

Gaining ground

The trend for larger projects with complex demands is driving innovation in the foundations sector.

Helen Wright reports on the latest products and applications.

Ambitious new projects are shaping the latest equipment launches in the foundations sector and pushing the limits of existing current machinery and construction techniques.

Rising energy costs, for example, are driving architects to improve environmental designs for buildings, and contractors are increasingly specialising in challenging projects including installing geothermal piles and wind turbine foundations.

Meanwhile, foundation equipment manufacturers report that an increasing number of large infrastructure projects around the world are fuelling demand from contractors for heavy, multipurpose piling machines with large capacities.

In April, for example, IHC Fundex Equipment unveiled the largest mobile piling machine it has ever manufactured in response to a customer request. Weighing over 300 tonnes, the FPD5000 has been designed for diverse methods of piling but can also be used as a crane. IHC Fundex said the machine was built for a customer in Brazil and will be put to work on the construction of a new airport.

The FPD5000 can be used as a 275 tonne capacity crane and can be modified with additional winches and cylinders to become a dedicated pile driving machine, capable of working with a maximum load of about 65 tonnes for the hammer and pile.

The machine has a 29 m boom in pile driving configuration and a standard 60 m length for lifting purposes. It can be disassembled relatively easily into separate pieces – the body of the machine weighs about 50 tonnes and is transported separately from the carrier and tracks.

Support network

Meanwhile, Soilmec has teamed up with Caterpillar to produce its latest heavy duty model – the SC-65 lattice boom crawler crane. Soilmec showcased a prototype at last year's Bauma Germany show, and the SC-65 has now been brought to the market.

The machine has undergone extensive testing and improvements have been made to its design. Managing director of Soilmec, Simone Trevisani, said that through the co-operation with Caterpillar, >

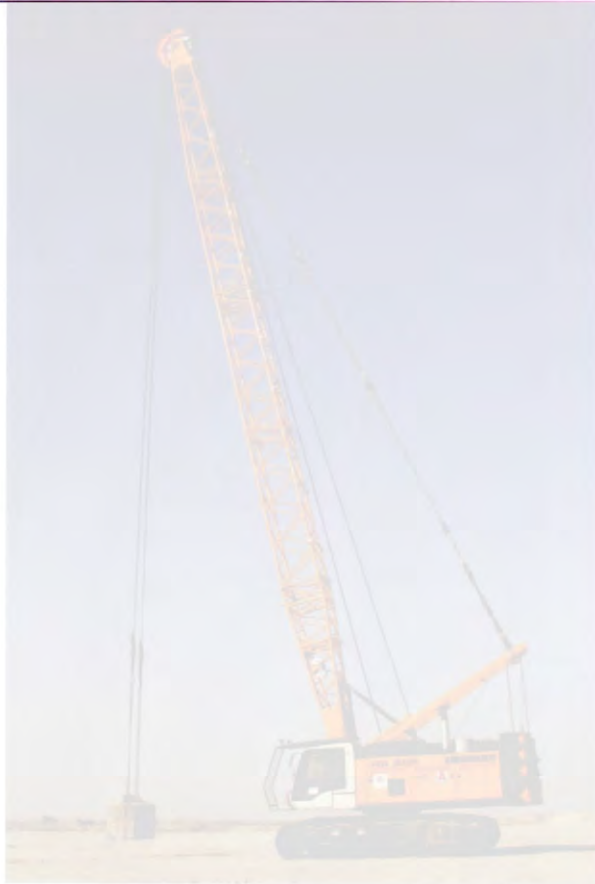
Soilmec partnered with Caterpillar to produce the SC-65 lattice boom crawler crane.



A Soilmec SR-80 piling rig installed displacement piles that doubled as geothermal wells for a hospital project in Monselice, Italy.

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Seven Liebherr SH 855 HD crawler cranes – four HS 855 HDs and three HS 885 HDs (pictured) – have been compacting a ground area of 6.5 km² for a new town in Kuwait.

the company aimed to build a leading range of products for the foundation crane sector, backed by a global support network.

