning the job, BS&C contractors and a HammerHead representative took extra time to walk the job and observe traffic flows to determine how to minimise project downtime, as the Department of Transportation would only allow BS&C to work on the road until 5 pm.

"As a team, Scarbrough and HammerHead devised a plan that helped overcome the large upsize of the sewer line, the close proximity of the power poles, and the traffic control plan," said Mr Murray.

Equipment selected for the project included HammerHead 24 inch pneumatic pipe bursting hammers, a HammerHead HydroGuide HG20 winch, and the customised burst head and pilots.

In February 2010, after extensive planning and preparation, it was finally time to begin the replacement process. For the first burst, BS&C was able to complete a 400 ft section in about three and a half hours. The next burst was longer, 550 ft, but it only took a little more than four hours.

Throughout the pipe bursting process, power and communications services were maintained, traffic flowed without significant delays, school remained in session, and the surrounding environment was not affected. Thanks to careful planning, the collaboration of many dedicated professionals, and state-of-the-art HammerHead equipment, the City of Atlanta now has a new sewer line that can meet its demands.

density of the ground in these exposed areas could cause the hammer to come out of the existing pipe. To prevent this, HammerHead would have to design and build a special bladed pilot that would keep the burst head and the hammer inside the existing pipe.

"The staff at HammerHead provided excellent technical support and immediate response to mechanical needs," said Mr Murray.

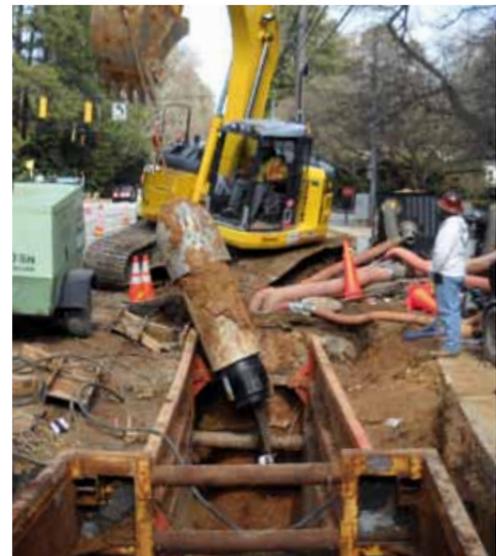
Another major issue was the power distribution poles running parallel to the existing sewer line. The poles were made of solid concrete, 90 to 100 ft tall, and anchored 20 to 30 ft below ground. Representatives of Atlanta Power & Light would be a constant presence on the jobsite to ensure that the poles were not dislodged or moved.

And then there were the fiber-optic communication lines that connected half of northern Atlanta's phone and internet

Project Manager for BS&C's pipe bursting division Jon Murray said "We had numerous conversations about the equipment and bursting tools. The proper equipment is always the key to a successful burst. By using HammerHead we were confident that the equipment would perform and help us complete our jobs with great success."

The most immediate concern was the quintuple upsize, which involved a substantial expansion not only for the pipe burst but also the burst head, which had an outside diameter of 33.4 inches. Walking the path of the job, the technician noticed the sections of pipe that had been exposed by erosion.

This prompted concern that the lack of



**THE TWO-DAY EVENT** will be supported by ISTT and feature the ISTT Trenchless Masterclass, which will provide attendees with an overview of the latest trenchless techniques and detailed sessions on specific topics such as inspection, repair, rehabilitation, replacement and new installation.

A certificate of attendance will be provided to all delegates and South African professional delegates will receive CPD points.

ISTT Chairman Dr Sam Ariaratnam and immediate past chairman and industry leader Dr Dec Downey will be leading the masterclass.

The simultaneous exhibition is the SASTT's first major event to showcase Trenchless Technology and will provide suppliers of equipment and services with an opportunity to present a range of products and services to their audience.

Trenchless Technology is an internationally recognised progressive and modern solution for the installation and refurbishment of underground services – particularly in urban areas where

the disruption to the public and the environment is minimised.

As South Africa plans a huge program of new infrastructure installations and continues extensive repairs to ageing underground services across the country, the staging of No-Dig South Africa 2011 is particularly relevant and timely for many engineers wishing to get up-to-date on the latest techniques and products.

For more information visit [www.nodigsouthafrica.com](http://www.nodigsouthafrica.com)



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# A short history of auger boring

by Robert Martin, CH2M HILL

Auger boring has evolved significantly in its 80 year history. Here Robert Martin presents a short history of auger boring technology and developments.

**HORIZONTAL AUGER BORING** has come a long way from its start in the coal mining industry in the early 1930s (Hartman, 1992). In 1941, Kandal Motors started manufacturing the first marketable Auger Boring Machine (ABM), making the technology commercially available (ASCE, 2004). Over time, the ABM was modified and improved to meet contractors needs, including splitting the ABM along with an increase in power and thrust to keep pace with the increasing drive length and need for a larger diameter jacking pipe. Early ABMs were not as dependent on accuracy and did not have mechanisms that allowed steering. Today, utility owners and engineers require that strict line and grade tolerances be maintained, and manufacturers have made significant strides in making ABMs steerable to meet the growing demand. At its infancy, ABM usage was limited to mining in silts, sands, and gravels above groundwater, and rock with unconfined compressive strengths less than 4,000 psi (28 MPa). Developments over the past 20 years have extended the variability of ground conditions within which ABMs can operate.

There are two distinct conventional ABM methods: the Track Method, in which the casing is advanced in the jacking pit on a predetermined length of track, and the Cradle Method, in which there are limited

operations in the pit and the casing is suspended from a crane and advanced forward by a hydraulic winch hooked to a jacking lug secured at the bore entrance.

## Conventional auger boring

Conventional ABM methods can be coupled with specialised cutting heads, such as the large diameter boring attachment (LDBA) that can facilitate the installation of pipe sizes ranging from 4 to 156 inches (0.1 to 4 m) and is effective in a wide variety of ground conditions, ranging from dry sand to firm clay (optimal) to solid rock. Conventional auger boring methods can accommodate cobbles and boulders up to about 30 per cent of the casing diameter. Generally, auger boring is not compatible with cohesionless soils subject to groundwater head; however, short granular layers interbedded with cohesive soils forming a plug can be mined with this technique. The largest pipe installed in the US using conventional ABM methods to date was completed in Phoenix, Arizona, and was 520 ft (170 m) long and 84 inches (2.1 m) in diameter.

## Pilot tube method

Horizontal auger boring is also used in conjunction with the Pilot Tube Method (PTM), a multi-stage method of accurately installing product pipe by use of a

guided pilot tube and followed by upsizing to install the product pipe (Akkerman, 2011). This method has been commonly referred to as "pilot tube microtunneling" and the "guided boring method." PTM can accommodate installations with pipe diameters up to 48 inches (1.2 m) drive length of up to approximately 400 ft (120 m). Pilot head steering is accomplished by aligning an angled pilot head for the desired course and thrusting forward. PTM can be used in soils where blow counts are greater than zero but less than 50, and are displaceable. Large cobbles and boulders can prevent the pilot tube from advancing, and may halt or modify the installation process. Recent developments such as lubricants for loose sands, water control reaming heads for wet sands, and testing of air hammers for use in rock will increase the range of subsurface conditions in which PTM can be used. The recommended drive length of PTM is up to about 300 ft (90 m), with a few recorded drives greater than 500 ft (150 m), but the drive length depends on subsurface conditions and pipe diameter (Akkerman, 2011).

## Small boring

In 1996, Robbins Company developed Small Boring Unit (SBU), a specialised rock-cutting head used in conjunction with the ABM to efficiently cut rock with

a UCS greater than 4,000 psi (28 MPa) (Long, 2006). The cutting head technology incorporated into the SBU had been in use for more than 50 years on hard-rock cutting tunnel boring machines. There are two kinds of SBU: SBU-A, in which the cutting head is powered by the ABM, and SBU-M, in which a separate motor powers the cutting head. SBUs are best suited for full-face rock. They have been used in mixed-face conditions and some

in full-face soil application, but such use is not recommended if soils are not partially cemented. SBUs operate above the groundwater and work well in weathered rock or cemented cobbles; however, they are not suitable for use in soils. The longest drive to date 600 ft (183 m) for the SBU-A will likely remain the upper limit for the machine (Sivesind, 2011).

Conventional horizontal auger boring, the catalyst for all other auger

methods, has undergone many changes over the past 75 years, from its early days in mining coal to completing 600 ft (183 m) crossings in rock with strict line and grade tolerances. Each boring method presented above has unique characteristics, but construction related risk is one thing all methods have in common. Risk can include steering variability, long drives and associated high frictional forces, obstructions, groundwater conditions, and operator experience. Any of these risks could result in an unsuccessful crossing and must be considered by designers before undertaking any trenchless project. More information on this topic is presented in "Auger Boring—A Historical Review of Techniques and Applications" (Martin and Grolewski, 2011).

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## References

- Akkerman, Inc. 2011. <http://www.akkerman.com/>. American Society of Civil Engineers (ASCE). 2004.
- Horizontal Auger Boring Projects. ASCE Manuals and Reports on Engineering Practice No. 106. pp. 2-5.
- Hartman, H. 1992. SME Mining Engineering Handbook, 2<sup>nd</sup> ed., Volume 2. Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado. p. 1447.
- Martin, R. and Grolewski, B. 2011. "Auger Boring—A Historical Review of Techniques and Applications. North American Society for Trenchless Technology (NASTT)", No-Dig Show 2011 Proceedings.
- Sivesind, C. the Robbins Company 2011. Personal Correspondence with R. Martin, February.



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# London digs deep

As part of its five year investment on essential works to improve ageing water pipes, sewers and other facilities, Thames Water, located in the UK, has two major tunnelling projects in the works – Lee Tunnel and River Thames. Here, Trenchless International provides the most up-to-date information on the projects.

## Lee Tunnel

The £635 million tunnel is expected to prevent 16 million tonnes of sewage entering the River Lee each year, a result of London's Victorian sewers not being big enough to cope with heavy rainfall.

A 100 m boring machine will be reassembled under east London and used to dig the UK's deepest tunnel ever.

From mid-June, the tunnelling machine will be transported to London, where it will be reassembled in sections at Beckton sewage treatment works, before it is lowered into the ground.

The machine will be transported by barge via Germany's River Rhine to Rotterdam then shipped across the North Sea to Tilbury, on the Thames estuary in Essex,

before being driven by lorry to Beckton.

Thames Water's Head of Capital Delivery Lawrence Gosden said "This machine is the best of its kind in the world.

"Tunnelling is a risky business, especially on a project of this scale, so it's essential we use the best available technology and ensure every last detail meets our unique requirements," he said.

The largest piece of the machine is the 7 m diameter cutter head, which will be transported in four parts. Even in pieces, the equipment will be so wide Thames Water will need to temporarily move lamp posts and other obstacles on nearby streets to get it to site.

A slurry closed faced tunnel boring

machine is being used to tunnel the 4-mile route beneath Newham. It will blend 1,000 tonnes of excavated chalk with water, forming a white slurry – a similar consistency to single cream, before transporting it through a pipe the length of the tunnel, so it can be processed above ground.

"The Lee Tunnel is the first of two tunnels, which will collectively capture an average of 39 million tonnes a year of sewage from the 35 most polluting combined sewer overflows," Mr Gosden said.

Tunnelling work on the Lee Tunnel is due to begin in January 2012 and is expected to finish in late 2013. The machine is likely to progress at a rate of 17 m a day.

## About the Thames Tunnel

The proposed Thames Tunnel is a sewer up to 20 miles long, the width of three London buses, which needs to run from west to east London, up to 75 m below ground, broadly following the route of the River Thames.

It is needed to help capture the 39 million tonnes of untreated sewerage which are discharged each year into the River Thames via Combined Sewer Overflows (CSOs), and transfer it to Beckton Sewage Works for treatment.

The CSOs were designed by the Victorians as a safety feature to prevent the sewers – which capture both sewage and rainfall – from backing up into streets and gardens when full. Used only occasionally in the 19<sup>th</sup> century during heavy storms, these overflows can now discharge sewage into the river after as little as 2 mm of rainfall. Although the Victorian sewers are still in excellent condition and are the backbone of today's sewerage system, they are not big enough to cope with a 21<sup>st</sup> century city which has trebled in size since 1850 and is continuing to grow. Many green spaces have been concreted over, preventing natural drainage and causing more rain water to enter the sewers.



Lee Tunnel project team in front of tunnel boring machine. From L-R Project Manager Mark Sneesby, Head of Program Deliver Nick Fawcett and Deputy Project Manager Roger Mitchell.

## River Thames Tunnel

Work to test ground conditions from previously unexplored depths beneath the River Thames – including clay formed 50 million years ago – will continue until the end of June 2011, to help Thames Tunnel engineers develop the best tunnelling route and strategy.

Two rigs are drilling boreholes along the stretch of the riverbed up to 70 m beneath the river to provide core samples, which will be tested to identify the various conditions the tunnelling

machine is likely to encounter – which include chalk in the east, mixed gravel in the middle and clay in the west.

The Thames Tunnel is urgently required to help tackle the 39 million tonnes of sewage discharged into the River Thames each year, due to lack of capacity in the capital's Victorian sewerage network.

Head of the London Tideway Tunnels Phil Stride said "We need to build up a thorough technical understanding of the potential constraints along the proposed

route to help us refine our scheme ahead of the second phase of consultation due in Autumn 2011.

"Eighteen boreholes will be drilled by the two rigs, supplementing the samples from the 200 cores we've already taken over the past year. Lab tests will provide us with a detailed understanding of the ground conditions, such as the levels of flint in the chalk, which will inform the design of the tunnel and the four large tunnel boring machines we will need to construct the Thames Tunnel."

Ground investigations have already been completed in locations including Hammersmith and Fulham, Lambeth, Nine Elms and Vauxhall. Ground samples obtained will be added to a national library of samples, which is held by the British Geological Survey, after construction.

The target date for the submission of the planning application is 2012. Initial construction of the Thames Tunnel is provisionally scheduled to start in 2013 with completion expected in 2020.

