

TRENCHLESS WORLD

Australasia

Auger boring

No-Dig preview

November 2012





ABU DHABI: SEWAGE SYSTEM WITH STRATEGY.

On the basis of the 2030 master plan, a gigantic new sewage network is being built in the desert metropolis of Abu Dhabi, which will connect new city and industrial areas. The "Strategic Tunnel Enhancement Program", in short "STEP", includes a main collector (deep tunnel sewer) with a length of 40 kilometers in three lots, as well as inflow link sewer and pump stations.

Herrenknecht has delivered five tunnel boring machines (EPB Shields) for the project lot 2 and 3. They are designed to withstand high groundwater pressures of up to 8bar, and have been working successfully since April 2011. In April and May 2012, Impregilo's tunnelling experts achieved breakthrough with the first 3 machines after daily top performances of up to 33 rings (Segment length: 1.400mm). The two other EPB Shields are underway at full speed. The concrete segments for the tunnel lining are delivered by a lining segment production plant, which was planned, equipped and put into operation with the help of Herrenknecht Formwork engineers. In the form of innovative rolling stock transport systems, MSD provides support for efficient jobsite logistics.

The project is well underway with Herrenknecht technology and competent partners from the region. This means that Abu Dhabi will soon have plenty of purified water for the irrigation of the desert city.

ABU DHABI | UAE

PROJECT DATA

CONTRACTOR



S-582, S-583, S-584,
S-649, S-654
5x EPB Shields
Diameter: 3x 6,310mm,
2x 6,950mm
Installed power: 3x 945kW,
2x 1,200kW
Tunnel lengths: 4,590m, 5,152m,
4,808m, 4,846m, 4,260m
Geology: clay stone, gypsum,
sandstone/limestone

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A great day out

WEB ADDRESS www.trenchless-world.com

DESPITE weather forecasts threatening total downpours, the occasional rain shower did not deter exhibitors or delegates from turning up in droves to visit this year's No-Dig Live exhibition and conference, held at the Agricultural Show Ground at Stoneleigh Park, near Coventry, UK. Indeed, the show enjoyed much sunshine and ended on positive notes all round.

The breakfast seminars proved popular, with strong interest for the talks and topics covered. Delegates were on the receiving end of quality information, ranging from the first day's review of plant records and their vital importance to safe and reduced-risk works; through to day two's programme of talks about onshore pipeline protection and concerns by the United Kingdom Onshore Pipeline Operators' Association (UKOPA); through to the finishing programme on day three, with an extensive update about the on-going fight against network leakage.

Initial feedback had suggested that early delegate numbers would be limited, yet of worthwhile quality, yet over 400 delegates arrived on day one, followed by an even busier day two, and a revitalised day three, with delegates coming from many countries to visit this world-class show.

Day three also saw the arrival of 90 engineering students from Warwick University, who were to be lectured by myself and colleagues on the following day. Here again, exhibitor feedback was

generally very positive, with everyone recognising that these students are the clients and engineers of tomorrow.

When not manning the UK Society for Trenchless Technology (UKSTT) booth with other council members and ensuring that our visitors were looked after, I took opportunities to visit some of the other stands. I noticed the inflatable trench-shoring system on the U Mole VP stand, and the various, ever-improving pipe-handling systems on Steve Vick's and TT UK's stands.

Size does not matter but the universal multi-purpose rig on the TT UK stand was certainly eye-catching, yet I found the Ferret service-pipe leak-detection system on the Hiram stand equally worthwhile, and certainly more universally applicable, given some of the delegates' interests on day three.

Without extensive space and time, this account can only scratch the surface of all that was on show and I shall be criticised for picking personal points of interest. This is not a detailed briefing, rather a flavour of the range and scale of information about materials, systems and techniques on display, many in demonstration for all visitors to see, sit on and examine.

As ever, the general standard of exhibit was exceptionally high, with all stands well-prepared and fully manned; organiser Westrade can take pride in helping everyone achieve another tremendous show.

If you missed it, you missed a real treat. But make sure you do not miss the UKSTT's No-Dig Live 2014 show. Make a date – the site is already booked.

Peter Crouch, UKSTT technical secretary
admin@ukstt.org.uk



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Cover

Perma-Liner specialises in lateral-inversion and pull-in-place lining, sectional main line point repair, main continuous air inversion, InnerSeal Innerwrap lateral connection sealing, Perma-Patch and heat-assist equipment. The company knows that sometimes products need to be seen for the customer to understand. It therefore accommodates installers and municipalities by performing live demonstrations at trade shows. And each year, it offers 'open house' seminars to educate those who want to learn and excel in this growing industry.

www.perma-liner.com

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NuFlow welcomes City Care to fold

NEW Zealand water and wastewater maintenance service provider City Care has joined Nuflow's expanding Australasian network of licensed installers for solutions to sewerage, stormwater, potable-water, fire-system and pressure-pipe repairs.

In becoming a licensed installer and utilising Nuflow's BlueLine technology, City Care will add a permanent, cost-effective solution to its pipe-repair work.

Nuflow's pipe-rehabilitation technology, BlueLine, lines and protects underground pipes from forming cracks, build-up or root intrusion. Using existing access points into a problem pipe, the BlueLine liner is pulled into place and inflated with an internal rubber bladder. It is left to cure and when the bladder is removed, the pipe is structurally rehabilitated and functions 'as new', the company says.

Referring to the recent earthquakes in Christchurch, New Zealand, Nuflow director Ed Ahern said: "We have seen mass failings of networks throughout the region. It gives us great pride to have been chosen as the company to provide the technology that will assist in rehabilitating the drainage network in Christchurch."

Pure Mexico wins fibre-optic project

PURE Inspection Technologies Mexico, a subsidiary of US-based asset-management and inspection-technology company Pure Technologies, has been awarded a US\$4 million contract for fibre-optic installation in Cutzamala, Mexico.

Under the contract, Pure will supply, design, install and commission a SoundPrint Acoustic Fibre-Optic (AFO) monitoring system on a section of a major pipeline that provides treated drinking water to roughly 30% of Mexico City's population.

Once the majority of the new work is completed – some time before the end of this year – Pure will then continuously monitor the new section of pipeline, which has

recently undergone electromagnetic inspection for structural integrity using the firm's PipeDiver technology.

Pure's Stephen Rothwell told *Trenchless World*: "The fibre optic

was wet-installed while the pipe was still in service. A parachute was inserted to which the fibre optic was attached. This was left to float with the flow of water until it reached the next available pick-up point."

Previous work undertaken by the company has included electromagnetic inspections and the installation of its AFO monitoring technology on around 25km of these critical pipelines.



Pure Inspection Technologies Mexico is installing fibre-optic systems in Cutzamala

UEA Trenchless buys slurry microtunnelling unit

AS A further step in expanding its tunnelling capabilities, Australia-based UEA Trenchless has purchased an mts1000S/M/L slurry microtunnelling unit that will give the company the ability to install pipe in difficult soil conditions where ground water is present.

