

# GeoDrilling

INTERNATIONAL

- Borehole logging
- Auger drilling
- Australasia



TECSO, S.A.

## In brief

**Van Elle opens in southeast**

Geotechnical, piling and foundation contractor Van Elle has opened a dedicated office in the southeast. The office is at: Van Elle Thremhall House, Thremhall Park, Start Hill, Bishop's Stortford, Herts, CM22 7WE. Tel: +44 (0)1279 874665.

**Atkins announces CEO**

Atkins has announced the appointment of Uwe Krueger as CEO, replacing Keith Clarke, who retired recently. A physicist by training, the 46-year old Dr Krueger has spent the majority of his career leading engineering and consulting organisations in North America, Europe, the Middle East and Asia Pacific. He joins Atkins from Texas Pacific Group.

**Arcadis UK hires Carroll**

International design, engineering and management services consultancy Arcadis has appointed Mike Carroll as its CEO in the UK. His responsibilities will include giving direction to the business and overseeing all the company's UK operations. Prior to his appointment, Mr Carroll was managing director (environment) for Arcadis UK. He has over 30 years' experience in the engineering and environmental sectors, as well as having held a number of senior positions within Arcadis USA and with the US Air Force in Europe in the 1980s.

**Crossrail CEO**

Crossrail has hired Andrew Wolstenhome as chief executive. He will take up the position in September, replacing Rob Holden, who stepped down recently. Mr Wolstenhome joins Crossrail from Balfour Beatty, where he is currently director of innovation and strategic capability. He was project director for the construction of Heathrow Terminal 5, overseeing the completion of the US\$6.4bn terminal on time and on budget. He also acted as construction director on the Heathrow Express rail link and as BAA's director of capital projects.

# NSCC warns of skills shortage

The long-term outlook for specialist contractors remains tough according to the latest NSCC State of Trade Survey from the National Specialist Contractors' Council (NSCC).

The results for the second quarter of 2011 show that enquiries and orders are still low as a result of concerns over government cuts and the lack of investor confidence.

However, 63% of respondents were operating at over 75% capacity, compared to 47% in the previous quarter, indicating that businesses are undertaking more work with fewer resources.

There are early signs of skills shortages, with 19% of respondents reporting recruitment difficulties due to a lack of operatives with the required skills and experience, compared to just 8% last quarter.



Suzannah Nichol MBE

This is leaving almost one in ten specialist contractors unable to bid for work, according to NSCC.

The availability of labour is now a significant factor in business

planning, although the majority of respondents are looking less than three months ahead.

NSCC chief executive Suzannah Nichol MBE said: "Specialist contractors are still feeling the effects of recession and they are doing more with less as margins become almost non-existent.

"However, it is essential that we continue to invest in training the industry's workforce to prevent a shortage of skills when the market recovery gathers pace."

NSCC contributes its findings to the State of Trade Survey published by the Construction Products Association, enabling the experiences of the specialist sector to be compared with the wider industry.

## Bauer Group announces half-year growth

Bauer AG has announced an overall growth in total group revenues and in earnings in the first half of the current financial year.

The firm said slight declines in the equipment and construction segments balanced out by strong growth in the resources segment.

Total group revenues were up 7.9% against the same period in the previous year to €639.9 million. Earnings before interest and taxes (EBIT) increased by 3.9% to €28.3 million.

After-tax profit of €5.6 million was just short of the previous year's level of €6.1 million.

Bauer said that ongoing political unrest in the Middle East and project delays have particularly affected the group's construction segment, which reported a 10.4% fall in revenues to €262.2 million, against the previous year's figure of €292.8 million.

The segment's major projects include the remediation of a dam in Florida, USA, excavation pits for an underground railway system in Panama and for the London Underground in England.

Other projects include specialist foundation engineering work for large-scale infrastructure projects in

Hong Kong and Malaysia.

The equipment segment increased its total revenues by 28.1% to €322.7 million from a previous year figure of €252 million.

Orders in hand were down slightly against the previous year, decreasing by 4.3 percent to €140.1 million. This was largely linked to the delivery of the first of a range of deep-drilling rigs during the reporting period.

The segment is seeing growing demand in the Far East.

The performance of the group's resources segment, which focuses on future-oriented products and services in the fields of water, energy, mineral resources and environmental technology, was thoroughly positive. Its total revenues rose by 23.6% to €95.5 million.

