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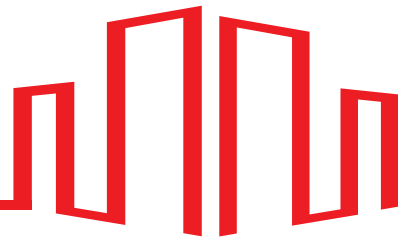


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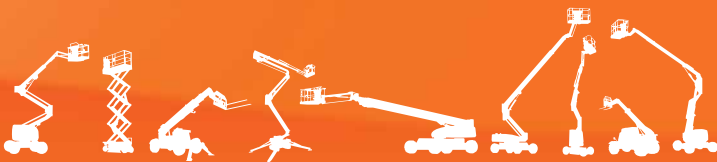
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Contents



On the cover:
 Hong Kong's new sludge treatment facility, T • PARK.
(page 58)

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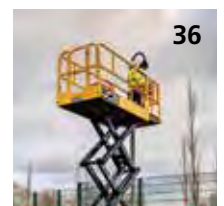
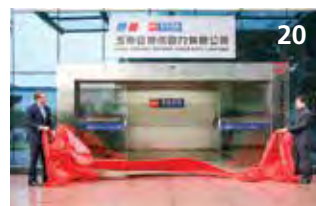
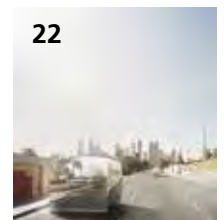
NEWS IN ASIA PACIFIC	12
NEWS IN THE MIDDLE EAST	22
GLOBAL NEWS	24
IPAF HIGHLIGHTS	30

EVENTS

CALENDAR OF EVENTS	26
INDUSTRY EVENTS	28

PRODUCTS

NEW IN INDUSTRY	32
MIXED CATEGORY	40





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Contents

PROJECTS & SPECIAL FEATURES

APPLICATIONS ON SITE	46
PRODUCT FEATURE	52
COMMERCIAL PROJECT	56
INDUSTRIAL PROJECT	58
TUNNELLING PROJECT	66
BRIDGE PROJECT	70
FOCUS ON AUSTRALIA & NEW ZEALAND	72
REVIEW OF WORLD OF CONCRETE 2017	80



SOUTHEAST ASIA CONSTRUCTION is published six times a year by:

Trade Link Media Pte Ltd. RCB Registration no: 199204277K
 Address: 101 Lorong 23, #06-04 Prosper House, Singapore 388399
 Tel: +65 6842 2580, Fax: +65 6842 2581 / +65 6745 9517
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The magazine is available free-of-charge to applicants in the building and construction industries who meet the publication's terms of control. For those applicants who do not qualify for free subscription, copies will be made available, subject to the acceptance by the publisher, of a subscription fee which varies according to the country of residence of the potential subscriber. Airmail (per year): Singapore - S\$45; Malaysia and Brunei - S\$90; Rest of Asia - S\$140; Japan, Australia, New Zealand, Middle East, Europe and USA - S\$170 (Incl. 7% GST Reg: M2-0108708-2).

Printed in Singapore by Kim Hup Lee Printing Co Pte Ltd.
 MCI (P) 032/06/2016 • ISSN 2345-7082 (Print) and ISSN 2345-7090 (E-periodical) • KDN No: 1560 (1271)-(6)

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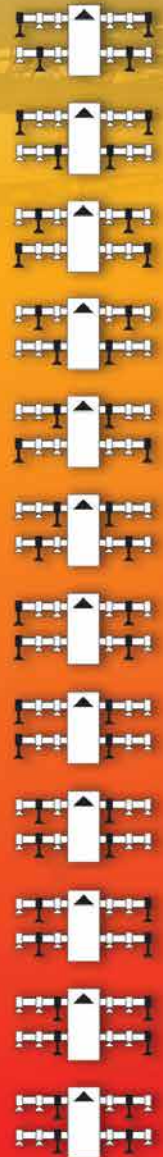


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TCC to build US\$3.5 bil integrated district in Bangkok

TCC Assets (Thailand) Co Ltd and Frasers Centrepoint Limited (FCL) will jointly develop a 16.7-ha site in the heart of Bangkok into one of the world's iconic destinations. The project, called 'One Bangkok', is believed to be the largest private sector property development initiative ever undertaken in Thailand, with an estimated investment value of approximately US\$3.5 billion.

The first phase of the project is planned to open in 2021. When fully completed in 2025, the entire development will have a gross floor area of 1.83 mil sq m, comprising five Grade A office towers built to LEED and WELL standards, five luxury and lifestyle hotels, three ultra-luxury residential towers, a comprehensive array of retail offerings within differentiated retail precincts, and a variety of civic areas, as well as art and culture facilities. About 8 ha of its total land area of 16.7 ha will be dedicated to greenery and open spaces.