The machine is designed for very long distances and large diameters and is claimed to be a reliable tunnelling solution for all ground conditions.

Slurry systems are essential in

difficult soil with high levels of ground water.

At the cutter head, the excavated spoil is mixed with water and is then transported to the surface, where water and spoil are separated and the water returns to the slurry circuit.

UEA has a full suite of cutter heads that can operate in four different modes according to the ground conditions.

The MTS 1000S/M/L slurry microtunnelling unit can jack pipes

of 350-2,000mm diameter in maximum jacking lengths of 350m. A variety of pipe materials can be installed including VC, Hobas, Polycrcrete, Naylor Denloc and reinforced concrete jacking pipe.

In a further recent development, UEA took delivery of an Akkerman guided boring machine (GBM). Sometimes referred to as pilot-tube microtunnelling, the use of a GBM offers customers extended, accurate drive lengths in various ground conditions.

Novel pipe material promises a multitude of benefits

INFINITPIPE is a new material that has been hailed as a revolutionary concept comprising carbon-fibre fabric layers surrounding a lightweight core, and said to promise longer lengths with fewer joints and, by implication, fewer leaks. It can be used for either lining existing pipes or forming new ones.

Similar in concept to the structural behaviour of an I-beam, InfinitPipe uses a lightweight honeycomb core (as web) with a

small quantity of the stronger and more expensive carbon fabric applied to its skin (like the flanges in an I-beam). The new material is a further development of a process that has been used for around 15 years, and now refined by Tucson-based company PipeMedic.

Company president Mo Ehsani, professor emeritus of civil engineering at Arizona University, said that the new concept is structurally efficient and

cost-effective. There are only one or two layers of the expensive carbon fabric on the skin of the pipe sandwiching a lightweight honeycomb core.

The benefits of the new pipe material are said to include formation on site to any length and diameter; fewer joints to leak; designed for any internal pressure; no corrosion; no cathodic protection required; no installation charges as the pipe is laid directly into the trench;

weight of 15% of conventional pipes; and virtually no transport costs.

Currently, InfinitPipe can be manufactured in a warehouse or on-site using a truck, though the process is still performed by hand. But according to Mr Ehsani, one crew member can produce 3m of pipe/hour, so a crew of three or four could produce 300m in just three to four days, directly off the mandrel, assembled and ready to go into service.



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AUSTRALIA

Down under a water table

Difficult site conditions, multiple stakeholder interfaces, piles along the alignment and highly polluted soils necessitated the development of innovative solutions for this pipe-jack project in Sydney, Australia. By Jonathan Sisovic



EPBM ready for insertion

THE Burrows Road tunnel is a pipe-jacked, 87m-long, 2.8m-diameter, watertight tunnel constructed beneath Burrows Road, within 100m of a tidal canal in the industrial area of Alexandria, Sydney. The alignment of the base of the tunnel is approximately 5m below the surface and, at that depth, is 4m below the groundwater table.

The US\$9 million tunnel, constructed by Abergeldie Complex Infrastructure for Ausgrid (previously Energy Australia), was designed to house six 132kV cable circuits to form part of a newly reconfigured network based on TransGrid's Beaconsfield South substation.

The tunnel was constructed by the trenchless pipe-jack method using an earth pressure balance machine (EPBM). Owned by Abergeldie, the EPBM, capable of boring a 2.1m-diameter tunnel in its standard configuration, had to be 'up-skinned' and its cutting heads rebuilt to cut the specified diameter of 2.8m.

A total of 28 liner segments, 2.8m in diameter, 410mm thick and 3m long, were pipe-jacked to construct the watertight tunnel. The actual boring process took 10 days at an

average rate of 8.4m/day.

Launch and reception pits were sunk 8m into the contaminated soil. The scope also included fitting out the tunnel with cable

support brackets, and refitting the pits for later use as tunnel maintenance access points.

The design-and-construct contract was awarded on March 17, 2010, with a target completion date of September 30, 2010. Having agreed

variations with the client concerning the scope of the project, and the consequent agreed extensions of time and adjustments to the total

contract sum, the works were completed to the scope and quality specified in November 2010.

Variations and extensions were largely due to latent site conditions, which required the redesign of the secant piling for the launch and reception pits; the discovery and relocation of a previously unmapped service line; and additional measures to manage and dispose of contaminated soil and ground water.

PROJECT COMPLEXITIES

The tunnel dimensions, site location, soil conditions and multiple stakeholder interfaces presented extreme technical and management challenges. Cranae was restricted by the proximity of the Sydney airport runway flightpath.

The project team had to liaise with the airport authorities, arrange a long-term crane permit, as well as notifying the airport when crane operations began and ceased every day. On-site space for storage and preparation of materials and equipment was at a premium, necessitating tight procurement scheduling and taking into account long supply lead times.

The soil was polluted with two centuries of industrial contaminants, and so saturated with ground water



Abergeldie replaced sections of steel reinforcement with fibreglass rods at the points in the piles where the TBM needed to break through

that an on-site detention system had to be set up, water samples taken and analysed, and disposal of contaminated water arranged. This was another activity requiring strict monitoring as space restrictions meant that only a limited volume of water could be stored and collection trucks had to be arranged accordingly.

Indeed, so soft was the soil that it could hardly support the weight of the tunnelling machine. A new operational control regime had to be developed to increase the number, and reduce the tolerance range, of positional checks and steering adjustments to maintain boring alignment and prevent the machine and the jacked pipes forming the tunnel from sinking into the mud.

Innovative measures, using hydrophilic crystals and cement mixed with the normal bentonite injection, were needed to control leakage of slurry spoil back into the launch pit. Similar measures were needed to prevent flooding of the receiving pit when the boring machine broke through.

PROJECT INNOVATION

Significant, innovative engineering solutions were developed and implemented in the course of the project to address problems presented by the unstable, water-charged soil.



The development, refinement and implementation of these innovations required the project team to initiate and manage a wide-ranging problem-solving process, involving the practical application of lateral thinking and networking techniques.

The original tender concept design called for the launching shaft to be located at the intersection of Burrows Road and Campbell Street, and the receiving shaft to be located on the site of the future Energy Australia substation. It was

Excavation of the launch shaft: its position was swapped with that of the receiving shaft during the planning stage to reduce traffic congestion

foreseen by Abergeldie that the potential for traffic congestion could be reduced if the launch and receiving pit locations were reversed. This cost-neutral change had the effect of greatly simplified traffic management.

Thorough investigation of underground services along the tunnel alignment, including position and depth, also prompted changes to the initial design. Abergeldie, in consultation with tunnel design consultants Demlakian, changed the size and location of both the launching and receiving shafts to accommodate the existing services found along the tunnel alignment.