Professor Thomas Bauer, chairman of the board of Bauer AG, said: "Thanks to the global span of the Bauer Group, problems in one market or another, while of course being unwelcome, can be relatively well absorbed.

"Our strategy is to utilise the opportunities and the stabilising effect arising from our presence in some 70 countries around the world."

## Soilmec opens piling-rig factory in Italy

**Soilmec has officially opened a facility for manufacturing its PSM micro-piling rig.**

**The new Casella plant, located in Asolo, Italy covers a total of 14,000m<sup>2</sup>. It includes a 6,000m<sup>2</sup> indoor area, with 1,000m<sup>2</sup> dedicated to offices.**

**The facility has been designed to optimise space and improve production efficiency.**

**The workshop features three overhead cranes of 20 and 10t capacities, a new painting furnace and a test area.**

**Large spaces are available in the mounting and testing areas for the assembly of large tunnel fore-piling rigs, as well as mini-piling rigs.**

**The plant fully complies with all safety standards, while offering a pleasant working environment.**



# CAP in hand

Soilmec describes how the cased augered piling technique, used in a recent project in Italy, is pushing the boundaries for using continuous-flight augers

Satellite map showing the route of the underpass through Merano



Right: two Soilmec R-825 rigs and a Soilmec R-625 working in CSP/CAP

Below: Soilmec SR-100 CAP

**T**revi/Soilmec is involved in a major project to build an underpass to cross the town of Merano, which lies at the foot of the Alps.

The underpass will start on the west of the town, in Lagundo, and pass under orchards before entering the town close to the train station, providing the only access to the town's road network

and to an underground garage.

From the railway station, the bypass road will wind underground, first in loose material, and then rocky material, through the Mount S Benedetto tunnel to the business area of Tirolo, at the foot of Mount Zeno.

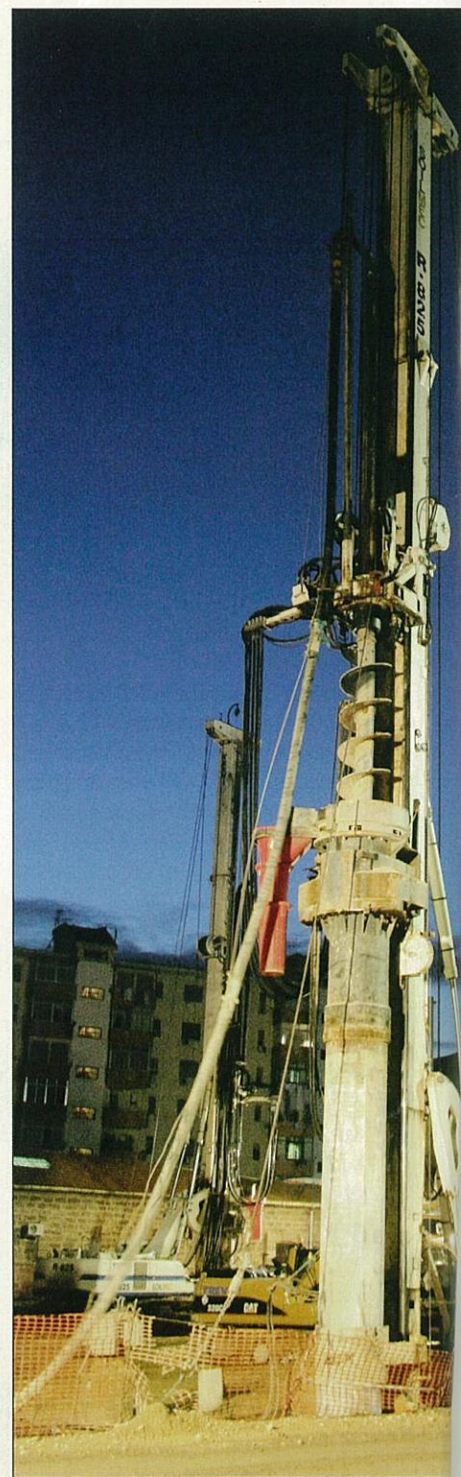
This stretch of the road will feature an underground connection to a garage planned to be built on Mount S Benedetto. A roundabout will also be built in the Monte S Zeno business area, connected to the road to Maia Alta, the business area, Val Passiria and Tirolo.