In addition to the Lee Tunnel and proposed Thames Tunnel, Thames Water is also upgrading London's five major sewage works so they can treat more waste, preventing them becoming overloaded in rainfall, and improving the quality to which sewage is treated, to further improve river water quality. MVB, made up of three of the country's leading civil engineering contractors – Morgan Sindall, VINCI Construction Grands Projets and Bachy Soletanc are working together to deliver the Lee Tunnel.

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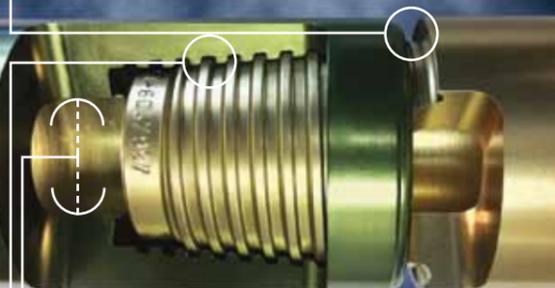
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# Jacking in Japan: the pipe roof method

by Toru SATO<sup>1,2</sup>, Tony SUZUKI<sup>2</sup>, Hideki SHIMADA<sup>1</sup>, Takashi SASAOKA<sup>1</sup>, Kikuo MATSUI<sup>1</sup>

In many cases, tunnels in an urban area are constructed near existing facilities and structures, in soft ground that contains underground water. For this kind of work, structural stability of the tunnel and the nearby structures and facilities is vital. Thus, pipe roof method, a closed trenching method, has been attracting the attention of engineers in many countries as a supplementary construction method.

**PIPE ROOF CONSTRUCTED** by slurry pipe jacking has been established as a non-disruptive pipe line repair technique. This method utilises mud slurry that is formed around the pipes in order to stabilise the surrounding soil.

## Slurry pipe jacking

Mud slurry and lubricant are injected into the face and void between the concrete pipe and the soil respectively. Slurry fills the soil voids and the soil stabilises due to the resulting mud slurry around the pipes. In Japan, a slurry type pipe jacking method within the range of 300–1,000 mm in diameter is used.



Photo 4: Slurry type pipe jacking machine.

The aim of using slurry pipe jacking with the pipe roof method is to extend tunnelling operation into urban areas in the most demanding conditions, such as non-cohesive soils, working in presence of ground water, limitations in surface settlement and different overburden depth. It is proposed that this be achieved through the use of the microtunnelling technique to build drifts, forming the lining of large tunnels.

This article describes the application of a pipe jacking system on the pipe roof method, analysed using the finite element method (FEM) analysis program. Different positions of the pipe rooms were used in this study in order to examine the stability of the excavation and natural ground for the pipe roof method.

## Pipe roof technology in Japan

Pipe roof refers to a roof matching the shape of the tunnel that is formed prior to tunnel excavation by installing steel pipes. Figure 1 shows a schematic view of the pipe roof method.

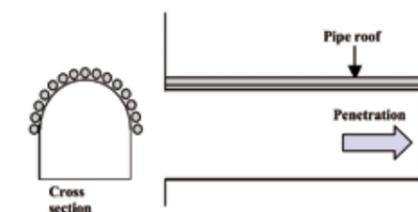


Figure 1: Schematic view of the pipe roof method.

Methods of pipe roof construction can be classified into three types; horizontal boring; auger; slurry type pipe jacking. Recently there has been an increase in the slurry jacking in pipe roof construction.

The horizontal boring method is used for variable soil conditions when installing pipes, with a rotating cutter bit in front of steel pipe. In Japan, the diameter range is 100–300 mm.

In the 1960s, the first example of pipe roof method, using horizontal boring method, was executed in the construction of the Atami Tunnel for the bullet train, Shinkansen. The steel pipe successfully

controlled and prevented any subsidence from the excavation. A congested urban environment of hotels and roads meant that ground subsidence had to be avoided; this consideration led to the decision to install the pipe roof.

Photo 1 and 2 show the view of the first example of pipe roof method [1].

Tolerance cannot be guaranteed with the horizontal boring method as there is no control device for directional steering. Generally, this method has a tolerance of approximately 1/200 of driven length [2].



Photo 1: View of tunnel for the first example of pipe roof method.



Photo 2: View of the first example of pipe roof method.

## Pipe roof method was superior in the maintenance of ground stability

Auger boring incorporates augers that remove the soil from the bore and are not suitable for wet soil conditions below water level. The driving device is located in the launching shaft, which means the drive length is restricted. Drive length is about 50 m. In Japan 300–600 mm diameter is typically used. Photo 3 shows an auger method machine.



3: An auger method machine.

## Conclusions

Pipe roof method was superior in the maintenance of ground stability, and in Japan there are many results by this pipe jacking method, but there are few studies and theoretical examination. The study of pipe roof construction method needs to be studied further.

Method	Tolerance of construction of driven length	Tolerance of construction of the length at 60 m
Horizontal boring	1/200	Approximately 0.3 m
Auger	1/300	Approximately 0.2 m
Slurry pipe	1/2,000	Approximately 0.03 m

Table 1 shows tolerance of construction. Slurry pipe has clear benefits.

## References

- 1] S. Saitou, Pipe roof method, Rikotosho Inc., pp.20-21 (1983).
- 2] N. Ishibashi et al, Pipe jacking and pipe roof method, Journal of civil engineering, Vol.52 No4, pp.27-102 (1997).

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This is an edited abstract from the up-coming No-Dig Down Under 2011, to be held 3–6 October at the Brisbane Convention and Exhibition Centre, Australia. Toru Sato will be delivering this paper along with case studies. For more information or to register visit [www.nodigdownunder.com.au](http://www.nodigdownunder.com.au)

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# Extreme and extraordinary: connecting Czajka underground

The underground connection to the new Czajka wastewater treatment plant in Warsaw, Poland, was completed successfully and on time. Two Herrenknecht AVND micromachines handled the difficult drives with a total of 5,860 m with bravura.

**AS WELL AS** pipe jacking, with extraordinarily large diameters of 3 m, the extreme winter conditions and a high groundwater level, demanded top performance by everyone involved. With performances of up to 36 m a day, the Herrenknecht machines blazed the trail for an efficient new wastewater system in the Polish capital fast and efficiently.

Wastewater systems in many large cities have already reached their limits requiring modernisation or expansion in order to avoid overflowing into nearby rivers. For this reason, the city of Warsaw is investing in the construction of a state-of-the-art wastewater treatment system. This will treat the wastewater produced by 80 per cent of Warsaw's inhabitants, thereby improving the quality of water and life along the banks of the Vistula over the long term. Hydrobudowa 9 S.A., PRG Metro Sp.z.o.o. and KWG (PBG Group) were commissioned to connect the plant with the underground wastewater network.

The Polish contractors selected the pipe jacking method for the tunnel project

and relied on the two AVND2000AB (with Extension Kit, Ø 3,025 mm) and AVND2400AB (Ø 3,025 mm) hydroshields from Herrenknecht. This type of machine is used globally in the construction of supply and disposal tunnels; the machines are able to tunnel through groundwater and can penetrate a wide range of heterogeneous soils. In Warsaw, the machines tunnelled at depths of 10 to 14 m reaching their final targets after boring through 5,860 m of soil comprising coarse and fine sand, clay, loam, gravel and boulders.

### Project challenges

The high groundwater level, which in some places reached up to 8 m above the top of the pipes, was a significant challenge on the project. The site teams were obliged to dewater and seal the requisite construction shafts prior to tunnelling. The Herrenknecht AVND pipe jacking machines proved its worth during this tunnelling process.

Where required, these machines secure the tunnel face using a support

fluid, such as bentonite and water mixture, and an additional compressed air cushion in the split excavation chamber, allowing safe tunnelling, under water pressure. The separation of solids of the excavated material from fluids was realised with the Herrenknecht Separation Plant HSP500, providing a capacity of 400 to 500 m<sup>3</sup>/h depending on the particle size distribution.

During the particularly cold winter months of 2010, the site team continued tunnelling work despite some extremely low temperatures and a lengthy period of frost. The micromachines completed a total of 16 drives, some with short distances starting at 80 m, but also including long-distance sections of 800 m and more.

The longest individual drive was 930 m. The hydroshields safely under-passed a six-lane highway without having any negative impact on the flow of traffic. Hydraulic intermediate jacking stations serve to reduce the friction forces prevailing in such long-distance tunnelling projects.

Herrenknecht had already adapted these interjack stations exactly to the thin walls of the HOBAS GRP pipes installed in Warsaw.

The longest section revealed yet another particular feature: two underground curves with a radius of 450 m and 900 m had to be realised. Thanks to the SLS RV navigation system the cutterhead is guided exactly with millimetre precision, the machine operators also mastered this task in a precise and safe manner.

The last section was completed on 14 December 2010, representing a significant milestone for the wastewater project. During the construction project, the equipment achieved impressive advance rates of up to 36 m a day, on a double shift, and an average of 20 m per day.

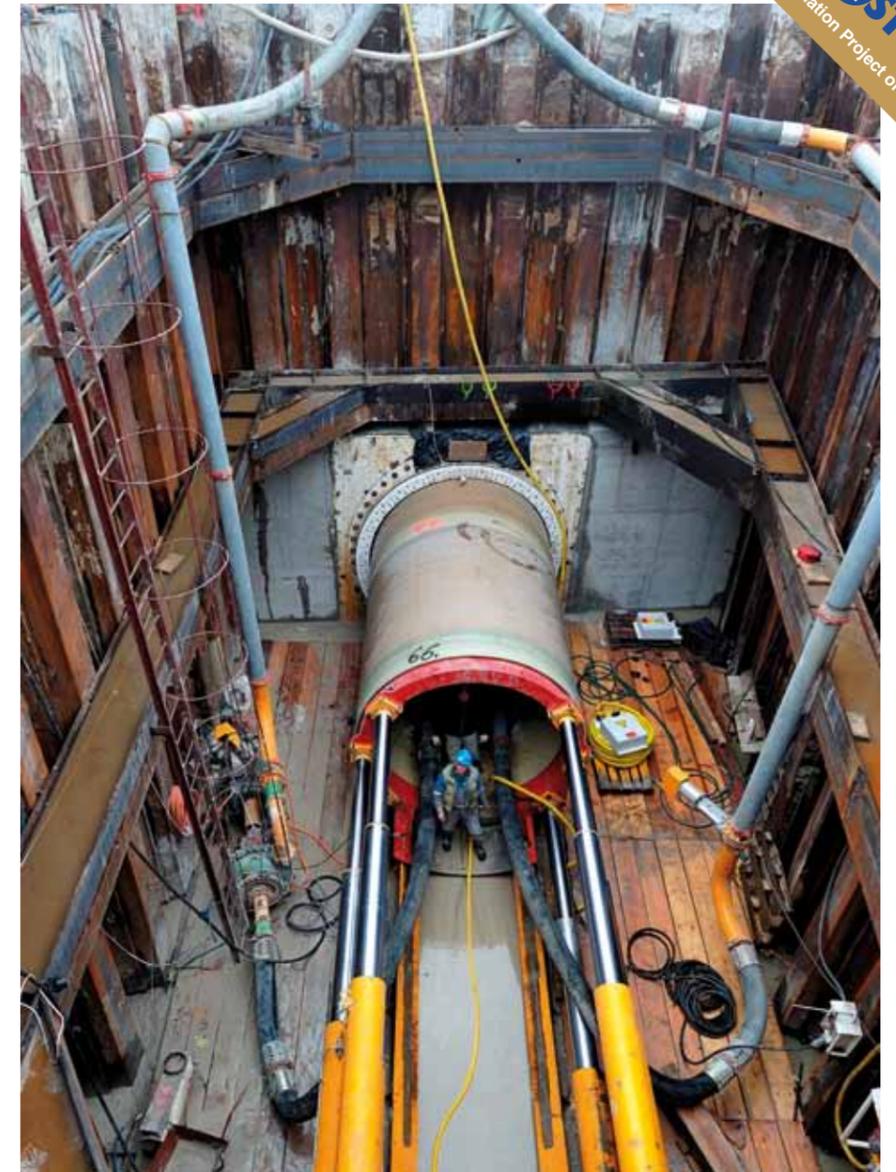
To complete the entire sewer system and connect it with Czajka wastewater treatment plant (WWTP), PRG Metro Sp.z.o.o. and Hydrobudowa 9 S.A. are also completing the 1,300 m long Vistula River Crossing tunnel with a Herrenknecht large diameter tunnel boring machine. The Mixshield S-642 with a diameter of 5.35 m was successfully accepted in February 2011 in the Schwanau/Germany plant of Herrenknecht. Once this tunnel is completed the Czajka WWTP will go into operation.

### Project data

- Wastewater tunnel in Warsaw, Poland
- **Geology:** 70 per cent coarse and fine sand, 30 per cent clay and loam, gravel, boulders
- **Tunnel lengths:** total of 5,860 m, 16 drives of 80 to 930 m
- **Particular features:** high groundwater level, long-distance driving, curve drives.

### Machine data

- Herrenknecht M-1083M, AVND2000AB with Extension Kit, excavation diameter 3,025 mm
- Herrenknecht M-1363M, AVND2400AB, excavation diameter 3,025 mm
- **Cutterhead:** mixed-soil cutterheads fitted with disc cutters and cutting knives
- **Maximum torque:** 780 kNm, 1,200 kNm
- **Tunnel lining:** pipe jacking.



The jobsite teams realised in total 16 tunnel sections with lengths up to 930 m with pipe jacking.



To connect the sewer system with the Czajka wastewater treatment plant, the Herrenknecht Mixshield S-642 (Ø 5.35 m) will be used for the 1,300 m long Vistula River Crossing tunnel.

Ready to go: the Herrenknecht AVND2400AB for the underground connection of a new wastewater treatment plant in Warsaw, Poland.



Award winning project Czajka – The large diameter of the HOBAS CC-GRP Jacking Pipes was only one of the record breaking features in the project.