“So soft was the soil that it could hardly support the weight of the tunnelling machine”

Secant piles were designed to create waterproof launching and receiving shafts. However, early on in the piling process, it was discovered that the actual soil conditions

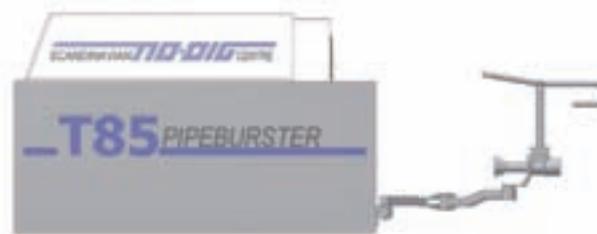
were not as indicated in the geotechnical report.

The piles that had been designed required a →

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TERMS APPLY

AUSTRALIA

Leakage control and additives

As is normal practice for EPBM boring, bentonite slurry was injected through the EPBM jacket and through lubrication ports in each section of pipe liner into the bored-out annulus space. This provides lubrication to ease the jacking movement of the pipe sections being installed, and also fills the annulus to prevent the surface of the newly bored tunnel from collapsing.

However, on the Burrows Road project, the bentonite mixed with the water-charged soil and formed an unstable, highly fluid sludge that leaked back into the launch pit. The sealing ring that had been installed at the entry point did not effectively staunch the flow.

Inspired by experience using hydrophilic expanding strips as joint sealers on other 'wet' projects of a very different nature, the project team experimented with mixing into the bentonite slurry a range of different types of hydrophilic crystals.

In principle, hydrophilic crystals should absorb some of the water in the bentonite slurry, expand in size, become sticky and

then be carried on the flow of the leaking slurry to the site of the leaks, where they lodge in the crevices and stop the flow. It took trials of various kinds of crystals, mixed in various proportions with the bentonite, to find a formula that worked.

Helped by advice from the NSW area manager of the Australian Mud Co, the range of products subjected to trial and error was narrowed down. A mix of Ausplug hydrophilic crystals in a precise proportion with bentonite did the trick. An innovative application of familiar products created a new, uniquely suitable drilling fluid that delivered effective tunnel sealing and control of the seepage.

It is also normal in tunnel boring to inject bentonite and detergent together as a 'lubricant' to loosen soil at the drill face and hold the soil particles in suspension at a consistency suitable for removal by screw and conveyor.

The water-charged soil conditions dictated against this normal drilling practice. Even without the addition of bentonite, the soil was

so wet and soft that the screw had difficulty carrying it away. It was also feared that sludge would pour into the receiving shaft when the EPBM broke through.

Further experiments with different mixes of drilling fluids and additives threw up an answer. Drawing on the broader experience of a personal associate of one of the engineering team, a 'leaf' was taken from the book of seismological practice.

Seismologists sometimes use a mix of bentonite and cement to create a gum-like substance. This substance does not set hard and provides a stable medium into which to insert seismic sensing probes in rock crevices. The engineering team experimented with the bentonite and cement – and it paid off.

The seismologist's mix of bentonite and cement, injected at the cutting face, enhanced the effectiveness and steerability of the EPBM as it moved forward, and created a seal to prevent the slurry from surging forward into the receiving pit, while the innovative combination of bentonite and hydrophilic Ausplug crystals sealed the slurry in the drilled-out annulus space. When the EPBM broke into the receiving pit, it was almost completely dry.

→ 2m socket into the bedrock, but the bedrock was found to be some 5.5m deeper than allowed for.

This meant that the pile design had to be varied to include temporary steel waler ring beam supports to ensure that the current pile design could be used even with the greater depths required.

This design change required more resources and skilled personnel to install the ring beam support in a short timeframe.

Traditional secant pile wall designs would have posed a problem for the tunnel boring machine, as the machine would not have been able to bore through the reinforced cages of the hard secant piles.

To mitigate this problem, Abergeldie replaced sections of the steel reinforcement rods with fibreglass rods at the exact points in the piles where the tunnel boring machine needed to break through. This provided a suitable temporary reinforcement solution for the structural integrity of the secant piles and also provided a 'soft-eye' through which to commence boring.

The positioning, dimensions and shape of these soft-eye breakthrough piles had to be extremely precise. The increased depth of the secant piles also meant that the prefabricated reinforcement cages had to be remade, and the



fibreglass reinforcement replaced in the cage at the correct position.

Innovations were also developed in relation to leakage control and bentonite additives (see box above).

Developing these innovative technological

The Burrows Road pipe-jack tunnel as completed by Abergeldie

solutions necessitated a problem-solving process that encouraged lateral thinking, drawing on expertise and experience well beyond the immediate project team, to come up with innovative solutions. The problem-solving process was time-consuming, the technological solutions were experimental and had to be trialled and proven on site, and their impact on completion time and cost had to be strictly contained.

THE FINAL PRODUCT

The finished alignment of the bore and tunnel had to be within 20mm of specified points – both horizontally and vertically.

Because of the extremely soft ground conditions, which made it very difficult to steer the boring machine accurately, the project team increased the frequency of laser positional checks and reduced the misalignment tolerance point beyond which delicate steering adjustments were made.

When the EPBM broke through into the receiving pit, the machine was bone dry, and the consequent frequent and minute steering adjustments resulted in a finished tunnel alignment within 7mm of target.

Jonathan Sisovic is a civil engineer with Australia-based contractor Abergeldie

LEAK DETECTION

A sound approach

Marc Bracken looks at the problems of water losses for utility companies and discusses some of the technology that is available to mitigate the problem

NON-revenue water (NRW) has an estimated value of over US\$18 billion/year worldwide and is therefore an important issue facing water utilities. NRW is the difference between the volume of water supplied to the system and the volume of water that is billed to the customers. Or simply put, it is the water loss for which the utility receives zero revenue.

The ability to assess and control water losses properly to ensure efficient use of resources and equitable and safe distribution of water to all legitimate customers is especially important, considering that water consumption is expected to increase 40% by 2025.

However, budget shortfalls for water infrastructure spending are presenting significant hurdles for utilities around the globe; these companies face increasingly frequent, excessive water leaks and main breaks, as years of unchecked deterioration take their toll on pipes that, in places, date back to the 19th century.

In the US alone, 700 water main breaks occur every day, so it is no surprise that more than 15-30% of treated potable water is lost through leaky pipes.

In light of utilities' continuing budgetary concerns, how can they reduce NRW if traditional leak-testing and pipe-condition assessment methods have questionable accuracy and can entail the expensive and disruptive process of excavating water mains or pressurising water systems to expose leaks?

TECHNOLOGY

Fortunately, efficient and cost-effective NRW reduction is possible as advancements in acoustic leak detection and pipe-condition assessment methods can help utilities detect leaks and prioritise water-system repairs and replacement – without breaking ground or disrupting service.