“These machines are not an adaptation of standard Caterpillar excavators. The turrets are designed by Soilmecc, integrating the best Caterpillar technological solutions, specifically developed for this project,” Mr Trevisani said.

“At Bauma 2010, the SC-65 was just a preliminary prototype. Now it has been validated on the field, and some improvements have been implemented thanks to feedback coming from the jobsite,” he added.

The capacity of the SC-65 is 65.7 tonnes at a working radius of 3.5 m and maximum boom length is 51 m. Power is from a 403 kW diesel engine and maximum line pull is 24 tonnes.



Bachy Soletanche's Heavy Duty Large Diameter Auger rigs are being used to install the piling for four large wind turbines in the UK.

High rise in Hanoi

Bauer tackles complex project Vietnam

Bauer Vietnam was appointed by contractor An Binh Star to carry out the main foundation work for three main towers that form the hub of the Sanctuary Towers complex in the Vietnamese capital, Hanoi.

Two Bauer BG 40 rotary drilling rigs, one BG 30 and two anchor drills began foundation work in July last year on the a 28000 m² site – the largest and most complex work that Bauer Vietnam has taken on to date.

The project is scheduled for completion in August this year and includes a total of 640 bored piles ranging in diameter from 1 m to 1.8 m, together with 7500 m² of nailed walling as well as the excavation and construction of a two storey basement.

Based in Ho-Chi-Minh City, Bauer's Vietnam subsidiary was founded in 2006 and only set up an office in Hanoi in May 2010, but the first projects started rolling in shortly afterwards.



The hydraulic crawler is the first from the Italian manufacturer with electro-hydraulic proportional controls, and the machine can be set up in crane, hydraulic grab, cable grab and hydraulic rotary configurations.

Mega projects

Such versatility from heavy duty machines is increasingly in demand as mega projects gets underway in developing markets, where investment in infrastructure is growing.

In Kuwait, for example, seven Liebherr SH 855 HD hydraulic crawler cranes – four HS 855 HDs and three HS 885 HDs – have been compacting a huge ground area of 6.5 km².

Contractor Ahmadiyah Group is preparing the desert ground for new Jaber Al-Ahmad City, which will be situated 22 km west of Kuwait City and feature around 7000 housing estates, including schools and hospitals.

The Liebherr units have been working in two 9-hour shifts per day, 25 days a month on a project that is set to last a total of 18 months. Each unit carries out around 600 automatic work cycles per shift using Liebherr's Litronic control system.

The 90 tonne HS 855 HD is fitted with two 25 tonne winches and the 125 tonne HS 885 HD with two 30 tonne winches. The ground was compacted using a drop

At over 300 tonnes, BHC Fundex Equipment's new FPD5000 is the largest piling machine it has ever manufactured.



weight of 25 tonnes at a dropping height of 29 m.

In addition to adapting to the scale of new infrastructure projects, foundation contractors are increasingly tasked with integrating environmentally friendly technologies to new builds.

Geothermal wells

On a € 165 million (US\$ 236 million) project to construct a new hospital in Monselice, Italy, for example, the displacement piles double up as geothermal wells.

A Soilmec SR-80 piling machine was selected by contractor Trevi for the work inserting 40 km of 600 mm diameter displacement piles at depths ranging from 17 m to 24 m. Soilmec said it took on average 30 minutes to install each geothermal pile – drilling the hole took just 8 minutes, but concreting and inserting the reinforcement cage holding the geothermal loop required more time.

The thermal exchange between the surrounding soil and the concrete piles is aided by the fact that the water table is located immediately under ground level. For easy connection with the future slab, concrete rings were placed on top of the piles to compensate for the difference between ground and slab level.

The SR-80, which weighs 90 tonnes and can deliver 292 kNm in torque, ensured good productivity – Trevi was able to install an average of 16 piles, including the rig tracking phase between piles, per day.