# World best in Poland

After receiving the national No-Dig Award by the Polish Society for Trenchless Technology (PFTT) in 2010, Hobas, along with construction company group PBG, was awarded the 2010 ISTT No-Dig Project of the Year Award - Installation for their Czajka project, in Warsaw, Poland. The award was presented to them at the recent conference held in Berlin, Germany.

**THE 3 M** large HOBAS CC-GRP jacking pipes were utilised for the trenchless installation of an intercepting sewer leading to the wastewater plant, known as Czajka, in Warsaw. The pipes' extra large diameter, along with the extraordinary length of micro-tunnelled line were not the project's only impressive features. Thanks to the excellent properties of the pipe material, national as well as international records were broken regarding the single drive lengths from one pit of up to 930 m, the peak installation speed of 36 m per day and the small number of drives in the total

of 5.7 km partly curved lengths. Implemented by assignment of the MPWiK Warsaw (City Waterworks) and supported by the EU Cohesion Fund, the job is part of the largest environmental EU project – Water Supply and Sewage Treatment for Warsaw. Microtunnelling 5.7 km of a 3,000 mm diameter HOBAS CC-GRP pipes, with state-of-the-art Trenchless Technology, led to the shortest possible installation time. This also kept impacts on the environment and city-life to a minimum. With the combination of installation method and chosen pipe material the PBG Group executed

an economically and ecologically beneficial solution providing exceptionally long service life. The project drew more than 500 international visitors, to the site in Warsaw during the 13 month installation works and showcased the technological importance this successfully implemented project presents. At the ISTT No-Dig Berlin Gala Dinner, held at the Charlottenburg castle, Chairman Dr Samuel Ariaratnam presented HOBAS and PBG with the award for Czajka. For more information on the project please see *Trenchless International* April or visit [www.trenchlessinternational.com](http://www.trenchlessinternational.com).

# Sustainable Water Solutions for a Changing Urban Environment

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## Programme At A Glance

TIME	MORNING	LATE MORNING	AFTERNOON	LATE AFTERNOON	EVENING	
Monday 4 July	Golf Classic	Technical Tours	Southeast Asia Water Ministers Forum		Opening Ceremony & Welcome Reception Guest of Honour <b>Mr Tharman Shanmugaratnam</b> , Deputy Prime Minister & Minister for Finance and Manpower, Singapore	
	World Cities Summit Mayors' Forum		Water Convention			
	Co-located Events					
Tuesday 5 July	Water Conversation with Mr Lee Hsien Loong, Prime Minister, Singapore	Water Ministers Plenary	Singapore Water Lecture	Water Convention	Lee Kuan Yew Water Prize Award Ceremony & Banquet Guest of Honour <b>Mr Lee Kuan Yew</b>	
	Water Expo					
Wednesday 6 July	Water Leaders Summit Roundtable & Workshops		China Business Forum			
				Japan Business Forum		
				Southeast Business Forum		
Water Convention						
Water Expo						
Thursday 7 July	Australia Business Forum		Americas Business Forum			
	Europe Business Forum		Middle East & North Africa Business Forum			
	India Business Forum					
Water Convention						
Water Expo						
Friday 8 July	Technical Tours		Co-located Events			
	Co-located Events					

Information accurate as of 1 June 2011



# Rebuilding Canterbury's underground



Following the devastating Christchurch earthquakes, Sydney Water and pipeline rehabilitation companies have been involved with sewer rehabilitation works in the New Zealand city.



**MORE THAN 80** per cent of Christchurch's water and sewer systems were severely damaged by the devastating earthquakes in September 2010 and February 2011. In response, Sydney Water co-ordinated a taskforce with six Australian pipeline rehabilitation companies to provide personnel and equipment to the disaster affected areas. Members of Water Infrastructure Group were part of the team helping to restore the city's sewerage system. Water Infrastructure Group redeployed resources so that a team of seven skilled operators and three trucks, equipped with a CCTV camera and water jetting work, could travel to New Zealand.

Water Infrastructure Group's Project Manager in Christchurch Kevin Kane said that when the taskforce arrived in March, approximately half of Christchurch's 1,700 km sewer network was not functioning.

"As a result of liquefaction, many of the sewer pipes have been left full of sand that is hardening. We're using 2,000 psi water jetting hoses to soften the sand so that it can be removed," he said.

"Our hoses are fed into manholes and can push through the pipes for up to 200 m. When the hydraulic reel on our trucks winds the hose back to the manhole, the sand and water follows the hose back toward the manhole. We can then use suction hoses to pump the sand into trucks for removal."

Mr Kane said that by Easter, it was estimated that 65 per cent of the network was working.

"There have been aftershocks and it is frustrating to arrive at a section of pipe we've successfully cleared to find that all our good work has been undone by further liquefaction," he said.

"This means that it will take longer to get the network fully functioning but I'm confident we will get there and people in Christchurch will be able to get back to a more normal way of life.

"The effects of the earthquake have been severe and the dusty conditions mean that we have to do a lot of maintenance on our equipment but we are making progress."

Despite the setbacks Mr Kane said "I think I can speak for the whole team

when I say that although the conditions are challenging it's been very rewarding to be part of this massive clean-up operation."

Once the sewer pipe is clear of sand, the team will be able to send CCTV cameras down the pipe to check for structural damage and provide help with any further work required.

"We are helping to get the system working again as well as providing information collected with our CCTV equipment and advice for the next rehabilitation phase to fully reinstate the sewerage system," Mr Kane said. "This will be a huge task and could take years to complete."



**The Christchurch earthquake**

The 2011 Christchurch earthquake was a magnitude 6.3 (ML) earthquake that struck the Canterbury region in New Zealand's South Island at 12:51 pm on Tuesday, 22 February 2011 local time. The earthquake was centred 2 km west of the town of Lyttelton, and 10 km south-east of the centre of Christchurch, New Zealand's second-most populous city. It followed nearly six months after the magnitude 7.1 Canterbury earthquake of 4 September 2010, which caused significant damage to Christchurch and the central Canterbury region, but no direct fatalities.

The 2011 earthquake caused widespread damage across Christchurch, especially in the central city and eastern suburbs, with damage exacerbated by buildings and infrastructure already weakened by the 4 September earthquake and its aftershocks. Significant liquefaction affected the eastern suburbs, producing around 200,000 tonnes of silt. The earthquake was reported to be felt across the South Island and the lower and central North Island.

In total, 181 people were killed in the earthquake, making the earthquake the second-deadliest natural disaster recorded in New Zealand (after the 1931 Hawke's Bay earthquake), and fourth-deadliest disaster of any kind recorded in New Zealand. It has been estimated that the total cost of rebuilding to insurers will be approximately \$US11.5-12 billion.

Visit [www.trenchlessinternational.com](http://www.trenchlessinternational.com) for references.





## Outstanding rehab teamwork

The rapid renewal of a steel water pipe, under tough conditions during a Bulgarian winter, earned Stroitelna Mehanizatsia and Sekisui SPR Europe the ISTT No-Dig Award 2011 for Rehabilitation Project of the Year.

**THE COMPANIES WERE** recognised for the outstanding rehabilitation project in Sofia, Bulgaria, at the 29<sup>th</sup> International No-Dig Conference and Exhibition, held in Berlin.

International Sekisui SPR Europe (SSPRE) Group Chief Executive Officer Edmund Luksch said "The ISTT has honoured one of the most exciting construction projects with its renowned award. That makes us and our partners very proud."

Using the Nordipipe pressure line, the team renewed a steel water pipe with a working pressure of 7 bar and a diameter of 1,220 mm, within the space of only a few weeks. A new inversion vessel, with a diameter of 3,000 mm, was specially developed for the purpose.

### Project scope

Stroitelna Mehanizatsia rehabilitated an 850 m section of a 30 year old pipeline below narrow streets of an old residential district in Sofia, which included a crossing underneath a railway. Population pressure meant that the pipeline could not be taken out of service for an extended period.

Construction could not start until December, but had to be completed by mid-January. In view of the large diameter and the thin 8 mm walls, SSPRE used the Nordipipe pressure liner as a semi-structural solution.

The severe cold hindered not only jet cleaning the host pipe with pressure water, but the impregnation, because it was difficult to keep the resin fluid. A further challenge was that due to minimum thickness requirements of the impregnated liner, only sections up to 90 m could be rehabilitated.

Stroitelna Mehanizatsia developed a new inversion vessel for the liner – likewise within the extremely tight deadline – tailor-made for rehabilitating sections of up to 110 m in length in this project.

This enabled the inversion to be completed successfully in all nine sections.

### Maximum performance from man and technology

Stroitelna Mehanizatsia General Manager Stefan Zhelyazkov said "The biggest challenge with this project was

to motivate my team to complete the work in the short time and to believe in themselves."

"Our employees did a great job and we were able to count on the full support of SSPRE. Our success is thus thanks to the complete family of SSPRE companies, who gave optimum cross-border support for the installation of the Nordipipe liner."

### Successful co-operation

A total of 45 tonnes of liners and resin were installed in only 35 days, including both the Christmas and New Year holidays.

"Due to the complexity of the construction project we had, of course, hoped for the recognition of the ISTT," Mr Zhelyazkov said. "Nevertheless, the announcement of the award came as a surprise and we are absolutely thrilled."

For more information on Sekisui SPR visit [www.sekisuispr.com](http://www.sekisuispr.com)



## Typhoon: best new machine

The Typhoon, developed by Gateshead based Hydrascan Ltd., in association with Northumbrian Water, was awarded ISTT 'Best New Machine' at the 2011 No-Dig Gala Dinner held in Berlin, Germany.

**THE AWARD FOLLOWS** the machine's success in winning the UK Society for Trenchless Technology (UKSTT) Award for innovation last year, and being short listed in The Engineer's Innovation Awards.

Developers of the Typhoon system believe it is the best solution to the problem of cleaning water mains infrastructure on pipes between 4 and 60 inches in diameter.

Typhoon was created in response to a challenge set by Northumbrian Water for an efficient means of cleaning the larger trunk mains as part of its four-year, £30 million, mains cleaning program. The scheme will improve drinking water quality to 500,000 people in South East Northumberland, North Tyneside and the north of Newcastle.

In 2007, the water company tested a number of systems during field trials and awarded Hydrascan – a subsidiary of Kilbride Industrial Services – a contract with Lumsden & Carroll Civil Engineers to clean approximately 50 miles of water mains in Northumberland.

The tethered pig system uses water jetting for its propulsion and cleaning functions and was developed from technology used in the oil and gas industry.

Requiring only a single entry point, the system cleans up to 1 km of pipe at one time, and will save water authorities and their contractors millions of pounds in the

cost of excavating and re-routing traffic for extended maintenance projects in both rural and urban environments.

Managing Director Julian Guy said "We are delighted to receive this award and are increasingly excited about the potential for Typhoon - both in terms of meeting the technological challenge and ultimately improving the quality of our drinking water."

Water companies and contractors can now get up close to award winning water mains cleaning technology after the launch of Hydrascan's new above ground demonstration rig.

The demonstration and training facility is on show at the company's Tyneside depot and features a 60 m section of mains pipe with clear viewing sections so visitors can see the water jet powered 'Typhoon' system in action.

Hydrascan technology achieves high levels of cleaning in pipes lined with concrete, cement, bitumen or PE and can be fitted with imaging equipment for surveying pipe condition.

Technical Director Dr Neil Stutchbury said "The hydro powered pig is jetted along a length of pipe where it will switch between propulsion and cleaning operations.

"On its return, multi-directional controlled water jets remove any build up on pipe walls allowing for expedient, thorough and environmentally friendly

cleaning at ranges of up to 500 m – totalling 1 km in both directions – from a single entry point.

"Compared to the Typhoon system, current 'pigging' and 'swabbing' methods require substantially more plant, equipment and machine operatives on site – each pipe length that requires cleaning necessitates an excavation at each end of the pipe length as access to both ends of the pipe is required and only average cleaning results can be obtained.

Hydrascan engineers have a professional background in the design of tethered and free swimming pigs in the oil and gas industries and the system is able to pass around pipe bends and flush out all waste to be pumped off-site and disposed of."

To date, the Typhoon System has been used to effectively clean pipe walls by applying the least jetting pressure necessary. Much more pressure is potentially available within the system and tests are being undertaken to establish the ceiling pressures which could be available and would be utilised in removing old linings in pipe rehabilitation work. The results of this are expected later this year.

To find out more about Hydrascan, see the Typhoon system in action, or to book a demonstration, visit [www.hydrascan.co.uk](http://www.hydrascan.co.uk) or email [info@hydrascan.co.uk](mailto:info@hydrascan.co.uk)



Close fit lining of water injection lines for the Kuwait Oil Company using high stress crack resistant PE100 pipe.

## Tough enough for the job

by Andy Wedgner and David Walton, Borouge

Utility companies are increasingly turning to No-Dig pipe laying technology to renovate and install pipelines because of the economic and social savings. However using techniques such as 'close fit' relining or horizontal directional drilling can introduce damage or scores into the surface of the PE pipe that, over time, can develop into cracks and cause the premature failure of the pipeline.

**TO OVERCOME THE** challenges posed by the installation of pipe, a new breed of extremely tough, high stress crack resistant (HSCR) PE100 polyethylene materials have been launched by Borealis in Europe and Borouge in the Middle East and Asia.

These PE100 materials, typified by BorSafe HE3490-LS-H, provide a much higher resistance to crack growth than standard PE100 materials, making them ideal for tough laying conditions. This is achieved by selecting the optimum co-monomer and polymerisation conditions for the production of the polymer. This creates a polyethylene material with an extremely tough structure that inhibits crack growth from gouges and scores on the surface or due to point loads from rocks and debris in the surrounding soil.

For example, in notched pipe tests the performance is over 20 times the 500 hour required for standard PE100 pipes, which makes it ideal for manufacturing pipes for insertion replacement, horizontal directional drilling (HDD) or laying in difficult soil conditions.