These new methods rely on measuring how quickly an acoustic signal is transmitted along a section of pipe, using vibration sensors and acoustic

correlators. The process is completely non-invasive; devices are attached to a section



Hydrophone being attached to hydrant

of pipe using standard accessories such as valves or hydrants, or directly to the pipe's outer wall.

An acoustic signal is induced into the pipe and changes to the signal – specifically changes to its transmission or propagation velocity – can be related to changes in the pipe wall's structural integrity. This yields a highly accurate measurement of the remaining (or effective) structural integrity of selected pipes while simultaneously detecting and locating leaks.

In addition, due to advances in sensor design and signal processing, significant improvements have been made in the ability of the system to

resolve leak noise in the presence of ambient background noise from running water, traffic or pumps. Utilities can therefore detect leaks and assess the condition of pipes of all sizes and materials – including ductile and cast iron, concrete, plastic and asbestos cement – as well

as in pipes in noisy, high-traffic environments.

The use of such technology is increasing →

“In the US, 700 water main breaks occur every day... more than 15-30% of treated potable water is lost through leaky pipes”



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LEAK DETECTION

→ among water service providers across North America, and in Europe, South Africa, Singapore and Australia, because of its accuracy and cost advantages over traditional methods.

IMPLEMENTATION

A recent example in the US involves the Sewerage and Water Board of New Orleans (SWBNO), which has been using acoustic leak detection for around two decades. However, in early 2011, it incorporated recent non-invasive acoustic technology developments into its water-loss management and water-pipe integrity assessment initiative.

During a pilot project that tested the accuracy of the technology, water main leaks resulting in NRW of around 300,000-400,000L/day (75,000 to 100,000 gallons) were quickly pinpointed; the loss from the leaks was enough to fill an Olympic-sized swimming pool every six days.

Impressed with the results of the pilot project, SWBNO is now using the technology to detect leaks and assess the condition of its water mains throughout New Orleans, a decision it credits with helping it to prioritise water system repair and replacement projects more efficiently.

The Las Vegas Valley Water District (LVVWD) is another US-based utility taking a similar approach. While it has a relatively young water infrastructure that experiences very few main breaks per mile compared with other major utilities, some of its pipes have started to fail more often due to corrosion and other factors.

A particularly troublesome section of pipe was part of a 10.4km stretch of 405-915mm mortar-lined, steel cylinder pipeline under some of the city's most popular thoroughfares. The pipe



Non-invasive acoustic testing can detect leaks and measure pipe thickness

was installed in the 1950s without any cathodic protection or corrosion control, and had experienced three main breaks over five years.

LVVWD expected to have to replace the entire 10.4km of pipe – a major expense that it estimates could have cost US\$300/ft (\$1,000/m) and disrupted busy roads. However, using non-invasive acoustics, the entire stretch of pipe was surveyed in only two weeks; LVVWD found that the majority of the pipeline was still in good structural condition, as it had retained more than 95% of its original wall thickness.

SOUTHEAST ASIA FOLLOWS SUIT

The same acoustic technology is also growing in popularity in southeast Asia as an effective way to reduce NRW. Recently, PUB (Singapore) turned to acoustic pipe-condition assessment services from Toronto-based Echologics to assess the condition of its water transmission mains.

PUB is Singapore's national water agency that manages the city's water supply, water catchment and used water. It is a statutory board under the

Ministry of the Environment and Water Resources. The project involves the acoustic survey of 1.6km of cast-iron and steel water-transmission mains (ranging from 500mm to 800mm in diameter) to detect leaks non-invasively and measure the mains' effective wall thickness. The collection of these measurements is intended to provide PUB with detailed information to help develop future rehabilitation programmes for some of its key assets.

Engineering firms in the region are following suit to help their customers address water loss issues. Malaysia-based environmental engineering company Jalur Cahaya Sdn Bhd (JCSB) is using non-invasive acoustics to locate water main leaks for a utility in Kuala Lumpur.

During one project, engineers acoustically surveyed in five days more than 4,700m of non-ferrous water mains with as little as 0.9bar of flow pressure. They non-invasively pinpointed five leaks, one illegal connection and one broken meter with a customer-side leak.

Initially, JCSB attempted to locate the leaks using various leak-detection systems, but it was unable to find them accurately due to the mains' low water pressure and non-ferrous composition. However, it then turned to technology featuring an enhanced correlation function, which enabled engineers to accurately identify and locate low-frequency leak noise.

Following the successful completion of the project, JCSB adopted the technology for use by some of its engineering crews.

"Using this advanced technology will bolster our current service offerings by giving our engineers the tools they need to locate leaks quickly and accurately in almost any environment they encounter – without disrupting surrounding infrastructure," says Sheikh Mazlan Sheikh Hassan, chief operating officer of JCSB. "Our vast experience combined with these capabilities will help us as we partner with other states in Malaysia to help them resolve their non-revenue water woes."

OPPORTUNITIES

Constrained budgets may continue to present utility companies with difficult challenges, but their efforts to prioritise water system repairs and replacement, and reduce NRW, do not have to be put on hold, thanks to recent developments in non-invasive acoustics.

These developments are being used increasingly by utilities and engineering firms around the globe; they provide the ability to locate leaks cost-effectively and efficiently, and measure the wall thickness of water mains, without many of the expensive and time-consuming processes typically associated with traditional leak-detection methods.

Industrial water application

Non-invasive, acoustic leak detection is also being used for industrial water applications. One such example involves a global leader in the beverage industry that was losing treated water at the rate of around 150,000L/day at its bottling plant in China's Shanyang region.

The water system was fed by the city's water supply through a 300mm service lateral, which provided water for the plant's operations, employees and fire protection system.

The plant's service crews had been searching for the leak for several months, but their efforts were unsuccessful due to the location of the pipes, which were buried fairly deeply (1.5m) under a concrete roadway. Machinery used for the plant's operations also created a large amount of background noise, which typically makes finding leaks in industrial facilities extremely difficult.

Eventually, engineers surveyed the plant's water system in less than one day, using the same kind of technology as employed by JCSB, and successfully pinpointed the leak, which was located on a span of pipe underneath a section of nearby roadway.

To conduct the survey, the engineers placed two hydrophones on valves and fire hydrants that were connected to selected sections of the system. Once the hydrophones were in place, a correlator listened for variations of acoustic signals induced in the pipe.

Changes in the acoustic signals enabled the engineers to pinpoint the leak quickly without breaking ground or disrupting service. Once the leak was located, service crews quickly excavated the site and repaired the leak, preventing further water loss that would threaten the facility's operations.

