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Only so many ways

Mike Hayes reports on the array of technological, environmental and mechanical advances that have changed the face of drilling equipment in the 21st century.

A senior construction industry figure recently said – and not for the first time – "there are only so many ways to dig a hole".

With all due respect to the great man, I suspect there are a few drilling experts who would disagree with that. Furthermore, the advance of the mechanical technology being utilised in modern drilling rigs is exponentially increasing the options for digging holes, as the next few pages will hopefully illustrate.

In Egypt, for a start, a new Suez Canal project will see a second canal built, parallel to the original, for a distance of around 35 km. The aim is to allow for the passage of super tankers and huge merchant ships.

The project also involves the construction of six road and rail tunnels, plus the development of five ports in Port Said.

CFA piling

The Egyptian Army Corps of Engineers is undertaking some of the construction work, and is carrying out a significant amount of drilling to carry foundation piles.

The Army chose continuous flight auger (CFA) piling, the advantage being there is never an open or unsupported pile bore, as with some other bored piling methods.

A number of Soilmec drill rigs are being used on the project, especially the SR-125. This rig is important, due to the fact that its technology has been designed for bored piles and CFA, but it can also be easily converted to perform cased secant piles, a technique using two separate rotary heads, the top driving the CFA auger and the lower head driving the casing.

This method benefited the Army operatives, as the accuracy of the piles could be significantly increased, as well as the speed of production.

The new mast and new rotary on the Soilmec rig ensures a healthy weight-to-performance ratio, and the H-cab has been designed to offer the operator comfort, along with control and monitoring over the rig and technological parameters, in the shape of the 300mm touch screen.

The turret has been redesigned to cut noise levels and, in the LDP version, the rig can perform 121m deep piles, with a maximum diameter of 3,500mm.

At the Port Said job site the SR-125 HIT has been used to perform the bored piles of 1,200 mm diameter to a depth of 74m. The piles were drilled in bentonite through the use of a bucket with soil teeth and with the first 12m cased directly with the rotary head.

A Liebherr LRB 355 installing sheet piles in the Austrian town of Frastanz

Parallel kinematics

In western Austria, in the town of Frastanz, Rondo Ganahi, a company specialising in the production of paper and packaging, is building a new warehouse and extension, as well as carrying out significant modifications to its existing facilities.

Hilti & Jehle was asked to carry out deep foundation work at the site, and sheet piling work had to be carried out on a 7,500m² area, to lower the groundwater level by some 3m, and secure the foundation pit.

The company utilised an LRB 355 piling and drilling rig from Liebherr, to install U profile sheet piles with lengths of between 11m and 12m.

Benefits of the LRB for the projects included its strong undercarriage and long crawlers for additional stability.

The drill rig features parallel kinematics – a mechanism that allows the head to move on a number of different axes – giving

to dig a hole

The Egyptian Army is using Soilmec's SR-125 HIT rig on the new Suez Canal project

Soilmec's SR-125 HIT drilling rig bores piles to a depth of 74 m, at Pord Said, Egypt

Bauer says its BG 46 is currently the most powerful rotary drilling rig on the market

The BG46's cabin offers operators plenty of comfort as well as cutting-edge technology

the drill a large working radius.

Another advantage is the assembly of all winches directly on the leader. This enables a clear view of the main winch from the operator's cab and also ensures that the ropes do not move when the leader is adjusted.

Kelly drilling

Another German firm, Bauer Maschinen, has its ValueLine and PremiumLine range of drilling rigs, both optimised for very different applications.

The ValueLine rigs are designed for Kelly drilling, while the versatile PremiumLine rigs can be tailored to a number of specialist foundation engineering applications.

One example is the Bauer BG 46, a PremiumLine rig that was first presented at last year's Bauma exhibition in Munich.

This large diameter rotary drilling rig is equipped with a KDK 550 S rotary head, which provides a maximum torque of 553 kNm. In addition, it is possible to apply a torque of 700 kNm to the drill casing using a mechanically mounted torque multiplier.

Through these forces, the rig has a capability to install casing deeper and overcome unexpected geotechnical conditions.

At a little over 33 m in height, the machine has a flexible mast and a folding auxiliary boom, which allows the auxiliary winch to be used in all single pass applications without any restrictions.

The optional single-layer piggyback winch allows the complete pulling force of 450 kN to be used in any working situation without reduction, and the design avoids rope jumps, meaning that a longer rope service life can be achieved.

Because of the highly powered base unit of the rig and the dual motor concept of the winch, even at a load of over 270 tonnes, the winch has a lifting speed of 50 m per minute, granting an efficient drilling process.

For Kelly drilling – and depending on the configuration of the drill rig – drilling diameters up to 3,700 mm can be achieved. Using the CFA method, the BG 46 can achieve a drilling depth up to 36 m, with a maximum drilling diameter of 1,200 mm. >