This new material was successfully used for the provision of a new water supply pipeline to the joint China – Singapore Eco City in Tianjin. The Tianjin TEDA water company identified a new source of water, but it lay on the far side of the Ji Canal. Whilst the company was keen to use a PE100 pipeline, it was concerned about any surface damage to the pipe caused by the HDD installation process under the canal.

Together with its customer, Cangzhou Mingzhu Plastic Co., Borouge demonstrated the benefits of the new HSCR PE100 material to allay the concerns of the water engineers.

The section of the 4.5 km, 800 mm diameter SDR 17 pipeline installed under the canal was subsequently manufactured using the BorSafe HE3490-LS-H material and the pipeline installation was successfully completed in October 2009.

The new high stress crack resistant material can also be used to provide additional security in industrial applications as demonstrated in the internal lining of water injection pipelines for the Kuwait Oil Company (KOC) in the Middle East. These steel pipelines were heavily corroded and while replacement would be costly, the environmental risk from leakage was unacceptable. Therefore the oil company opted to reline the pipes with a 'close fit' polyethylene pipe manufactured from BorSafe HE3490-LS-H using the swagelining technique.

The relining project was undertaken by Kuwait International Advanced Industries and Anti-corrosion Protection Systems and was successfully completed in October 2010, providing KOC with a cost-effective, long term solution, which won't suffer from the same internal corrosion problems.

Utilising No-Dig pipe laying techniques, wherever possible, helps to reduce project costs and the disruption to the local community. Now using these HSCR PE100 materials, the pipeline engineers can be reassured that the pipes can withstand this tough treatment without any loss of operational lifetime.

BorSafe is a trademark from Borealis group. For more information visit [www.borouge.com](http://www.borouge.com)

## Bursting with rope

ABS Trenchless has introduced the rope bursting system – the world's first large pipe bursting system with a rope as the pulling mechanism and a pulling force of more than 1,000 kN.

**THE ROPE BURSTING SYSTEM (RBS)**, from the ABS Trenchless company in Germany, uses an innovative clamping technology in order to complete relining jobs with long pulling distances exceeding 1,000 m. This is done in one run, using only one machine pit in certain soil conditions. The RBS-Burster line is available with pulling capacities between 40 and 150 tonnes.

With the use of return pulleys, this technology also makes it possible to overdrive larger doglegs and bent old pipes.

The single operator is able to control everything from a safe distance above the pulling unit, as the Burster is operated by radio remote control – an important safety feature to the machine.

In addition to the safe handling, the new rope pull technology makes the work much easier for the operator as there is no need for rods to be removed.

Along with pipe bursting, the pulling system can also be adapted for slip lining, relining and swagelining jobs, making the machine very versatile.



### Roping in France

ABS Trenchless, with Entreprise de Travaux Publics GIROUD GARANPON – Isère – France, recently completed a project in Vorion, near Grenoble, France with the RBS helping to supply cleaner drinking water to the town.

For this project the team used a RBS 1,200 machine to burst through two sections of water pipelines. The old pipes, which had an OD 250 mm for a 420 m section and an OD 200 mm for a 210 m section were replaced with new HDPE OD 200 mm pipes.

With a pulling force of 40 tonnes, the 420 m section was reached in only one drill string.

Project Manager Marco Wulff said "This is the first time that a 420 m section was burst in only one string."

Trenchless techniques were chosen for this job as the site was close to a nature reserve and for the reservation of trees. In addition to this, due to the amount of water that was involved, it would have been impossible to do use the traditional open-cut method.

Special tools were needed as the concrete pipes had curves and bends that are quite difficult to crack. The advantage to using a rope is that it can be redirected with a pulley and can burst more of the diameter.

Only taking two days to complete the bursting, the full project was done in just one week.



Innovative  
Quality Products for  
Trenchless Specialists



### Products:

- RBS Rope Bursting Systems
- ABS Auger Boring Systems
- BentoVac Mud Vacuum System
- Pulling Heads
- Accessories for HDD



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# Locating voids behind pipe walls



by David Crowder, C.E.T., R.V. Anderson Associates; Gerald Bauer, P.Eng., R.V. Anderson Associates Limited; Kevin Bainbridge, A.Sc.T, Robinson Consultants Inc. (formerly City of Hamilton); and Harry Krinas, A.Sc.T, City of Hamilton

Large diameter sewers are considered critical assets for most municipalities. Preventing catastrophic sewer failures is probably one of the most challenging issues facing Asset Managers today. Recently the City of Hamilton, Ontario, Canada, took a pro-active approach to face this challenge and experimented with a pipe penetrating radar inspection tool (PPR), using Ground Penetrating Radar (GPR) technology.

**IN 2009, THE** City of Hamilton undertook a pilot project using a PPR inspection tool to locate voids in large diameter sewers that are greater than 1,500 mm in diameter.

The City of Hamilton (City) owns, operates and maintains over 400 km of large diameter storm, sanitary and combined sewer systems. Approximately 50 per cent of the City's sewer systems are over 100 years old, while the average age ranges around 60 years.

Due to the varying terrain across the City, the majority of the main sanitary interceptor sewer systems are located very deep, running under existing residential areas and traverse their way through the City's historical Steel Town and through existing environmentally sensitive areas (valleys) to the Woodward Avenue Wastewater Treatment Plant.

Several large diameter storm sewers convey storm flows through Hamilton's mountain, stepping their way down through waterfalls into plunge pools and eventually outlet into Lake Ontario through numerous outfalls along the Hamilton harbour.

The City considered over 50 per cent of sewers as 'critical assets' due to their size, depth, location and amount of flow they convey. The City has placed a zero tolerance for failure on these critical assets. To manage this responsibility, the City carries out a large diameter inspection program using various technologies, including CCTV, combined CCTV and sonar, person-entry inspection where possible, and occasionally multi-sensor inspections.

The above inspection technologies are designed to locate defects only within the inside of the sewers, including cracks and active infiltration. However, these techniques cannot locate voids that are present or forming behind pipe walls.

The detection of voids behind pipe walls in sewers has been an ongoing

challenge for municipalities, as there is no current technology available to locate voids on the outside of the pipe wall. Proper management of critical assets and the ability to scan and determine what is occurring behind a pipe wall, would allow a municipality the time to properly plan and manage the repair, rather than the alternative 'wait-and-see' approach and hope that the sewer does not deteriorate to an unacceptable structural level.

## Background

Determining the need to locate voids behind pipe walls became apparent to the City during an inspection of the Western Sanitary Interceptor, a 1,524 mm diameter sanitary sewer. Several active infiltrations were observed in one 270 m long segment, based on the CCTV camera video review. It was anticipated that voids caused by the water infiltration were forming behind the pipe walls.

A follow-up person-entry inspection was ordered by the City, which is not commonly carried out for large diameter sanitary sewers due to the confined space entry and danger of working in high sewage flows.

The main purpose of the inspection was to determine if using GPR technology could locate voids behind the pipe walls. GPR technology is generally used to locate voids under pavement, voids in concrete and underground utilities from the surface. GPR works by sending a radio signal into the ground. The return signals provide information about changing ground characteristics with depth. The radar measures depth in the terms of the time it takes for a signal to return after emission.

Hamilton's Asset Management Group manages and maintains the entire sewer system and explores new inspection

technologies that could assist them to better understand the condition of their sewers. They identified the need for more accurate and reliable data from their large diameter sewer inspections, which would allow them to make more informed decisions regarding maintenance and rehabilitation planning. To approach this challenge, the City retained R.V. Anderson Associates Limited (RVA) to assist in developing a pilot project to determine if GPR could be effectively used to locate voids behind pipe walls.

## Developing a pilot project

To undertake this pilot GPR inspection project, RVA and the contractor, PipeFlo Contracting Corp., employed Sensors and Software Inc., manufacturers of GPR equipment, as a part of the inspection team.

During the planning stage of the GPR trial, the team determined several limitations and challenges that must be looked at when working with GPR in a sewer rather than traditional ground application, including:

- Surface GPR units are large, hand-operated, generally pushed or towed by the technician, along the surface to search for the underground anomaly or utility. Sewers are tightly constrained and person-entry is complex and risky.
- GPR surface units utilise a small on-board computer which is required to collect and store data allowing the technician to observe possible anomalies through a portable computer screen during the scanning operation.
- GPR units have several different size antennas that operate at different frequencies for various applications.

Choosing one system to work effectively within a large diameter sewer required careful consideration. Because of the

limited size of the 1,524 mm diameter and harsh conditions, any GPR system must be hand-held, waterproofed and portable.

## Hand held in-sewer GPR trial

The in-sewer GPR trial was carried out in a segment of the Western Sanitary Interceptor. This 1,524 mm diameter sewer was built in a tunnel by hand mining techniques in the 1960s. The pipe wall design thickness was 375 mm and the average depth of the sewer test segment was 28 m.

Due to the extreme depth of this sewer and associated hazards working in a high flowing sanitary sewer, the crews set-up in-sewer teams with live communications, including a CCTV robot from the downstream manhole to provide a full-time camera view of the technicians.

During the in-sewer GPR trial, Sensors and Software modified one of its portable GPR units, allowing for two antennas, 500 MHz and 1,000 MHz, to determine which worked better to locate voids. Three separate lines were established longitudinally down the sewer at the 9:00, 12:00 and 3:00 o'clock positions. The 500 MHz antenna was used first and was followed by the 1,000 MHz antenna. Both sensors followed the same clock positions for post inspection comparison and analysis of the data captured. The length of the test lines were 10 m.

Due to the size limitation of the 1,524 mm sewer diameter, the project team on the surface paid particular attention to the technicians and their ability to operate the modified GPR equipment inside the confined space of the sanitary sewer.

When the technicians moved down the sewer, existing slime on the pipe walls caused the sensor antennas to slip or shudder. The other noticeable problem was keeping accurate control of the distance from start to the end of the profile to ensure any existing cracks or active infiltrations in the sewer were identified. This would become more apparent during the post-inspection analysis.

## Results of the in-sewer GPR trial

Overall, the test was successful and both antennas managed to see the back of the existing concrete sewer.

The higher frequency (1,000 MHz antenna) clearly showed better resolution, allowing for more detail to be seen in the data but did not provide penetration into deeper layers. The lower frequency (500 MHz antenna) had better penetration resulting in higher amplitude signals, received, making features deeper behind the sewer walls, potentially detectable.

Interestingly enough, it was found that both antennas showed evidence

of inconsistency at the same location. Further analysis concluded there was a possible existence of voids within the pipe wall.

The other concern identified during the post-inspection data review was that the depth of the concrete pipe wall significantly varied from the designed thickness of 375 mm. The data indicated that the concrete pipe wall thickness varies from 100–800 mm. The possibility of a sewer collapse is greater if wall thickness is considerably less than 375 mm at the depth of 28 m.

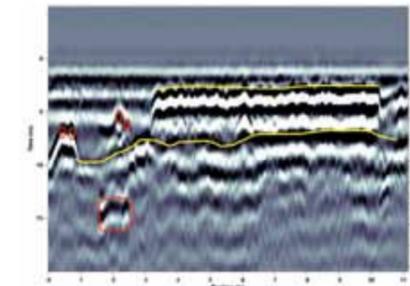


Figure 1: GPR inspection data from the 500 MHz antenna.

An additional depth verification inspection was undertaken to confirm the actual pipe wall thickness. This inspection was carried out by PipeFlo technicians who drilled through the walls in seven predetermined locations based on the data analysis gathered during the GPR trial. The depth verification inspection found that the concrete depth close to the outside of the manhole shaft was 800 mm in depth. This exceeded the expected designed depth of 375 mm.

The most interesting finding revealed the existence of voids within the actual pipe wall. As the technicians began drilling into the pipe wall, the drill bit slipped easily through the open cavity, then hit concrete again on the other side of the void. Careful measurements were taken to confirm the actual size of the inside cavity, which were compared to the depth determined during data analysis. Following the depth verification inspection, all located voids, including voids located behind the pipe wall were filled with chemical grout.

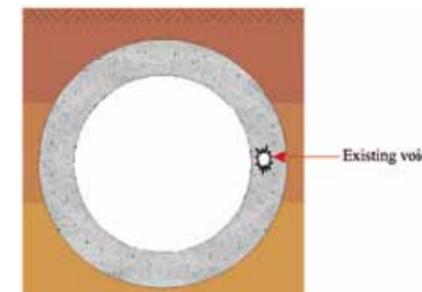


Figure 2: An example of the concrete void.

## Development of a PPR inspection tool

Based on the data gathered from the in-sewer GPR trial and the confirming results from the post inspection data analysis, the project team made a decision to go forward to design a full size Pipe Penetrating Radar (PPR) inspection tool.

To avoid the risk of technicians working in deep, high flowing sewers and to eliminate the risk of not being able to accurately correlate the location of possible voids within a pipe, the project team gathered in the Spring of 2009 to develop the design criteria to build a full size PPR inspection tool that has the ability to scan the walls in the pipe from a 9:00 o'clock to 3:00 o'clock range, while meeting the following specific design requirements:

- The inspection tool must be able to fit through a standard manhole opening and/or be able to be assembled in the invert of a manhole similar to other inspection tools.
- This inspection tool must be designed to work in 1,500 mm diameter and larger sewers.
- All sensors, antennas and associated electronic hardware must be fully waterproof.
- The inspection tool must be designed to be able to be transported on a stable platform to work in flow to eliminate the need and additional cost for sewer bypass.
- The design must have a tethered connection in order for data to be viewed at all times during an inspection.
- This inspection tool must be designed to accommodate several sensor antennas (minimum of three, maximum of nine) for very large pipes.

Based on the above criteria, a concept inspection tool was designed (see Figure 3). →

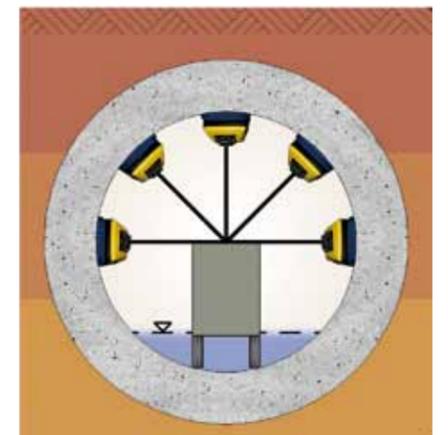


Figure 3: Concept design of a PPR inspection tool.