Marc Bracken is vice-president and general manager of Toronto-based Echologics

In the right direction

A challenging excavation involving six crossings using small boring units required careful steering along congested alignments in hard rock. Desiree Willis reports

TURN-KEY Tunneling, a contractor based in Ohio, US, was hired to undertake six utility crossings through competent hard rock in a dense urban location. It all seemed fairly straightforward but that was before the company saw the drawings of buried utilities: the lines were so numerous that they were described as looking like “a plate of spaghetti”.

The challenging project would require all of Turn-Key's experience and knowledge from past auger bores in rock, and its previous successes using Robbins Small Boring Units (SBUs). No stranger to steering SBUs in difficult conditions, the contractor ultimately carved out the small-diameter tunnels just inches away from active pipelines.

NEW WATERWAYS FOR PITTSBURGH

The crossings for Turn-Key Tunneling were part of a US\$101 million project representing one of the biggest recent investments for public utility Pennsylvania American Water. The utility had determined that ageing infrastructure had reached the end of its usable life and needed replacement.

Built in 1894, the original Hays Mine water-treatment plant and Becks Run pumping station have delivered 220 million litres/day of water to communities in southern Allegheny and northern Washington Counties for nearly 120 years. An intake was constructed in 1905, stretching from the Monongahela River up to the Hays Mine Plant.

Under general contractor Kokosing Construction, work is on-going on a new treatment plant and pump station, along with 900m of new 1-m-diameter water main. Six crossings, however, could not be open-cut due to the number of buried utilities in the area.

BORING CHALLENGES

The US\$751,400 contract for six bores, ranging in lengths from 11m to 39m, specified auger boring. Testing showed the crossings to comprise competent rock in the range of 62-158MPa UCS.



The Robbins SBU-A was utilised with a 1.5m auger boring machine

“Due to the hardness of the rock, the Robbins SBU-A seemed to be the perfect match for the project,” explains Joel Froehlich, contractor representative for Turn-Key Tunneling. “Cut and cover was not an option due to the depth and myriad of existing utilities in the area. The short run lengths did not make microtunnelling feasible, and a ‘Christmas tree’ head would not have provided the necessary cutting strength. Cutter wear would have been astronomical.”

SBU-As were also favoured over other types of auger boring machine (ABM) heads because of their capability for minor steering adjustments. Hydraulic stabiliser pads, located in each quadrant of the machine's rear shield, are adjustable within the first 6-9m of steel casing



Turn-Key Tunneling steered the 1.7m Robbins SBU-A between multiple existing utility lines

installation, in order to set the machine on the correct line and grade. After this initial period, the pads can be adjusted to correct any tendency towards ‘drift’ – this is the tendency of the SBU to climb and move towards the right, due to the clockwise rotation of the head. Line and grade can be monitored continuously using a water level, or periodically, by pulling the auger string.

The pads also stabilise any vibration or movement of the cutting head – the SBU's small-diameter disc cutters are downsized versions of TBM disc cutters, and are capable of excavating rock up to 175MPa UCS. In diameters from 600mm to 1.8m, a mid-range SBU-A would also be a good fit for 1m-diameter crossings.

Turn-Key ultimately decided on a 1.7m-diameter Robbins SBU-A, paired with a contractor-owned 1.5m ABM, for the job. “Though there were no tolerances spelled out in the contract per se, the existing structures and utilities in the condensed area provided a complex layout that we knew we had to steer well clear of while boring,” says Mr Froehlich.

NAVIGATING THE NARROWS

On its latest project, Turn-Key Tunneling not only needed to maintain line and grade, but also had to avoid multiple nearby utilities, which were mostly water lines coming into and out of the treatment plant. The first run was launched in October 2011 from a pit 4m wide and 12m long. →

AUGER BORING

➔ "Overall, it steered surprisingly well," says Jeremy Blake, operator/foreman for Turn-Key Tunneling. "One of the active utility lines was just inches away, most were 3-3.5m away, and we were able to avoid all of these."

Mr Blake additionally mentions a set of side-by-side bores, running just 1.2-1.5m apart. Both bores were completed within 50mm of line and grade after 60m of excavation.

"The only issues involving line and grade arose from differing material being located in the bore heading. These included layers of hard and soft rock and seams of dirt throughout several of the bores," states project engineer Brian Froehlich. The stabiliser pads provided the necessary adjustment to prevent drift in these sections.

Challenges arose when a duct bank and several utility lines were not found to be in their bidding-plan locations. These runs were stopped and grouted in place and the pit was lowered several feet to avoid the obstacles.

"The duct banks and utility lines were accounted for and remain in operation. The condensed jobsite location, centred in a highly

The crew carefully lines up the Robbins SBU-A for its first of six hard-rock bores ranging in lengths from 11m to 39m



populated area of Pittsburgh, in a local topography consisting of extreme hills with very hard rock, is what made this so challenging," explains Mr Froehlich.

Ultimately, all six bores were completed on line and grade by June 2012, with no machine

problems and only one cutter change in 195m of excavation.

"Support was tremendous in getting the one cutter replaced. It was done quickly and right the first time," said Mr Froehlich of the Robbins field service team.



Turn-Key Tunneling has been using Robbins SBUs since 2007, when it completed a 143m-long bore that holed through just 6mm off grade

Steering pedigree

Turn-Key Tunneling's ABM operators were no strangers to challenging projects, having completed similar bores in Cincinnati, Ohio, and Louisville, Kentucky. On their first 143m bore in 2007, the crew was faced with a 50/50 mix of shale (48MPa UCS) and limestone (100MPa UCS) to be excavated with a 1.3m Robbins SBU-A.

"The limestone layers provided a challenge as they were very thick and hard and moved vertically as the bore progressed. This caused the head to drift, depending on where the rock was present in the face," explains Brian Froehlich, project engineer for Turn-Key.

Mr Froehlich and the crew monitored line and grade with a water level, pulling the auger every 12-24m to ensure the machine was on the correct heading. The SBU-A ultimately broke through just 6mm off grade and 280mm

off line – well within the specified limits.

"Other heads would have cut this rock; however, they would not have been as easy to steer," he says. "With the way the layers were varying vertically, maintaining grade with other types of heads would have been extremely difficult and more labour-intensive."

The company repeated this feat on a record-breaking bore below a highway in 2009. The 1.4m SBU-A completed 107m through limestone up to 137MPa UCS, holing through just 4mm off line and grade, and well within the contractual ± 75 mm requirements.

"We continued to make progressively smaller adjustments and the SBU responded very well. The last 60m we bored were very true and required little fine-tuning," says Roger Lewis, project superintendent for Turn-Key Tunneling.

MANOEUVRING INTO THE FUTURE

The contractor's fleet of tunnelling machines, ABMs and SBUs stands it in good stead for more hard-rock utility crossings. "Our 1.7m SBU provides a competitive advantage in terms of increased production rates and being able to upsize other difficult bores with tight tolerances," says Mr Froehlich.