## The project

The project is divided into two phases. The first, currently under construction, connects the Mebo semi-underground roundabout in the west of the town to the railway station. It includes a 300m cut-off diaphragm wall along the Adige River, built with secant piles and a 500m "cut-and-cover" tunnel.

The piles to be constructed have diameters of 600, 800, 1,000 and 1,200mm and lengths ranging from 7 to 23.5m, amounting to 26,000m in total. The soil is alluvial and characterised by the presence of gravel, cobbles and blocks of porphyry gneiss, amphibolite and mica shists, usually of 0.5m diameter, although they can reach up to 1m<sup>3</sup> in volume.

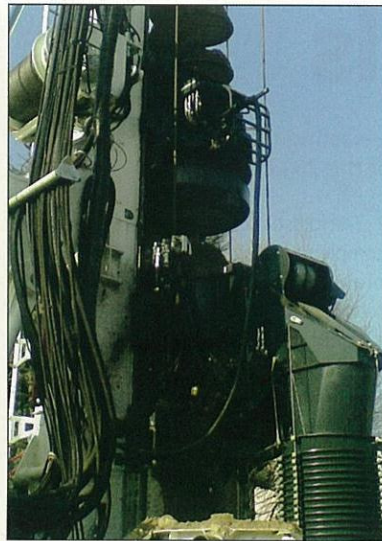
In difficult soil formations, such as in the Alps, Kelly-drilling inside a temporary casing is traditionally used. The casing is driven into the soil by a casing oscillator that is hydraulically operated by the rig's circuit. Although Kelly-drilling offers good performance, it is slow and the continuous-flight auger (CFA) method is two to four times faster. This is why CFA has been extensively used in Europe for the past 20 years.



Yet the CFA method has two limitations:

- In the presence of loose water-saturated soils, there is a risk of soil distressing/loosening around the pile while extracting the auger;
- While, in non-cohesive soil, there is a risk of concrete migration during concreting, resulting in excessive consumption.

Trevi has developed the cased augered pile (CAP) method to overcome these difficulties, using additional casing to the CFA method.



### SR-100 CAP

Power	kW	480
Weight	t	150
Nominal crowd force on auger	kN	400
Nominal crowd force on casing	kN	440
Nominal casing extraction force (max)	kN	840
Nominal auger extraction force (max)	kN	1,280
Relative stroke between heads	m	21.7

#### Drilling capacity in CFA

Max diameter	mm	1,400
Max depth	m	28.5

#### Drilling capacity in CAP

Max diameter	mm	1,200
Cased drilling depth	m	21

production rate may fall to only 50 or 25m of piles, in large cobbles, or even less in the presence of boulders.

CFA drilling in such a soil is a real challenge, regardless of the casing. However, based on the diameters to be drilled, Trevi proposed using the CAP method. Drilling was conducted using CAP versions of the Soilmec SR-80, CM-120 and SR-100 rigs, equipped with double rotary heads.

CFA drilling was driven by an upper rotary head, while temporary casings were driven into the soil by the lower rotary head, working as a casing driver. The two rotary assemblies are rope connected, although they run independently along the mast.

The SR-100 rig achieved excellent results. With its 480kW installed power, 330kNm available torque on the upper rotary head and 448kNm on the casing driver, it reached an average daily production rate of four to five piles of 1,200mm diameter, drilled to depth of 17m. This is twice the productivity of the traditional method.

Although having a rig capable of delivering suitable torque and power is crucial, just as important are the characteristics of the tools.

The tip of the auger and the cutting shoe of the casing were adapted to handle the non-cohesive, hard and abrasive soils.

This involved selecting the most suitable type, arrangement and number of teeth, wear-resistant tungsten-carbide plates and positioning of the concreting plug. All these details affected productivity as much as the features of the drilling rig itself.

In this specific soil formation, another crucial feature besides the casing extraction capacity was the possibility for the upper rotary to move freely along the

mast and separately from the casing driver. This ensured cuttings removal, while maintaining the production rate. At the same time, cuttings were brought to the ground in a safe condition by means of a telescopic spoil discharge system.