### PPR inspection tool

GPR equipment consists of antennas, electronics and a recording device. They are digitally controlled, and data is usually recorded for post survey processing and display. The digital control and display output of a GPR system most commonly consists of a micro-processor, memory and a mass storage medium to store the field measurements. A micro-computer and standard operating system is often utilised to control the measurement process, store data and serve as a user interface (Daniels, 2000). PPR's primary use is to detect variations in pipe bedding conditions to identify the location and extent of voids outside pipe walls (Najafi, 2010).

The PPR inspection equipment consists of a three-wheeled steel cart that carries adjustable arms that support the sensor antennas directly against the inside face of the pipe.

The sensor arms are designed to be adjustable to fit through a manhole opening and allow for vertical movement (the ability for the sensor to move away from the pipe wall over existing encrustation buildups on the pipe walls and/or offset joints as the cart is being deployed down a sewer). The three arms were set at the 10:00, 12:00 and 2:00 o'clock positions, designed to fit inside a 1,500 mm diameter sewer.

Attached directly to the cart is a waterproof box that houses the electronics needed to potentially support up to ten sensors. A series of network interface cards, a router and a built-in backup power supply unit are also included in this box.

Attached to the box is an Ethernet/power cable which supplies power to the sensors and transfers data directly to the surface where a laptop computer is used to view and store data. A pan/tilt CCTV camera is located on the top of the cart and is used to observe the pipe during a pipe scan to correlate existing deficiencies with the PPR data.

### Results of field trials

A field trial of the PPR inspection tool was performed on 19 April 2010, at the Binbrook Road site near Hamilton in a 1,500 mm diameter reinforced concrete storm sewer pipe. The PPR tool was assembled and attached to the three 500 MHz antenna sensors and to the cart. It was inserted into the 1,500 mm diameter concrete pipe through the pipes outfall. This test site was chosen due to its easy access.

The City of Hamilton is one of the first municipalities in Canada to allow a trial of this technology to attempt to locate voids behind pipe walls for critical sewers.



Figure 4: Full size PPR inspection tool.



Figure 5: Waterproof box that houses network interface cards, a router and a built-in backup power supply.

Sensors and Software staff managed the data gathering process as the cart was deployed down the sewer. The data was captured, recorded and viewed on the screen from the portable toughbook laptop computer. Post-field trial data analysis completed by Sensors and Software identified that there were some potential artifacts (possible interference by the metal cart design).

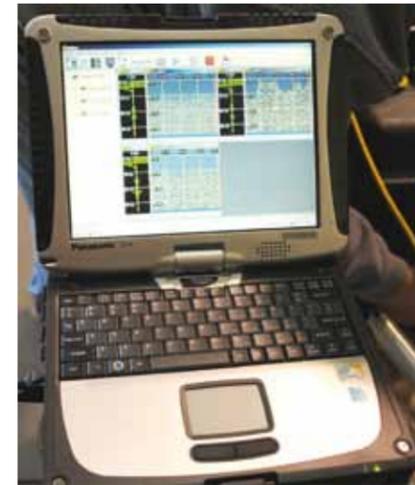


Figure 6: Toughbook laptop.

To confirm the presence of interference from the cart, the Sensors and Software team deployed again to the same test location to perform additional tests on their hand-held equipment. A single 500 MHz sensor antenna located on the cart, used in the original PPR inspection trial, was mounted on a portable handle. The hand-held sensor was deployed down the pipe in the same positions as the original field test. Sensors and Software team analysed and compared data captured from this hand-held trial with the data from the first field trial. The results indicate no interference from the hand-held field test, leading us to believe that some interference during the original field trial was caused by the metal cart.

Based on the above field trials, the team confirmed that the three-channel PPR inspection tool performed to expectations and, with further modifications and testing, can be used effectively to locate voids behind pipe walls.

### Conclusions

The City of Hamilton is one of the first municipalities in Canada to allow a trial of this technology to attempt to locate voids

behind pipe walls for critical sewers.

Using PPR as an inspection tool can help municipalities determine if voids are present behind pipe walls. The data that is captured from PPR inspections can assist municipalities by giving them advanced notice of possible problems, such as voids that are present and/or are forming behind the pipe walls. In the past, this could never be achieved through traditional inspection techniques.

Through the trials completed in Hamilton it was determined that the PPR inspection tool performed well, but to improve the PPR inspection tool there is additional work required by the trenchless industry.

### References

- Daniels, J.J., (2000) Ground Penetrating Radar Fundamentals, prepared as an appendix to a Report to the U.S. EPA, Rebio V, November 25, 2000, (Ohio State University, Columbus, 2000) 1-21.
- Ariaratnam, S., Webb R., and Conroy A., (2005) Utilising SSET with GPR for Assessing Large Diameter Lined Concrete Sewers, Proceedings of No-Dig Show 2005, Orlando, April 24-27, 2005.
- Najafi, M., (2010) Trenchless Technology Piping: Installation and inspection, McGraw-Hill, ISBN-10: 0071489282, June 15, 2000, page 455.

This is an edited extract of a NASTT paper presented at the 2011 No-Dig held in Washington, D.C.



# How to assess the risk to your assets



## Deterioration rate modelling for sewers and optimising investigations and investment using a risk-based approach

by Matt Wheeldon BEng(Hons) CEng MICE, Wessex Water Services Ltd.

Understanding the rate that the UK's sewers are deteriorating has, hitherto, been the subject of much expert judgement, strong opinions and statistical modelling based on poor and insufficient data. Here, Matt Wheeldon looks at how quickly the assets are actually deteriorating to find the best approach to fix the situation for the future.

**WESSEX WATER, WHICH** is leading the industry in proactive investigation to identify structural problems and invest in them before they collapse, has been 'consequence of asset' driven rather than 'risk' driven.

This article summarises Wessex Water's approach to addressing asset deterioration by:

1. Quantifying the rate of sewer deterioration through the utilisation of time-spaced observed data.
2. Optimising investigation and subsequent investment by assessing each sewer length using a risk-based approach, supported by asset, operational and geospatial data analysis.

Sewers form a network of vital infrastructure in any developed country where public health and environmental protection are considered an important aspect of living conditions in the 21<sup>st</sup> century.

The length of sewers owned by the ten water and sewerage companies in England and Wales amounts to 325,000 km. Last year, the industry renewal (replacement and rehabilitation) rate was 0.07 per cent of the total length sewer network. At this rate of investment, sewers would be expected to have a lifespan of 1,400 years.

The key question facing the industry is whether this low level of investment is sustainable or whether we are storing up significant problems for future generations to address?

### The state of the UK's sewer network

The structural condition of sewers can be summarised by using Structural Condition Grades (SCG) 1 to 5 (five being the worst). Most sewers in the UK have not been visually observed since the day they were laid. This is because the majority of sewers

do not change condition from one decade to another – the pace at which they move through the SCG is, for most sewers, exceptionally slow. On top of this, reported national failure rates continue to be low – around ten collapses per 1,000 km of pipe network per year.

So is the current level of investment adequate? After all, this is a slowly changing asset group – it is highly unlikely that any significant change will be observed in the next few years – so there doesn't appear to be any 'burning bridge' that needs addressing. Or are we missing the point? Is there a massive underlying issue that has yet to visibly materialise – that the general condition profile of the nation's sewers is deteriorating (and therefore risk is steadily increasing), but no-one has quantified the scale of the problem?

### Sewer deterioration rate modelling

*Time-spaced observed data:* The information that has prevented an understanding

of how this ageing asset base is deteriorating can only be obtained by recording the movement of sewers through the structural condition grades. Obtaining this data for these buried assets can only reliably be obtained from CCTV surveys repeated over time.

Part of Wessex Water's commitment to understanding the rate of deterioration of its sewers has been to collect CCTV data over many years and in a consistent format. To date, this extensive dataset contains repeated CCTV surveys on over 10,000 sewer lengths (approximately 600 km or 4 per cent of the company's total sewer length).

*Transitional probabilities between SCG:* The data has been analysed to investigate how sewers have deteriorated over time by observing how SCGs have changed in the time between the surveys. The figure and table below show the observed movement of SCGs from CCTV surveys carried out 15 years apart.

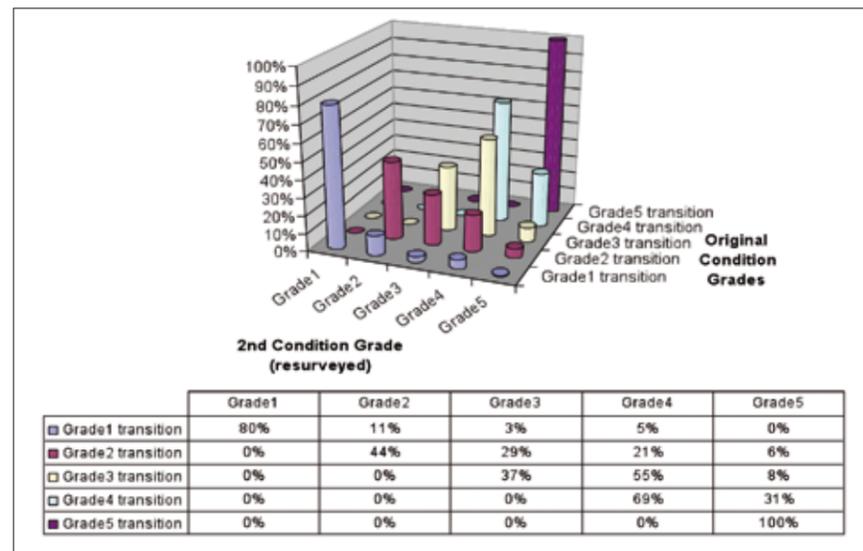


Table 1: Changes in observed structural condition grade between surveys 15 years apart.

The graph and table show the change over time of the structural condition of the sewers. As expected, the largest proportion of sewers showed no change in the 15 year interval between surveys.

Such matrices, combined with statistical analysis methods have enabled sewer deterioration to be visibly observed and recorded and rates of change measured. However, like any model, these are only truly valid for the observed part of the sewer network and for the time interval considered. Therefore, Wessex did not consider it a reliable tool to measure the overall sewer deterioration rate for the whole asset base.

*Using separate datasets to substantiate the deterioration model:* To overcome the uncertainties described above, the approach used two probability matrices derived from CCTV surveys – one from observed data ten years apart, and the other 15 years apart. The datasets were also from different parts of the sewer network across Wessex Water's region.

The two datasets were used to calculate two 30-year deterioration estimates (2x15 and 3x10) that were then compared by performing a Z-value test. The results showed a 90 per cent statistical significance level, indicating that the observed deterioration rates in the two datasets were statistically consistent.

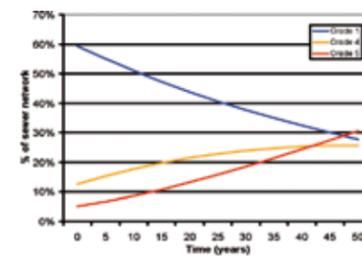


Figure 2: Predicted movement across condition grades over time.

Using this sewer deterioration model based on observed data, it becomes possible to predict the rate of decline of sewer structural condition, and therefore predict what would happen to the condition grades of the sewers if varying levels of investment are carried out.

### Conclusions: sewer deterioration rates

Based on the observed deterioration rates, the model shows that, for the next few years, approximately 2 per cent of Wessex Water's sewers will deteriorate into a Grade 5 over five years. This equates to approximately 70 km per year.

From analysis of historical and current rates of renewal, it is clear that the level

of investment by the UK water industry is not keeping pace with underlying sewer deterioration rates. In effect, until renewal rates equate or exceed deterioration rates, it is logical to assume that the long-term stability of these assets is by no means secure and risk is increasing. However, with these unseen assets still performing satisfactorily nationally, alongside a constant pressure on sewerage bills, it is unlikely that there is a substantial enough impetus to do anything materially different until asset performance begins to significantly impact customer and environmental service levels.

### Optimising investigation using a risk-based approach

Understanding how quickly sewer assets are deteriorating is crucial for understanding the quantum of investment required, but to ensure investment is optimised, regardless of expenditure levels, it is crucial to know where investment is most needed. This is not straightforward for a large unseen asset group for which comprehensive surveying is prohibitively expensive.

Historically, a lack of knowledge of the 'likelihood' of asset failure has led to a 'consequence only' approach, i.e. investigate those sewers where the consequence of failure would be high – these sewers were categorised as 'critical' sewers. Proactive

CCTV of 'critical' sewers meant that 75–80 per cent of sewers were left to a 'reactive only' approach.

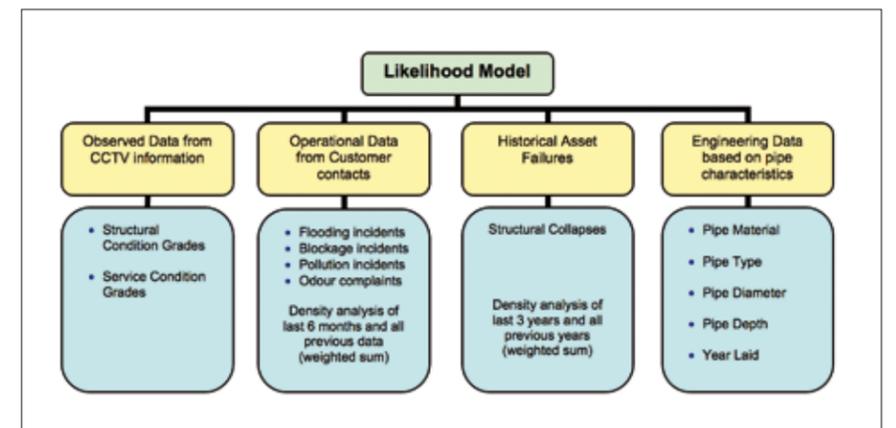
The approach adopted by Wessex Water for targeting investigation is a risk-based approach, comprising a set of 'likelihood' and 'consequence' models built up from all available asset and operational data and information, updated regularly and analysed geospatially.