To date, the contractor has used Robbins SBUs – in varying diameters – on nearly 30 projects around the US, with near-term plans for several more. Of Turn-Key's success with the SBU, operator/foreman Mr Blake may have summed it up best: "The steering adjustment is great. It seems the harder the rock is, the better they cut."



After boring past active utility lines just 3-3.5m away, the Robbins SBU-A completed all six bores successfully

Desiree Willis is a technical writer with The Robbins Company

INTERNATIONAL NO-DIG PREVIEW

Brazil welcomes No-Dig

São Paulo, Brazil, will be the venue for the 30th International No-Dig exhibition and conference on November 12-14

WITH over 80 exhibitors committed to the event, organisers are looking forward to a successful, well-attended show. In addition to the usual benefits such events bring, visitors will also be able to gain an insight into the Brazilian, and hopefully Latin American, trenchless sectors.

Below are selected exhibitors that will be presenting at the show.

Conference themes

The main theme of the conference will be The Trenchless City, with sub-themes that will encompass:

- pipe installation using horizontal directional drilling (HDD);
- rehabilitation and replacement networks;
- pipe-bursting applications;
- geotechnical analysis at underground utility projects;
- soil investigation and inspection;
- microtunnelling, pipe jacking and GBM at gravity sewer projects;
- asset management;
- water-leak management;
- cost reduction and environmental impact at underground works;
- work safety, regulations and civil liability;
- new applications of trenchless technologies; and
- public investment programmes in infrastructure projects with no-dig.



Akkerman GBM308A guided boring machine

The 308A/339A systems are hydraulically powered with a P100Q or P150Q power pack, and controlled with an in-shaft pendant. The two systems can also be complemented with the 308A/339A GBM system with a powered cutter head, powered reaming head kit, or cutter head with integral swivel for more project versatility. More information is available on the Akkerman website.

Booth: 33

Website: www.akkerman.com

AKKERMAN

Akkerman's Guided Boring Machine (GBM) method is designed to offer customers extended and accurate drive lengths in a multitude of ground conditions. The GBM is said to provide the spoil-removal process of an auger boring machine and the same level of accuracy as traditional microtunnelling – all in a compact, powerful, multi-faceted system.

The 308A/339A latching frames allow operators to install up to 800mm-OD pipe from a 2.4m or 2.7m shaft. These jacking frames offer up to 91t of jacking force and 14,238 Nm (10,500 lb-ft) of rotational torque. The distinctive dual-walled pilot tube allows liquid lubrication throughout installation, thus minimising jacking force and rotational torque. A guidance system consisting of a theodolite and digital camera, mounted behind the jacking frame, allows operators to view the illuminated LED target on a computer monitor in the launch pit, ensuring that line and grade tolerances are met.

AMERICAN AUGERS

Visitors to the show will be able to see a selection of American Augers' line of underground construction equipment, which is manufactured at the company's 22,390m² facility in West Salem, Ohio, US.

The product line includes auger boring machines, maxi-rig and mid-size directional drills, oil and gas drilling rigs, mud pump and cleaning systems, and product tooling and accessories.

American Augers (AA) says it was the first HDD manufacturer to eliminate chains and utilise a rack-and-pinion carriage design – which is now the industry standard. This rack-and- ➔

American Augers' best-selling product is the DD-10 horizontal directional drill



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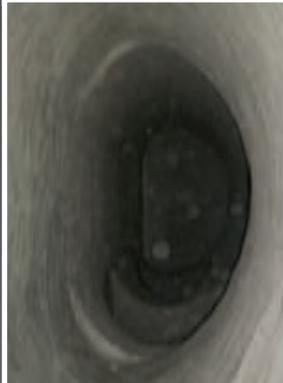
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AA says its best-selling product is Horizontal Directional Drill 10 (DD-10), featuring:

- quick-disconnect anchor plate – allowing for multiple drilling angles;
- availability with a 4.6m (15ft) or 6m (20ft) pipe loader;
- a 45t thrust/pullback (100,000lb);
- 20,834kg/m (14,000ft lb) of rotary torque, claimed to be the highest in its class.

The DD-10 has a state-of-the-art operator's cabin, a Quiet Pak noise-reduction system and an on-board mud pump. All the company's machines are supported through a dedicated parts and technical service department.

Booth: 47

Website: www.americanaugers.com

HDD BROKER

HDD Broker is a brokerage firm that advertises and sells rigs for private owners, banks and equipment dealers worldwide. Present at the majority of global trenchless shows, HDD Broker will be exhibiting at International No-Dig São Paulo.

The US-based company has been helping contractors source high-quality used equipment from around the globe for over 10 years. Its professional sales force has extensive experience in all aspects of the transaction, including pricing negotiations, inspections, international letters of credit, freight, logistics, quarantine cleaning and much more.

Listings for used utility installation equipment can be viewed on the company's website.

Booth: 85

Website: www.hddbrotker.com



HERRENKNECHT

Germany-based Herrenknecht positions itself as a technology and market leader in the area of mechanised tunnelling systems. The company delivers cutting-edge tunnel boring machines for all ground conditions and in diameters ranging from 0.1m to 19m.

Herrenknecht's product range includes tailor-made machines for transport tunnels (Traffic Tunnelling) and supply and disposal tunnels (Utility Tunnelling).

With 77 subsidiaries and associated companies working in related fields all over



A Herrenknecht TBM bored a 726m-long underwater sewage outflow pipe at Praia Grande, Brazil, in 2008. The machine was then recovered and bored two further tunnels, each about 700m long, to complete the project

the world, Herrenknecht says it can provide a comprehensive range of services close to the project site and the customer, quickly and in a targeted way.

As the world's population grows, the need for underground supply tunnels is also increasing; this is as true for developing countries as it is for modern urban centres.

That is why more than 850 Herrenknecht Utility Tunnelling machines are in operation around the world, constructing or laying water and waste-water systems, gas and oil pipelines, as well as conduits for electricity, internet and telephone lines.

Here, trenchless tunnelling technology offers a range of advantages compared with conventional construction procedures: transport, business and environment remain mostly undisturbed when micro-machines, horizontal directional drilling rigs or shaft-sinking equipment are being used.

At International No-Dig 2012 in São Paulo, Herrenknecht will use the exhibition to highlight the latest utility tunnelling projects where its machines have been used, as well as outlining its latest developments and

“As the world's population grows, the need for underground supply tunnels is also increasing”

innovations in mechanised tunnelling.

Booth: 27

Website: www.herrenknecht.com

INTERNATIONAL NO-DIG PREVIEW

HOBAS

Centrifugally cast GRP (CC-GRP) jacking-pipe systems by Hobas have been used successfully for decades in trenchless projects around the globe.

The first scheme implemented with GRP jacking pipes and remote-controlled jacking machines was carried out in 1982 as part of a research project in Hamburg, where 2,980mm-long pipes with an outside diameter of 752mm and a wall thickness of 50mm were safely installed.