As governments worldwide invest in low-carbon, renewable energy, the installation of wind turbines is another application for which foundation equipment is increasingly in demand. In May this year, for example, Bachy Soletanche won a UK£ 0.5 million (US\$ 0.8 million) contract in the UK to install the piling for four large wind turbines on a new wind farm. Located near the Solway Firth in Cumbria, the Hellrigg Wind Farm is set to contribute to meeting the UK's target of 15% renewable energy by 2015.

Contractor Hanson used Bachy Soletanche's Heavy Duty Large Diameter Auger (LDA) rigs and the piles are being constructed with segmental casing and under a bentonite suspension due to the properties of the soil and the unstable ground. Each base will contain 16 900 mm diameter piles which vary in depth from 25 m to 38 m.

Bachy Soletanche contracts manager Steve Mallinson said the project was one of the company's more unusual jobs, "The site is in a remote location and we are using large piling rigs and cranes and making sure that there's as little disruption as possible to the surrounding area".



Pile Dynamic's handheld pile installation recorder viewer.



PTC's new Tiltex 60t clamp can tilt, grab and lift sheet piles lying on the ground, reducing man power on site.

Efficiency

New equipment to improve the efficiency of foundation works is also under constant development. To ease the handling of sheet piles, for example, PTC (part of the Fayat Group) has produced a new concept of clamp, the Tiltex 60t. Mounted on a PH Vibrodriever, the clamp can tilt, grab and lift sheet piles lying on the ground helping to reduce on-site manual labour.

With a clamping force of 60 tons (60.9 tonnes), the new Tiltex provides a steady grip for heavy duty jobs. It can be used with a wide range of PTC excavator mounted models including the 6PHFV, 8PHFV, 7PHE, 10PHF and 13PH.

Piling technology is also under constant review from equipment manufacturers, and several new systems for complex applications have been launched.

Liebherr has developed new software to help make deep foundation work more efficient. The company's deep foundation machinery is equipped with Liebherr's new PDF process data >

Confined environments

A challenging underground car park project demands precision

An Hitachi ZX225USRLC-3 excavator has been put to work in a confined environment on an underground car park project in Paris, France. The excavator, which is owned by contractor Saperle Travaux Publics, was fitted with a clamshell telescopic arm and used to remove earth from depths of 21 m below ground level and load trucks that transported the material offsite.

The excavator can dig to a maximum depth of 25 m and was used to remove a total of 65000 m³ of earth between September and November last year. Saperle Travaux Publics site manager Laurent Petain said a challenge for the ZX225USRLC-3 was working between and around the pipes that held the car park's outer structure in place.

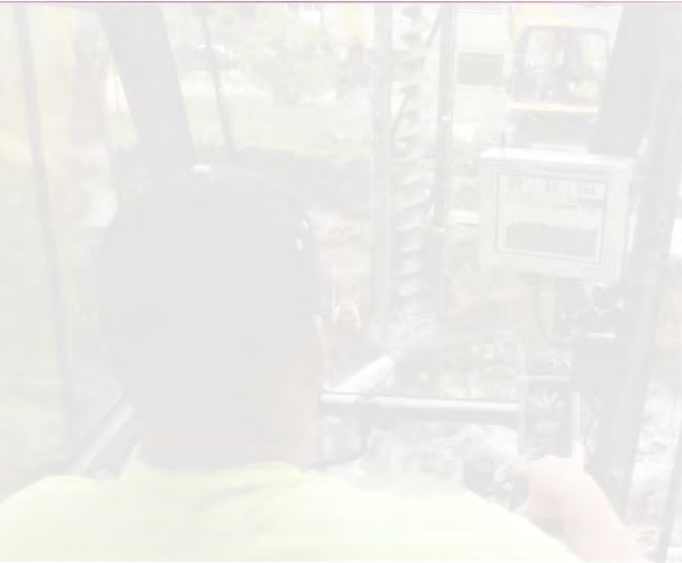
"The pipes were required because the earth had a high water content and was therefore relatively soft. The excavator worked in 5.5 m deep sections at a time and was required to be extremely precise," Mr Petain said.