The result is a current risk score for each individual sewer length, which directs investigation more efficiently towards higher risk sewers than the previous consequence driven approach.

### Building the 'likelihood' model

Factors affecting the likelihood of failure of a sewer can be a complex process. The likelihood of asset failure is closely linked to the SCG, which can only be obtained from CCTV data. The model uses the SCG as the primary indicator, but since a comprehensive dataset of this information does not exist and is prohibitively costly to obtain (only about 25 per cent of sewers have ever been surveyed), the model uses supplementary indicators – operational and sewer characteristics – which also contribute to the probability of each sewer length failing.

The model uses a dynamic weighting to allow for the real issue of not having comprehensive coverage of all desired asset information. →



	Observed data from CCTV	Operational Data from Customer contacts	Historical Asset Failures	Engineering data based on pipe characteristics	Total Weighting
Likelihood model	0.55	0.15	0.25	0.05	1
model weighting	n/a	0.33	0.55	0.11	1

Table 2: Example of dynamic weightings to counteract missing data/information.



# Site report: curing with light

Recently, a sewer had to be rehabilitated in the city of Speyer, located in Rhineland-Platinat, Germany, due to corrosion, structural damages and extreme fat deposits. The city called upon Brandenburger's light-curing pipe liners to rehabilitate the 1.7 km of pipe.

Density analysis can be performed and presented geospatially for operational and asset failure information. This information contributes to the overall likelihood score, examples of which are shown below.

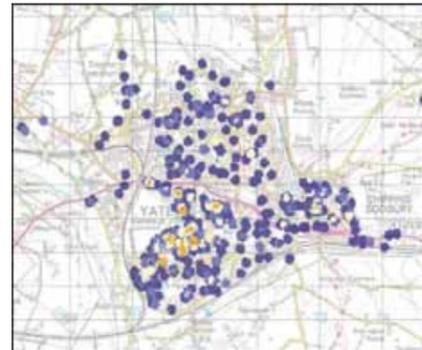


Figure 4: Operational hotspots.

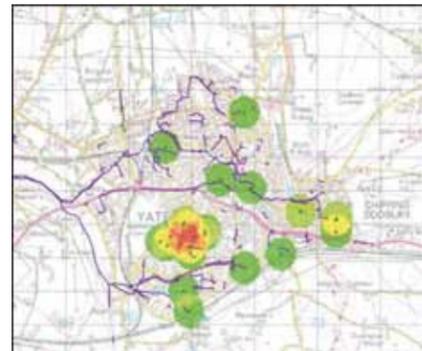


Figure 5: Asset failure hotspots.

### Building the 'consequence' model

Identifying, assessing and scoring the consequence of a sewer failure utilises information abstracted from Wessex Water's corporate Geographical Information System.

Using a similar process to the likelihood model, a consequence score is calculated for each sewer length.

### Visualisation of risk

The product from the likelihood and consequence models becomes an individual sewer length risk score. This can be represented on a risk matrix or histogram for the whole region or any geographical area (Figures 7 and 8):

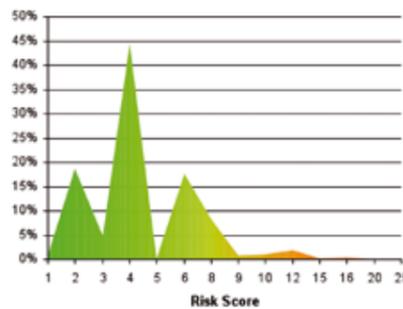
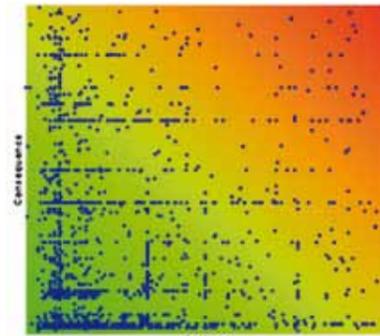


Figure 8: Sewer risk histogram.

Sewer lengths, towards the top right corner of the matrix have a higher risk than those towards the bottom left corner. The histogram provides a useful view of the sewer risk profile that can then be analysed over time to convey longer term trends in levels of risk associated with this asset group.

As asset and operational data is collected every day, the information added to the models increases. Each month CCTV data is uploaded and the complete risk model is re-run every six months.

### Using risk scores to target investigation

The sewer risk scores can also be portrayed geospatially (Figure 9) to enable CCTV surveys to be targeted and grouped efficiently.

Previously, only 10–15 per cent of the length of all sewers surveyed would identify structural issues. The new risk-based approach has increased this to around

60 per cent of surveyed lengths.

The sewer risk model also provides sufficient flexibility to allow add-on models for specific needs and requirements. For example, for the 'operational hotspot model' – operational factors like Service Condition Grade and historical service failures such as flooding due to blockages are given higher weightings. These hotspots help steer the operational CCTV and jetting program.



Figure 9: Geospatial representation of risk.

### Conclusions

#### Sewer deterioration rates:

- A better understanding of the rate of deterioration of long-life assets, such as sewers, has only been possible through a commitment to consistent data gathering over a long-time period.
- Evidence shows that investment rates are insufficient to match the rate of deterioration of the nation's vital sewerage infrastructure and risk is increasing.
- Current asset performance and pressure on sewerage bills are not sufficient to drive a step change in levels of investment for this vital national infrastructure.

#### Sewer risk scoring:

- Optimising investigation and investment can be improved by adopting a risk based approach as opposed to a consequence driven approach to surveying. The probability of identifying sewer maintenance needs when using a risk based approach are significantly higher than a consequence based approach.
- Incomplete datasets, which add value to deriving likelihood or consequence scores, can still be used using a dynamic weighting approach to scoring and shouldn't be discounted.
- The sewer risk model doesn't just highlight asset condition risks. It can steer attention to operational performance issues by adjusting weightings as appropriate.
- Additional information from operational and asset activities can be added regularly to the databases, which drive the models enabling risk scores to be kept as 'live' as required.

**THE MUNICIPAL WASTE** disposal company Speyer gave the project contract to sewer rehabilitation specialists Ehnes GmbH, who is based in Germersheim. The project included the complete repair of 1.7 km of damaged concrete sewers. The project was carried out from March to April 2011.

The sewage pipes from the 1960s lie in a residential area near the centre of town. Speyer's St. Vincentius hospital is also located nearby. The sewers with circular profiles of DN 300–800 mm as well as oval profiles of 400/600–700/1,050 mm showed serious corrosion and structural damage, plus extreme fat deposits in places. Speyer called for tenders in 2010 for the comprehensive installation of pipe liners to prevent possible collapsing and to achieve long-term preservation.

### Working at night

Segments were rehabilitated at lengths of 20–160 m during the 40 day project. A strict schedule was mandated by the city to limit the traffic problems and inconveniences for local residents, as well as the hospital operations. Therefore the Ehnes team did part of the work at night. In addition, due to the great amounts of wastewater in the larger sewers, extensive water drainages needed to be installed.

Project Manager and Director of Ehnes Hans Kreuzer said that due to the prevalent fat residues in the sewer, callibrating and cleaning the pipes thoroughly was not an easy task. Obstacles such as protruding ports or intrusions were removed by milling robot equipment owned by the rehabilitation company.

Once the sewer pipes were prepared to be rehabilitated, the pipe lining commenced with Brandenburger's light-curing

technology in sections, installing an average of 150 m, approximately one section, per day.

After the liner was installed, the necessary partial projects followed. The previously dimensioned side inlets were milled open using robots and their ports reconnected the next day. The connection of the liner ends to finish the shaft rehabilitation also used the robotic equipment.

### Rapid execution

The rapid execution of the liner can be shown through the rehabilitation of the longest section, which was 160 m, in the Hafenstraße of Speyer. The, first step after the DN 300 mm pipe under the quiet residential street was rinsed, was to insert the protective foil for the liner. Once complete, the GFRP liner, which was impregnated in the factory with light-curing polyester resin and delivered ready for installation, was drawn in by a cable winch, sealed with packers and pressed against the old pipe walls by pressurised air.

A camera inspection showed the flush and non-wrinkling position of the 4.2 mm thick liner. For curing at a pressure of 500 bar, a light chain with eight lamps, each with 400 watt, was drawn in. Completed in 3.5 hours, the curing speed was at a rate of 0.9 m per minute.

### Reducing administrative expenses

With the tight times frames, the quick curing times, as well as the good preparation and routine working methods of the construction team, allowed for the other sections to be rehabilitated on schedule.

An engineer appointed by the waste disposal company Mr Riedel said "The Ehnes company provided very good work."

The company said that the advantages

of the liner procedure with UV light curing are clear, "In addition to the quick curing, the setting up and dismantling of the construction site is carried out quickly and above all, contrary to the usage of needed felt, all ports can be opened up immediately after the curing.

"That is an advantage for the construction supervision, because the construction site does not need to be visited a second time, which reduces the documentation and administrative expenses. And of course, the client prefers to have a quickly completed construction site," said Mr Riedel.

### Sewer rehabilitation from one source

Owner and Director of Ehnes Roland Herr emphasised the good co-operation with the Speyer municipal facilities, in particular with the engineer responsible for planning and executing rehabilitation projects, Stephan Wittner. To ensure a continuous exchange of information, the construction site consultation and the taking of sample pieces were done on a weekly basis.

Mr Herr considers the professional qualification of the employed personnel a central factor for the cost effectiveness and quality of pipe lining projects, along with the good co-operation with the client.

"In 2010, we sent in about 70 samples of cured pipe liner for inspection and there was not a single complaint," Mr Herr said.

Since 2009, Ehnes has relied on the Brandenburger procedure with good rehabilitation results.

For more information visit [www.brandenburger.de](http://www.brandenburger.de)

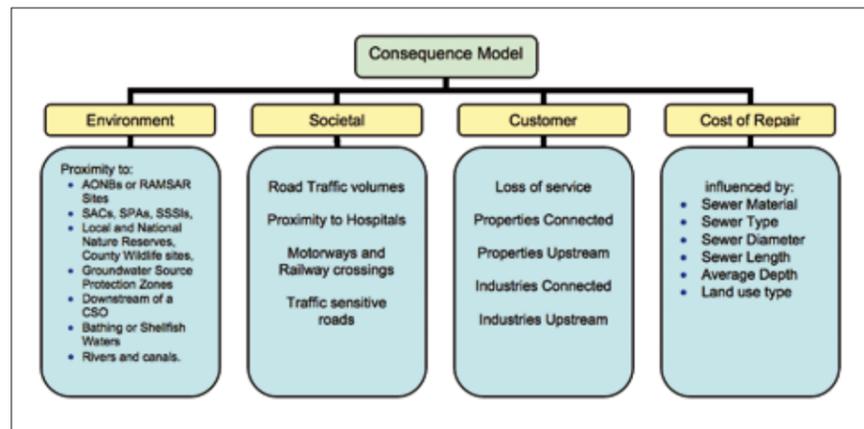
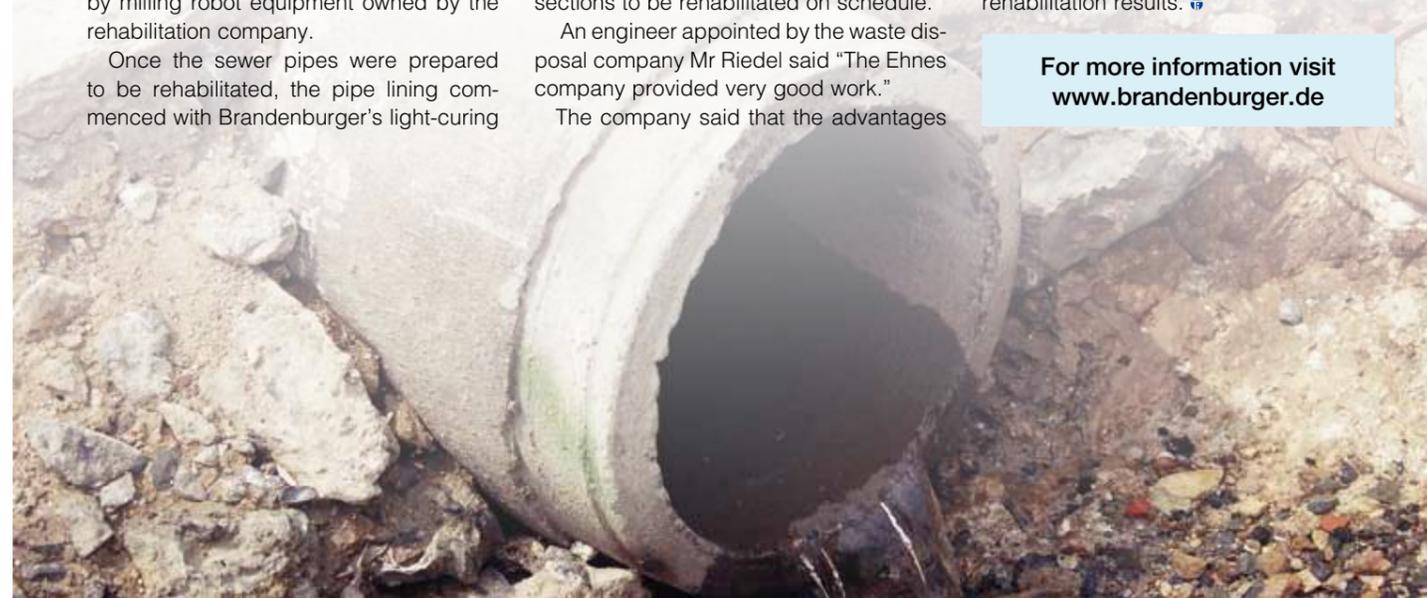


Figure 6: Information used to build the consequence model for each sewer length.