Within only a few decades, GRP jacking pipes gained a firm foothold in trenchless technology and today, Hobas manufactures jacking pipes for pressure and gravity applications, in diameters ranging from 250mm to 3,600mm.

Among the benefits claimed for lightweight, high-strength CC-GRP pipes produced by Hobas are the following:

- installation progress of up to 20m/day;
- precise pipe routing;
- comparably low jacking forces;
- lower equipment costs;
- less excavation material;
- high corrosion resistance;
- resistance to sulphurous gases;
- excellent hydraulic properties; and
- a long service life, up to 100 years

The innovative production process (centrifugal casting) ensures that the pipes are circular, the wall thickness uniform over the entire length, and that the material displays corresponding strength properties for each individual project.

Given their high stiffness and smooth outer surface, CC-GRP pipes are also suitable for long drives, saving on intermediate stations and installation time.

For the 2011 No-Dig award-winning Czajka project in Poland, 3,000mm-diameter pipes were jacked on a single 900m-long drive. Even curved routes are not an obstacle when the right material is chosen: pressure jacking pipes were pushed along a 1000m-radius curve beneath the River Rhine in Switzerland.

Booth: 53

Website: www.hobas.com



Hobas centrifugally cast GRP jacking pipe

IMPREG

iMPREG International is a leading manufacturer of glassfibre liners for the rehabilitation of old and corrosive sewer pipes. Currently, more than 300km of iMPREGLiner are produced every year and installed globally.

Cured by either the latest UV-light technology or steam, the iMPREGLiner is →

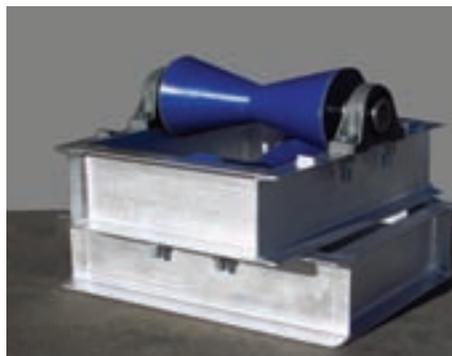
iMPREG manufactures glassfibre liners that it claims are strong, cost-effective and environmentally friendly



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→ claimed to be one of the strongest, most cost-effective and most environmentally friendly products on the market. Made in Germany, it is produced under fully quality-controlled conditions to DIN EN ISO 9001. Furthermore, the iMPREGLiner is certified by the DIBt (German institute for construction techniques) and meets all relevant industry standards.

The liner is delivered to the job-site ready for installation and pre-impregnated with special polyester or vinyl ester resin. A shelf life of up to six months and easy container shipment keeps the installation flexible.

iMPREG also provides on-site training, as well as running training courses in Germany. With its own lining equipment, including a state-of-the-art UV rig and a team of expert applications engineers, iMPREG can provide global support.

During No-Dig Brazil, iMPREG will introduce its latest innovation: an iMPREGLiner for rehabilitating large-dimension sewer pipes up to DN 1500, as well as the associated UV-curing technology.

Compared with other relining systems, the use of glassfibre liners can provide cost-effectiveness and short installation times when rehabilitating large-sized pipes, the company states.

Booth: 21A

Website: www.impreginternational.com



Pure Technologies helps utilities to manage their pipeline assets as effectively as possible



PURE TECHNOLOGIES

At No-Dig 2012, Pure Technologies will be showcasing the benefits of its Assess & Address pipeline-management programme.

Pure is currently undertaking a major initiative to demonstrate the fiscal benefits to utilities of assessing critical pipelines and addressing the problems identified through selective rehabilitation and replacement.

Through nearly 13,000km of pressure pipe inspection, Pure has found that 96% of relevant pipelines are in "like new" condition, and less than 1% of sections require immediate repair.

Using return-on-investment studies, Pure has determined that an Assess & Address programme can be implemented for about 4% of the capital cost of replacement, and significantly extends the useful life of a pipeline.

The show will also highlight Pure Engineering Services (PES), which aims to create improved, innovative solutions to help utilities manage their buried pipeline infrastructure. The PES division has spearheaded two innovative management

Vermeer AXIS guided boring system

programmes in the US, for the Miami Dade Water & Sewer Department and the Washington Suburban Sanitary Commission, as well as several other programmes across the US in St Louis, Baltimore County, Baltimore City and Cleveland.

Booth: 43

Website: www.puretechltd.com

VERMEER

Developed by Vermeer, the AXIS guided boring system is designed to install 254-356mm pipe in lengths of up to 107m, and can maintain grades of less than 0.5%. The system is designed to push or pull product pipe into place and offers flexibility in the type of product installed.

Comprising four main components, the AXIS system includes a power unit, rack, vacuum pump and vacuum tank. The power unit contains the engine and hydraulic pumps and connects to the rack to power-thrust and pull back the drill stem. The rack includes the thrust/pull-back carriage assembly and gearbox. As the thrust/pull-back carriage assembly moves up the rack, the gearbox



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simultaneously provides rotation to the cutter bit at the front of the drill head.

The drill head uses a flat-face cutter and, when combined with the laser guidance system, AXIS is designed to complete flatter grades more accurately. As the drill stem cuts through the soil, the displaced material is removed by a high-power vacuum system. Spoil is diverted to a vacuum storage tank. The vacuum process gives a cleaner work site and allows a minimum annulus, which helps improve accuracy.

Because of the flexibility of the four major AXIS system components, various set-up configurations can be used to adjust the machine's footprint, based on job site and transport logistics.

Booth: 23

Website: www.vermeer.com

VMT

Germany-based VMT supplies TBM navigation systems for segmentally lined and pipe-jacked tunnels. For conventional tunnelling, it supplies navigation systems for roadheaders and

rockbolters to keep machines on the planned alignment. The company has subsidiaries in Australia, China, Russia and the US.

VMT can also provide monitoring and communication systems. The information systems collect, visualise and evaluate varying data; monitoring solutions automate and monitor processes; and VMT

communication systems deliver real-time monitoring and communication.

The company will also present its products for curved microtunnel drives.

Since 1995, it has completed around 300 projects in 30 countries, in association with 100 customers. Project references show a total of 200,000m of curved microtunnels in diameters from 600mm. During the past few years, countries such as the US and Morocco have successfully completed their first planned curved drives.

Customers opt for curved instead of straight microtunnelling drives to reduce the number of intermediate shafts and shaft depths. Other cost-saving criteria include reducing construc-



VMT will present its products for curved microtunnel drives

tion time and flexible alignment planning. VMT navigation systems run with a minimum of advance downtime and manpower.

Also on the VMT booth will be Jackcontrol, highlighting its new demonstration model of the Hydraulic Joint, which is hailed as the key to curved microtunnelling. It can be used on sharply curved alignments, using regular pipe lengths, and when traversing difficult boundary conditions.