*Above left: new Soilmec soil-handling system for CSP/CAP*

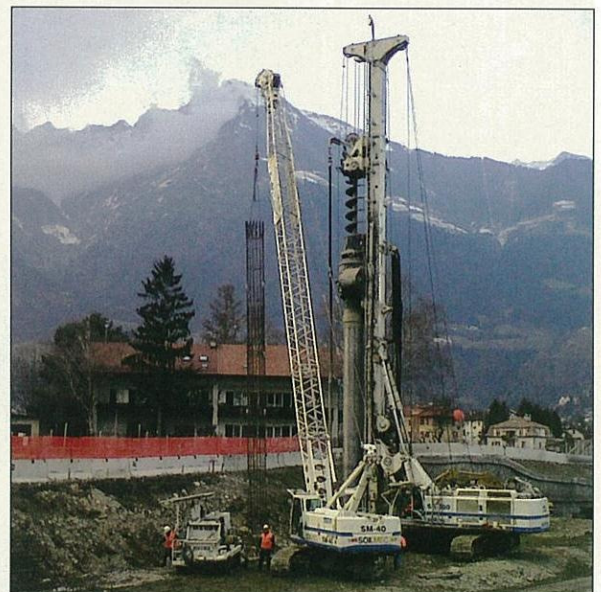
### Extending CAP use

Based on the results achieved in this project, it is likely that, with application of the CAP method, the use of CFA drilled piles will be extended to soils on which only cased drilling with a casing oscillator has been used to date.

The SR-100 pushes back the limits of using CAP in hard soils, enabling the drilling of 1,200mm-diameter piles to 21m. While the CAP cannot be applied to cased piles for bridges of 1,500mm diameter yet, the SR-100 is pushing the boundaries, enabling a maximum drilling capacity in CFA of 1,400mm and a depth exceeding 30m.

**“The SR-100 pushes back the limits of using CAP in hard soils”**

*Soilmec SR-100 constructing CAP piles, with a SM-40 crane in attendance*



### The CAP challenge

The soil in Merano mostly consists of gravel and very hard cobbles. Drilling must be to a depth of more than 23m for piles of diameters up to 1,200mm. In such conditions, the use of the traditional Kelly-drilling method, using temporary casings, seemed unavoidable.

Where the soil is not too hard, this involves the casing being driven into the soil directly by the rotary head, as drilling advances. However, in the presence of very hard formations, a casing oscillator is used to assist the rig. As a result, the daily

30-35m, this would result in an assumed saving of one hour per pile.

The difference between these tools and an original tool owned by the contractor was 41 minutes over 15m.

With the configuration of the original tool, the overbreak was much higher as the tool pulled material from the bore. In this case, the contractor had four rigs working on site for two months.

Taking this into consideration, it is clear that, through attention to design, the savings are beneficial; not only financially, but also in terms of the length of contract, running costs and wear to the machine.

It is important to have site feedback in order to monitor all aspects of tools in use for analysis and to influence any design amendments that may be required for future tool designs. Put simply, such feedback will explain what works.

Tooling and the application of tooling can ensure a contract runs smoothly, so attention to design should therefore have a high position on any agenda.

For other applications, specialised tools may be required. When drilling under any support fluid, such as bentonite or polymer, the design of the tool must allow the passage of the fluid past the tool when extracting it from the bore. This serves to balance the hydrostatic pressure, thus keeping the bore supported.

These tools, if in drilling bucket form, are usually a 'D' shape in profile, while augers have a separate helix through which the fluid can pass.

Another tool now being used for hard formation is the cluster bucket.



This consists of a bucket fitted with down-the-hole (DTH) hammers, which are driven by air. The exhausted air then lifts the cuttings until they lose velocity and drop into a Calyx basket at the top of the tool.

Alternatively, the cluster bucket is driven from the machine with shrouded extension tubes, with the cuttings coming to the surface.

### Health and safety

Health and safety should also now be a major factor in the design of tooling. It is important to ensure the correct procedures are carried out when installing and extracting any consumable parts. This is especially true with tungsten carbide, which requires the use of soft-faced hammers to insert and slide hammers for extraction.

Similarly, it is important to ensure the correct quantity of auger-retaining pins are inserted into the CFA couplings. Mini piling auger pins should be placed in the correct orientation for the flow of material.

In conclusion, the drilling tools for rotary, CFA, restricted access or mini piling machines are at the sharp end of the piling operation. However, on many occasions tooling design and its importance to the overall operation is too often overlooked. In short, the wrong tool for the wrong job will only slow any contract and cause expensive downtime.

*Tim Lasbury is director of Ground Engaging Technologies*

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