# Laterals: plugging and renewal

by Peter Ellegaard Larsen – Business Development Manager, Per Aarsleff A/S, Pipe Technologies

Cured-in-place pipe lining methods are known to cause only minor reductions of pipe cross sections. Here Peter Ellegaard Larsen reviews CIPP techniques and lateral renewal products successfully used in Copenhagen, Denmark.

**IN RECENT YEARS**, there has been a growth in the development of methods for No-Dig renewal, flushing and CCTV inspection of laterals – all carried out from the main pipe. These methods mean minimum inconvenience to residents, business owners and traffic.

No-Dig methods are also cost effective compared to conventional excavation. The following cured-in-place pipe (CIPP) lining methods cause only a minor reduction of the pipe's cross section, whereas other methods, such as sliplining of small dimension pipes, can cause an unacceptable reduction of the pipe's cross section.

One thing it has in common to other methods is that it is not necessary to have access to the pipe system on private property as all the methods can be carried out from existing manholes on public thoroughfare.

## Lateral connection collar – hat profiles

Hat profiles are lateral connection collars sealing the connection between the lateral and main pipe. In general, hat profiles are only installed in relined pipes. They can be installed in pipes made of concrete, clay or plastic, but adhesion to the surface of the existing pipe cannot be guaranteed.

## Short hat profile from main pipe

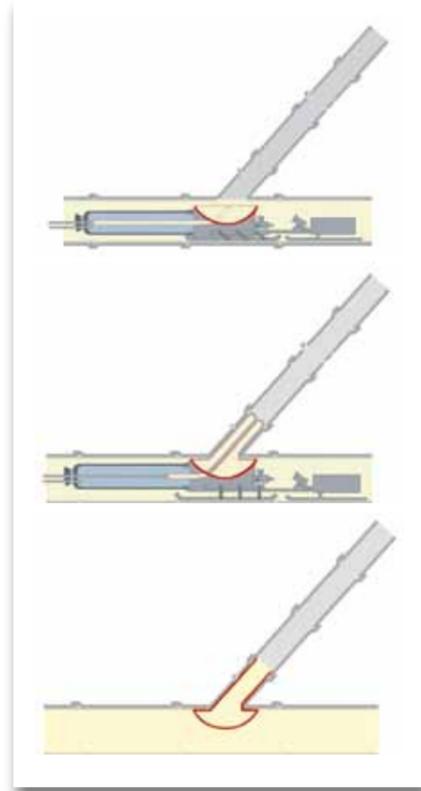
The short Aarsleff Hat Profile is a tight lateral connection collar made of acid proof polyester fibre. The length of the short hat profiles used for Copenhagen Energy resulted in the passing of the first connection on the lateral.

A short hat profile consists of a rim of collar and an endless extension of the collar. The product is tailor-made for specific projects on the site, where it is also impregnated with resin.

For installation, a short hat profile is fitted to a tool and pulled forward to the lateral in question while monitored by a CCTV camera. When the tool is

in position, the rim of collar is pressed into place and the extension of collar is pushed into the lateral. Subsequently, the hat profile is cured and the tool is retracted.

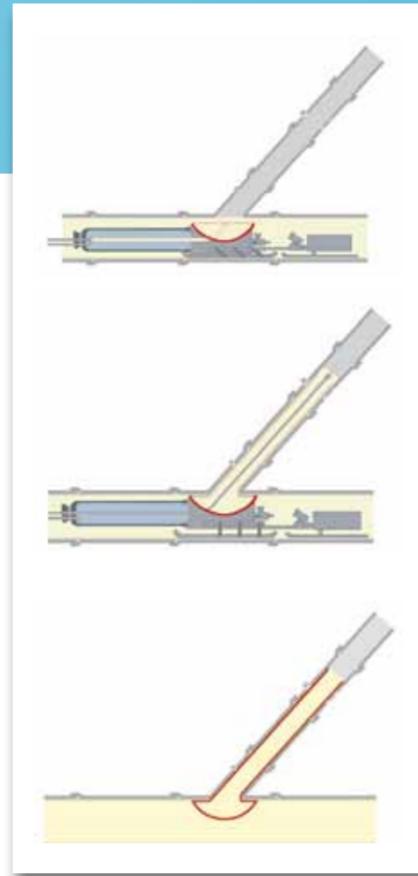
As the lateral is not renewed, this method is used for providing a tight transition between the main pipe and the lateral. The length of a short hat profile is at least 30 cm and past the first joint of the lateral.



## Long hat profile from main pipe into lateral

The hat profile is installed the same way as the short hat profile, the only difference is that the lateral is relined all the way to the property boundary, the manhole or the water trap of a road shaft.

Long hat profiles can be made in lengths of up to 17 m.



## CIPP lining of lateral

CIPP lining of laterals can be made both from the main pipe and from manholes. The pipe is made with a liner of acid-proof polyester fibre impregnated with resin.

## CIPP lining of lateral from main pipe into lateral

In principle, CIPP lining of a lateral from the main pipe into the lateral consists of a long hat profile without a rim of collar installed in the main pipe. If this solution is chosen, no tight transition between the main pipe and the lateral is provided. CIPP lining can be made all the way to the property boundary or water trap of the road shaft. It can be made in lengths of up to 20 m.

## CIPP lining of lateral from boundary manhole towards main pipe

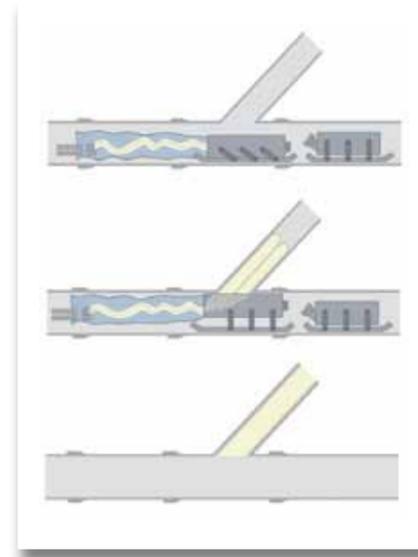
CIPP lining of laterals from the boundary manhole towards the main pipe is also

made with a liner of acid-proof polyester fibre impregnated with resin.

From the manhole, the soft liner is inverted into the defect pipe by means of air and the end of the liner is open.

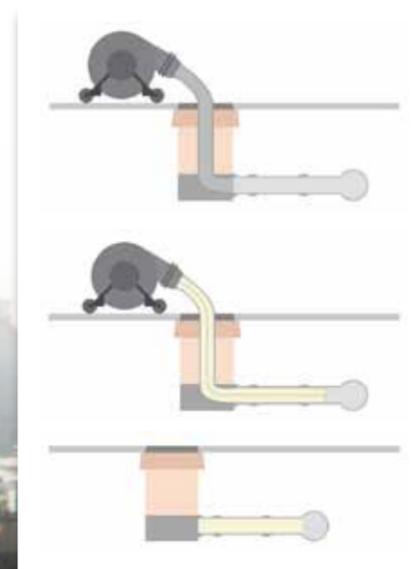
Then a calibration tube is inserted and the tube's end is sealed, the material does not combine chemically with the resin-impregnated CIPP lining. Therefore, the lining is cured and the calibration tube is retracted.

If too long, the protruding end should be cut off in the main pipe. Endless CIPP lining from manholes can be made in lengths of up to 25 m.



## CIPP lining of lateral from roadway inlet with water trap towards main pipe

This type of CIPP lining is carried out in the same way as CIPP lining from a manhole.



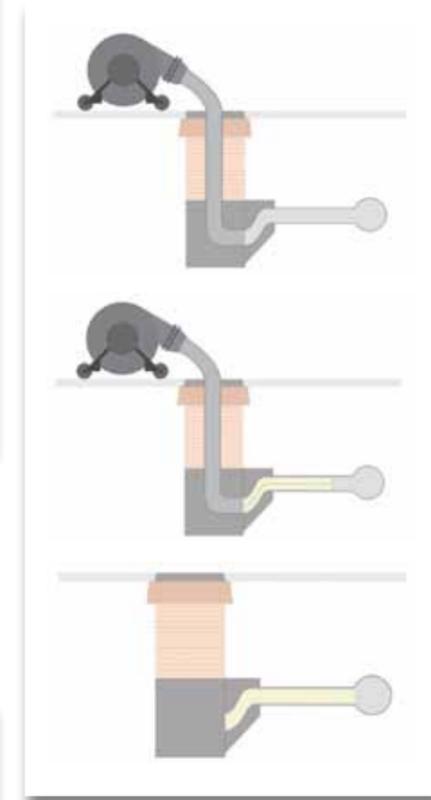
## Spot repair or plugging of lateral

Laterals no longer in use may be closed by means of spot repair or plugging depending on the condition of the lateral or the main pipe.

## Spot repair

Spot repair consists of a short relining, customised for the actual job on the work site. It is made of acid-proof polyester fibre impregnated with resin.

The impregnated CIPP lining is mounted on a tailor-made tool which is pulled forward to the place in question while being monitored by a CCTV camera. When the tool is in position, the pressure in the tool is increased and the spot repairs are pushed into place. The spot repair is then cured, and the tool is retracted.



## Plugging of lateral at main pipe with Lock Pipe Grout

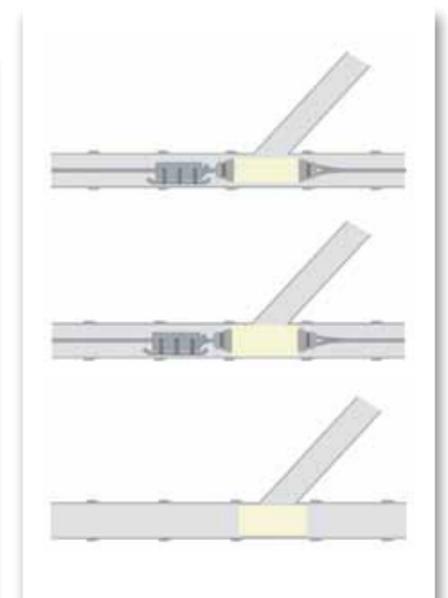
Lock Pipe Grout is the only product for plugging of laterals approved for use

in the water and sewerage system by Danish authorities.

Installation of Lock Pipe Grout from the main pipe provides an advantage against conventional installation methods, where installation takes place by means of an excavation pit, a duckfoot bend or similar.

An advantage of Lock Pipe Grout over spot repair is it does not affect the hydraulics of the main pipe. Through the manhole and the main pipe, the Lock Pipe Grout is pulled forward to the lateral in question.

The Lock Pipe Grout is inserted in the lateral and filled with rapid-hardening concrete. After hardening, the equipment is retracted.



## Development of equipment and technological innovations

The industry is forced to develop new methods and be innovative within a multi-annual framework agreement where the client continuously makes new demands.

For example, the development of CIPP lining from road shaft and the installation of Lock Pipe Grout are a result of the client's demands.

The challenge that remains is the measuring up of laterals and opening of laterals through laterals. 



# Extreme lateral connections



## Planning of sewer rehabilitation in Minden and Roesrath, Germany

Investing in a reliable functioning sewer system with the right rehabilitation technology has been made easier with the Janssen lateral rehabilitation process, that can be used even with groundwater ingress and the formation of voids.

**LAST OCTOBER IN** the Westphalian city of Minden, located in Germany, the main sewer was comprehensively repaired at a length of 190 m, including leaking joints, shards, and original improper connected laterals. At a depth between 4.8 and 5.2 m with the local soil conditions of heavy clay and gravel sands, initially there was no detailed information about the existing compaction of the sewer line. Here the CCTV inspection of the main line and the laterals helped. Soil reports in connection with a geo-physical process by way of geo-radar were to give additional information about voids and bedding problems.

### Quick solution needed

Ulrich Schmit of the City Works Minden (SBM) said "It turned out that there was no serious compaction problem, yet at the leaking joints and above the lateral connections there was a large infiltration of groundwater." In co-operation with the engineering firm IWA of Minden, the option of constructing a new pipe in an open trench was quickly dismissed as it would be too costly and complex. A new construction would have meant the need for costly groundwater management. "It was for this reason, and because there were no major hydraulic load problems, we decided for a repair from the inside.

"With this option we used a close-fit-liner, which meets the on-site structural requirements and can be installed under the given circumstances. At the same time we trusted the Janssen Lateral Rehabilitation Process. No other lateral repair system can connect and seal these laterals so well," Mr Schmit said. This solution is based on a special packer and two component resin. After a series of protruding laterals, and other obstructions were removed using a cutting robot, the actual rehabilitation could begin.