The excavator's short tail swing also helped as it meant trucks could stop directly adjacent to it and be loaded straight away as material was brought up. Construction of the six-level underground car park is scheduled for completion in October 2011.



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The main module of Pile Dynamic's installation recorder in the operator's cabin.

recording system, which relays data such as depth, geometry and the amount of suspension in real time to the operator's cab.

The PDE process data recording system also enables recording of process-related values on a memory card in the operator's cab for a large number of deep foundation methods. This can be evaluated on a computer after the work has been done, enabling the generation of individual site protocols for proof of quality and to facilitate the settlement of the site.

Meanwhile, Pile Dynamics has developed a new viewer for its pile installation recorder (PIR). The PIR is an automated

Tunnel vision

Project required 20000 m of piles to be installed in 9 months

Contractor Marti Tunnelbau used two Liebherr drilling rigs to install a secant pile wall for slope and foundation pit reinforcement for a project in Switzerland. The 3.3 km Tunnel de Choindex will run between the border of the Jura canton and eastern Delémont district.

The 95 tonne LB 28 and 115 tonne LB 36 worked at the northern entrance, which is 300 m long, to install 20000 m of piles to form a secant drilled pile wall. The length of the 1020 piles is between 13 and 26 m with a diameter of 1000 mm and the contractor had nine months to complete installation.

The task was made easier thanks to the low operating weight of the machines, which can be transported in one piece, allowing for flexibility on site. The LB 28 is equipped with a 286 kNm rotary drive and the LB 36 with a 366 kNm rotary drive. Both units can drill to a maximum diameter of 3 m and a maximum depth of 70 m. The machines are equipped with a Kelly winch and rope crowd system with 40 tonnes of pull force, making them well-suited to operating in the most difficult soils.

Liebherr said the project was completed "well before" the deadline thanks to the efficient LB rigs and site management.



Foundations

Manufacturers

AlBauer	www.bauer.de
BSP	www.bsp-if.com
Casagrande	www.casagrandegroup.com
Fraste	www.fraste.com
Junttan	www.junttan.com
Kobelco	www.kobelco-kenki.co.jp
Hitachi	www.hitachi-c-m.com
ICE	www.ice-bv.nl
IHC	www.ihcfundex.com
IMT	www.imtspa.com
Liebherr	www.liebherr.com
Link-Belt	www.linkbelt.com
Mait	www.mait.it
Manitowoc	www.manitowoccrane.com
Movax	www.movax.com
Numa Hammers	www.numahammers.com
Pennine	www.pennine-group.co.uk
Pengo	www.pengoattachments.com
Pile Dynamics	www.pile.com
PTC	www.ptc.fayat.com
PVE Cranes and Services	www.pveusa.com
Seacore	www.seacore.com
Sennebogen	www.sennebogen.de
Soilmec	www.soilmec.it
Terex	www.terex.com
Trevi Group	www.trevigroup.com
Wirth	www.wirth-europe.de



Pengo has introduced a new line of foundation drilling tools for its single row, double row and spiral rock augers along with its dirt tools, core barrels and drilling/muck buckets featuring new pitches and attack angles.

monitoring equipment designed to aid in the installation and quality control procedures of augered cast-in-place and continuous flight auger piles.

The PIR viewer is a hand-held wireless device that allows an inspector or piling foreman to view what the main unit of the PIR in the crane cabin is displaying – the progress of the drilling and grouting operation is seen in real time on both the main unit and on the PIR Viewer.

The development of technology to check and record the quality of foundations has clear benefits for contractors, and demonstrates that equipment manufacturers not only have increased productivity at the forefront of their latest designs, but are also adapting to the increasingly complex demands of the industry.

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