Booth: 45

Website: www.vmt-gmbh.de

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TRAINING

Confusion in UK trenchless training?

Peter Crouch of the UK Society for Trenchless Technology discusses possible reasons behind any confusion concerning the UK's no-dig training standards, and advances possible solutions

THE past 20 years or so have seen the advent of ISO classifications and similar industry-wide accreditations across the utility sector. One result is that it is now expected that all operatives, whether they are employed by utility companies or by their contractors, must be fully trained, adequately equipped and competent for the works being undertaken, regardless of any financial restrictions operating at the time.

Perhaps because the UK is in a recession, it is more business-critical that works are completed correctly from the start. No-one can afford revisits to put work right. This is largely because in such a competitive market there is no slack in the pricing structure of contracts to allow for such things. It is, therefore, critical that operatives are directed, inspected and expected to clearly ensure compliance with national industry health-and-safety (H&S) and workmanship standards, regardless of the particular sector. Trenchless working is no different.

CONFUSION IN STANDARDS?

The evidence suggests that mandatory training in the UK is taking place as required. 'Confined spaces' is an example. Operatives have to hold a certificate of competence to undertake this work or they are uninsured and operating illegally. This situation, while a burden to some, is seen by most to be totally necessary to ensure the safety of both the workforce and the public that might pass the work site.

Where this situation appears to change is in training for technology-specific applications. One of the aims and objectives of the UK Society for Trenchless Technology (UKSTT) is to promote the safe implementation of trenchless technologies across the utility sector. UKSTT has contracted with one of the UK's leading training providers,



Multiple training and qualification standards are evolving in the UK

Develop, to provide a jointly developed range of City & Guilds-recognised and approved training courses across various aspects of the trenchless technology spectrum.

“How do these ‘nationally recognised’ standards compare, and what level of competency do they represent?”

winching, pipe trailer handling, impact moling and pipe bursting. So, if there is confusion, where does it lie?

Confusion may well stem from changes within the industry relating to the transfer of private sewers and laterals into the hands of

water companies across England and Wales.

In an effort to ensure continuation of work for many of the local private sewer contractors with this change in ownership, some new training courses and certifications have been established that aim to bring often very experienced but 'unqualified' operators into the fold of certificated operators. Perhaps the use of the term 'unqualified' should be explained. 'Unqualified' in this instance means that while the operators might have undergone a particular manufacturer's training for specific equipment and products, they have not gained a recognised national certificate for that particular technique. So operators may be very proficient in one particular product but not necessarily in the methodology and its application as a whole.

While it has to be recognised that all training to make operators safe and effective in their work is welcome, without a consistent and recognised national standard being applied across the industry as a whole, no comparison of skill levels or competence is possible. This is perhaps where the confusion in standards comes in.

With the private sewer transfer initiative approaching its first anniversary, organisations representing the 'local' contractor have spent time working with recognised certification organisations to develop training and certification programmes that would bring such contractors up to a 'recognised national standard'.

Some of the courses now on offer are new to the industry and cover areas not previously noted as requiring certification, provided manufacturer training had been completed. However, other courses on offer 'conflict' with existing industry-recognised courses.

While the newer certificating body may have negotiated new 'national standards' with industry, relating to the courses, training and certification it now offers, it has not, apparently, included existing certification bodies in these negotiations. The question this raises is how do these 'nationally recognised' standards compare, and, therefore, what level of competency do they represent? This situation is, for many, unclear.

The situation could perhaps be compared to driving a car, where a provisional licence means a driver is working towards the national standard, the standard licence means the basic driving test has been passed, but a driver with the advanced licence or an HGV licence has exceeded these basic minimums by some significant degree. The same could be said of the current levels of national recognition for work standards and competency in the drainage and other related industry sectors with the changes currently being made and new courses being offered.

AGREEMENT NEEDED

Until industry, government, all certification bodies and training organisations agree on a basic minimum standard and how different qualifications relate to each other in terms of recognised competency levels, there is the danger that all certifications may be seen to mean the same thing, when in fact they do not. Ultimately, this could lead to an undesirable two-tier qualification system.

But it could also create a retrograde movement, whereby some qualifications and certifications are recognised by some client companies, but not by others. This would then take the industry back to the days (of not too long ago) when contractors had

to have operators trained a number of times in the same occupation or technology, simply to meet individual client requirements to have the 'right' card or piece of paper. This has proven to be not just very inefficient but also very costly, to contractors and also to clients, as the extra costs involved in multi-training for the same topic have to be vectored into any project's final bill in one way or another.

So, while mandatory certification is working well and in accordance with fully recognised and accepted national standards, the question has to be asked whether the same is true for specific training in working methods, applica-

tions, product types and technology. At the moment, this is unclear, which may mean that it is not a true reflection of the current situation and that there is or could be confusion developing that has not yet been fully recognised within the industry.

Have we again reached a point (or are we again creating a situation) that means there is little or no consistent, effective control, monitoring or post-construction auditing of

individual technologies, such as CIPP? Here, little final testing is undertaken and, at present, methods of installation vary from contractor to contractor, with perhaps too much emphasis being placed on suppliers' training by the client companies,

and on word-of-mouth 'reputation' (in future, 'client' companies may simply be the utility owner's main contractor, which will ultimately carry the can for any shortfall in subcontractor performance).

This must add weight to the argument that term contract specifications must include demands for all operatives to have independently accredited, generic, topic-specific training and certification that is in fact nationally recognised; not just recognised by certain parts of the industry but at all levels.

It is for the client companies to insist on this as being essential for tender/contract compli-

ance. It is only by having all parties coming together to make such an agreement that any confusion that is developing, or that may already exist, will be eliminated from the certification process. How Germany operates in this respect might prove enlightening.

GERMAN LESSONS

The German national DIBT scheme looks not just at final product quality, but also at methods and practices involved in the installation, and the competency of individual operators. If they can achieve this control, why can't we in the UK?

We need to ensure that projects are not compromised by sub-standard workmanship or by a lack of fully recognised training standards. But who should set and monitor such standards?

The courses currently on offer through organisations such as the UKSTT and Develop have already gained City & Guilds approval and so make an excellent starting point for spreading this type of competency training and certification across the UK. The long-established reputation of the City & Guilds qualification, not just in the UK but also internationally, should perhaps be viewed as the starting point for the discussion on which qualifications match to those required.

Perhaps it is time for client/main contractor partnerships to think again about what will be needed to maintain high standards in the very near future and ensure that any new certification offerings fully meet the levels of skill and competency that have been created over many years by already world-renowned organisations.

“There is the danger that all certifications may be seen to mean the same thing, when in fact they do not”

Peter Crouch is UKSTT technical secretary. Further details of courses available can be obtained from UKSTT: admin@ukstt.org.uk www.ukstt.org.uk

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