The packer was placed at the damaged spots and inflated by compressed air. Then the liquid two component resin was injected through the damaged areas. Managing Director of the Goch-based



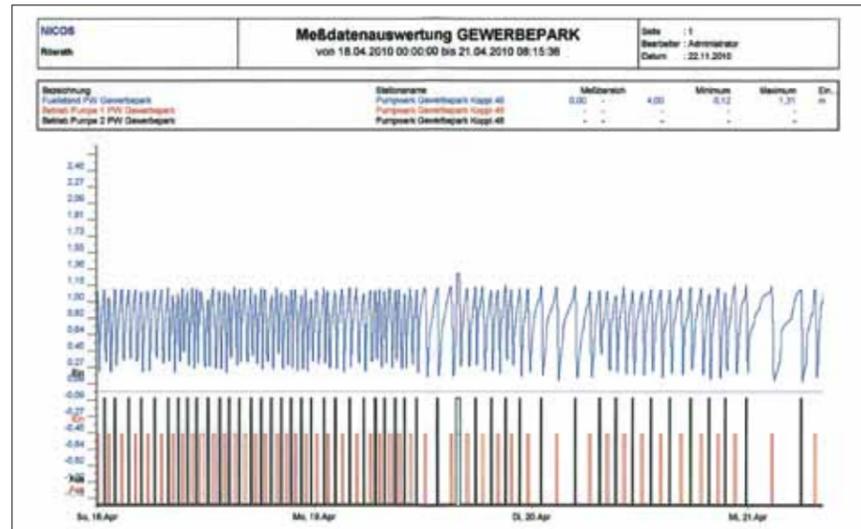
L-R Dipl.-Ing Netservice Wastewater Norbert Fischer and Dipl.-Ing Manager Net Water and Wastewater StadtWerke Rösraht Rainer Witte.

service company Janssen Umwelttechnik said "The resin fills the voids, displaces the groundwater and bonds with the bedding material – this way the actual sealing and stabilising happens on the outside of the pipe. "Even the annulus between the close-fit-liner and the host pipe is filled and sealed up to 1 m to the left and right of the lateral." The freshly sealed laterals could then be connected to the HDPE liner, the so-called close-fit-liner – now there will be nothing standing in the way of unproblematic sewer discharge in Minden-Letelen. "Because the sewer lines and the laterals are now tight, there will be no more sand washed into the pipe through the

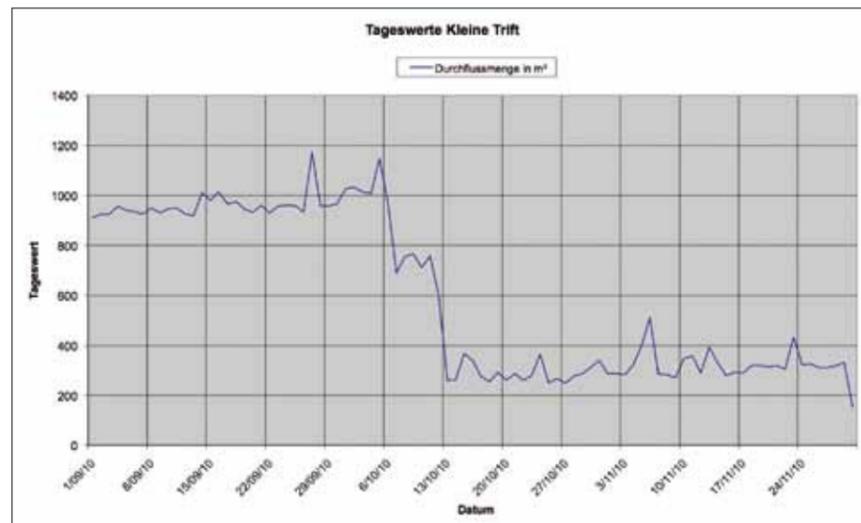
damaged areas," Mr Schmidt said. The total wastewater volume was reduced from 900 cubic m to around 300 cubic m with this constructive measure. The reduction by two-thirds has positive effects on the life of the pumps and leads to more economical operation of the pumping station. "Thus a cost reduction at the pumping station comes hand in hand with the rehabilitation of the sewer system." Mr Schmidt said.

### Special resin against ground water ingress

In 2009, the sewer had been inspected by CCTV according to the existing ordinance (SuewVKan). Five damages with



Measurement data evaluation from the pump station in Roesrath. The data shows the flow rate before and after lateral renovation from 200 to 90 cubic metres.



Measurement data evaluation from the pump station in Minden. The data shows the flow rate before and after renovation from 900 to 300 cubic metres per day.

significant ground water ingress were found making an immediate repair inevitable. The service company from the Lower Rhine Janssen Umwelttechnik applied its lateral repair process here as well.

"This way all damages could be sealed and repaired," said Norbert Fischer of Grid Service Waste Water of the City Works Roesrath.

The data of the running times at the pumping station prove the successful repair of the sewer pipe. While the pumping station was operating for eight to nine hours prior to the repair, it needed to run only three to four hours after. The volume of the wastewater pumped showed a significant difference – it was reduced from about 200 cubic m to 90 cubic m per day.

By reducing the external water inflow into the wastewater stream, the city works not only profited in the short term from the reduction of cost and the well functioning wastewater system, but also long term from a safe wastewater management without the danger of streets subsiding.

Head of the Department of Water and Wastewater Grid in Roesrath Rainer Witte said "Without this technology all this combined would not have been possible in such a short time. Therefore in future we will always rely on the Janssen Lateral Connection Rehabilitation Processor whenever necessary."

For further information, visit: [www.janssen-umwelttechnik.de](http://www.janssen-umwelttechnik.de)

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# A TIP for rehabilitation



A project undertaken by the Urban Drainage Council in Hagen, Germany, was recently recognised for its pipeline construction. Bettina Linke accepted an award for her employers at the 4<sup>th</sup> German Symposium for trenchless pipe replacement at the University of Siegen.

**THE PRIZE INCLUDED** the recognition of the trenchless rehabilitation of a sewage pipe using the Tight-In-Pipe (TIP) method and applying the Burstform device for long pipe lining through manholes.

The TIP method involves welding together PE pipes to form a complete pipe string, which then gets pulled into the old pipe via a revision manhole with a 1 m diameter. In order to carry this out, the pipe has to be formed into an oval shape. Immediately before entering the old pipe, the pipe is returned into its original circular form and continuously pulled in with the guiding sleeve. This runs ahead of the new pipe and is held centrally by guiding rollers, to even out any deformations. To help decrease the cross-section as minimally as possible, the pipe lays very tight to the old pipe wall.

The lining project was completed at the end of April 2011. The company Rettberg GmbH & Co. KG from Göttingen, together with TRACTO-TECHNIK, Lennestadt, sponsor of the prize and promoter for the Symposium in Siegen, were responsible for the project. Two sections in Hülisdorfer Street, located in Hagen, over 52 m and 57 m in lengths were due for renewal. Of the nine house connections, four were connected centrally in the machine pit using open trenching, and five were carried out with Trenchless Technology, using a sanitation robot from Hächler.

Situated at a depth of 2.1 m and made of concrete DN 300 mm, the old pipe had several displacements and deformations over the entire length. The single pipes from Schöngen PE 100 resistant to cracks (RC) 292x13 mm, each 6 m in length, were welded together beforehand to complete a 52 m pipe section.

## The process

Initially emergency disposal and cleaning of the old pipe was arranged. In the middle of the complete lining length a pit was set up and the Grundoburst 400 S bore rig was installed. With this hydraulically operated rig the QuickLock bursting rods could be pushed in both



directions for the installation of the new pipe.

The Burstform and the roller guidance system were then installed inside the manhole. The pipe string connected to the QuickLock bursting rods was pulled through the roller guiding system, giving the pipe its oval shape.

In the manhole – on the level of the old pipe – the PE pipe carried out a 90 degree curve in the tightest space. Then a reverse forming device brought the pipe back to its original circular form and pulled it through the guiding sleeve.

The forming process for the pipe allows a higher curve access and easier handling. The special PE 100 RC pipe material, according to Publicly Available Specification (PAS) 1075, makes sure that the material does not lose any of its structure.

The socketless pipes, made of PE plastic have a much lower roughness value than concrete pipes of the same diameter. Managing Director of the Urban Drainage Council Karsten Rettberg said "The necessary flow capacity is therefore still retained even if the cross-section of the pipe is slightly reduced."

The Burstform device pulling the pipe through the manhole.



The pulling head with the pipe follows the guiding sleeve.



Karsten Rettberg congratulates Bettina Linke for winning the prize.



The guiding sleeve arrives in the target pit and is dismantled.

The forming process for the pipe allows a higher curve access and easier handling.

## Method advantages:

- Installation of new sewage pipes as a long pipe: trenchless and no sockets.
- Pipe installation generally from starting manhole Ø1 m into a target pit up to 100 m for pipe material/pipe Ø PE 100 RC from OD 192, 242 and OD 292 mm.
- The pipes are transformed mechanically and vertically above the manhole and guided into the old pipe.
- Before entering the old pipe the plastic pipe is brought back into its original circular form and pulled in using TIP.
- TIP means only slight cross section reduction. The hydraulic pipe performance remains intact.
- The material characteristics of the new plastic pipe are not affected by the forming process.
- The pipe installation is also possible using the pipe bursting method, thus the new pipe can be the same size, or even larger than the old pipe.
- House connections can be connected underground.
- Short construction times.
- No personnel required in the manhole during the pulling-in process.

## Construction advantages

- Applicable with existing pipes, and recommended for inner-city areas.
- Minimal jobsite set-up with small target pit requiring only space for pipe section and working area.
- One central target pit for two pipe lengths can be inserted in opposite directions, each over 100 m lengths.
- No road-blocks, no traffic diversions or bottlenecks.
- No concerns with local residents and commercial premises.
- No excavation, no road disruption and no road repair work.
- Cost saving due to short construction times and reduction of civil engineering works. 🏠

For more information visit [www.tracto-technik.com](http://www.tracto-technik.com)

# 5 minutes with Sergio Palazzo



As a part of a new feature, *Trenchless International* will introduce you to the members of the ISTT Executive Sub-Committee. Get to know the great people behind the ISTT. Here we speak to Sergio Palazzo from the Brazil Association for Trenchless Technology (ABRATT).

**THE ISTT, WHICH** was established in 1985, beginning with a one-time conference, has been instrumental in educating and promoting the benefits of Trenchless Technology around the globe for over 25 years. The members of the ESC are an important part to the board and help in running an efficient day-to-day society, and are empowered to act for the full Board.

## When or how did you first become involved in the trenchless industry?

I first got involved in 1991, when the company I represented in Brazil (Vermeer) started doing business in the trenchless industry. Vermeer started producing pierce tools and directional drilling machines. I had the chance to bring the first directional drilling unit to the country, almost at the same time, Flow Mole was also bringing one unit through a contractor named COEST to work in gas, and I brought a unit for PASSARELLI to work in sewer, water, and telecommunications.

## Which organisation are you from and how long have you been on the Executive Sub-Committee?

I'm partner of PELLA Construction, an old and traditional contractor with 30 years of experience, but I was also a distributor for 35 years through SOTENCO, which actually represents some products in other segments. This is my first term on the ESC which commenced at No-Dig 2010 in Singapore.

## What has been the most memorable project you worked on?

Well, after so many years of countless experiences, each one richer than others, I'm actually very excited with a project that is going on right now, where all my experience in planning and production management is being applied for a trenchless job. We got a contract to be a 'case' regarding the difficulties we've experienced when dealing with infrastructure jobs, where variables are so many and out of control for the contractors involved, that planning is basically the key point to success and guarantees a profit. We will be changing 2 km of a potable water AC pipeline. This was meant to take 160 days, but with good planning, we will do it in 45 days.

## What do you see as the most important role and/or responsibility of the ISTT?

It seems that number one is to update the trenchless community about what's new and what has been done worldwide, and training is important. Training is as important at universities as it is for the day-to-day basis operations, and for certifying labourers and inspectors.

## How do industry initiatives such as conferences and publications help you in promoting trenchless technology in your country?

It's incredible the benefits of these activities, how easy is to make people,



Sergio Palazzo and ABRATT Chairman Paulo Dequech.

and I mean decision making people, understand the relevance of use of trenchless in tackling the actual challenges in huge cities around the world.

## What are some of the main challenges your country is facing with Trenchless Technology and how do you think these can be overcome?

Brazil, and probably many other Third World Countries, are dealing with potable water supply and sewer collection and treatment. The cities grew up for decades without these services and now installing these pipelines in areas totally urbanised is the greatest challenge. Mainly in gravity sewer collection pipelines where 70 per cent of the network has 6 inch diameter going deeper, 5 feet or more, with lateral connections to be connected to these mains. It's a big challenge really.



The ESC and Office Holders at the Berlin No-Dig 2011.



## About ISTT/Membership

The ISTT is the umbrella organisation for trenchless technologists in over 30 countries of the world. In 30 countries, groups of trenchless technologists have their own national groups that are affiliated, while the remainder are registered directly with the ISTT.

Trenchless Technology covers the repair, maintenance, upgrade and new installation of underground utility services using equipment and techniques which avoid or considerably reduce the need for excavation. The ISTT promotes research, training and the more extensive use of Trenchless Technology through publications, co-operation with other NGOs, an annual international conference and an interactive website.

Trenchless Technology is recognised as an environmentally sustainable technology and is particularly suited, for use in densely populated urban areas by reducing disruption to peoples daily lives, social costs (traffic congestion, damage to road surfaces and buildings, air quality), noise and dust. Trenchless technologies also have a considerably reduced carbon footprint compared to trenching in most situations.

Visit  
[www.istt.com](http://www.istt.com)  
for further  
information.

## Contacts and addresses of Affiliated Societies



### Austrian Association for Trenchless Technology (AATT)

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4-8 July 2011 Singapore  
www.siww.com.sg

No-Dig South Africa 2011  
23-24 August 2011 Pretoria, South Africa  
www.nodigsouthafrica.com

Trenchless Technologies Symposium -  
ACODAL Congress  
31 August - 1 September 2011  
Santa Marta, Colombia  
www.ictis.org

Trenchless technologies for water and  
wastewater industries - Hong Kong 2011  
28 - 29 September 2011  
The Cityview Hotel Hong Kong  
www.chkstt.org

No-Dig Down Under 2011  
3-6 October 2011  
Brisbane Convention and Exhibition  
Centre, QLD, Australia  
www.nodigdownunder.com

ICUEE 2011  
4-6 October 2011 Louisville, Kentucky, US  
www.icuee.com

Trenchless Middle East 2011  
10-11 October 2011 Dubai, UAE  
www.trenchlessmiddleeast.com

Symposium Grabenlos 2011  
18-19 October 2011 Steyr, Upper Austria

ICPTT 2011  
26-29 October 2011 Beijing, China  
www.icptt.org

Trenchless Asia 2012  
21-22 March 2012 Singapore  
www.trenchlessasia.com

No-Dig Poland 2012  
16-19 April 2012, The Uroczysko Hotel,  
Kielce, Poland  
www.nodigpoland.tu.kielce.pl/

No-Dig Live 2012  
2-4 October 2012 Coventry, UK  
www.nodiglive.co.uk

2012 International No-Dig Brazil  
12-14 November 2012 Sao Paulo Brazil  
www.acquacon.com.br/nodig2012/en

2013 International No-Dig Sydney  
1-4 September 2013 Sydney, Australia

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