"The fundamental aim in the planning and design of One Bangkok is to enhance Bangkok's stature as a key gateway city in Asia," said Charoen Sirivadhanabhakdi, chairman of TCC Group and FCL.

One Bangkok will be a fully integrated 'city-within-a-city' district, built on people-centric principles and a focus on environmental sustainability and smart-city living. It is located right next to Bangkok's largest central park - Lumpini Park - with direct linkages to the city's mass transit systems, as well as easy access to the expressway network.

"Accessibility, connectivity and sustainability are top priorities in our urban planning," said Su Lin Soon, CEO of One Bangkok. "New quality standards, international best practices and diversity in the mix of uses and architecture are fundamental features of the



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One Bangkok will be a fully integrated 'city-within-a-city' district. It is believed to be the largest private sector property development initiative ever undertaken in Thailand.

masterplan, designed by Skidmore, Owings & Merrill. Supported by local expertise from Plan Associates, and A49, the masterplan combines both international and local experiences from the most influential architectural and urban planning firms."

She added, "One Bangkok will also be the first district in Thailand to be built entirely around sustainability principles and to LEED for Neighbourhood Development Platinum standards." ■

Manitou acquires Terex Equipment in India

Terex Corporation has agreed to sell its India-based compact construction business to Manitou Group. Terex Equipment Private Limited (TEPL) manufactures and sells backhoe loaders, engages in the sale of wheel loaders and contract manufactures and sells skid steer loaders. The sale is expected to be finalised in the first half of 2017.

"We are pleased to enter into this agreement with Manitou. Manitou is a strong strategic buyer with the resources and desire to further grow the business as an industrial base for Asia and emerging markets," said John L. Garrison, president and CEO of Terex. "For Terex, the sale of TEPL represents the disposition of the last significant asset held for sale in Terex's former Construction segment.

This is an important milestone in executing on Terex's commitment to focus our portfolio on those product categories where Terex has a significant presence in the market and that can provide the greatest returns for our shareholders."

Michel Denis, president and CEO of Manitou Group, added, "This acquisition perfectly fits our strategy to reinforce our presence on emerging markets. TEPL has a solid dealer network, which we will continue to further develop. TEPL produces high-quality products with a very efficient spare parts and service organisation, and will be a strong industrial base for Manitou Group to develop new product ranges for Asia and emerging countries." ■

ADB supports public-private partnerships in Yangon region

The Asian Development Bank (ADB) and the Yangon Region Government (YRG) have agreed to partner up in promoting public-private partnerships (PPPs) in the urban infrastructure sector. ADB will provide strategic and transaction advisory services to support YRG. In this role, ADB will advise YRG in prioritising key urban infrastructure projects, in particular on projects that could be procured through PPPs.

Building on ongoing urban planning work and initiatives in Yangon, ADB will focus on screening and prioritising projects, undertaking due diligence, and structuring work with a view to place

these projects in the market for private sector investment. Part of this effort from ADB includes a strategic and transaction advisory services agreement signed with the Government of Myanmar's Ministry of Transportation and Communications in February 2017 to support, screen, prioritise and place transport infrastructure projects for PPPs.

"PPPs will play a key role in delivering the urban infrastructure needed to meet the economic and growth targets for the Yangon region. This ADB-YRG cooperation is the first step for systematically prioritising the projects that could be delivered using a PPP modality," said U Phyo Min Thein, chief minister of YRG. ■

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Atkins and Dragages reach major milestone in HK project

The Liantang/Heung Yuen Wai Boundary Control Point (BCP) project in Hong Kong recently marked a major milestone with its first TBM breakthrough at the Lung Shan Tunnel southbound section.

Atkins was awarded the contract in 2013 to be the detailed design consultant for Dragages. Part of the scope includes the 4.8 km dual two-lane road tunnels - believed to be the longest land road tunnel in Hong Kong - which will connect millions of passengers and cargo travelling between Hong Kong and mainland China. Atkins said the project also involves the largest EPB (earth pressure balance) TBM in Hong Kong with a 14.1 m diameter, to tackle the challenges of excavating the geological area with multiple faults and mixed ground conditions.

Moreover, the tunnel boring machine (TBM) is equipped with advanced systems designed by the contractor for real-time cutter disc wear measurement and automatic replacement of worn cutter discs in a timely manner, reducing the need for manual inspections and repairs, thereby enhancing the safety and efficiency of works substantially. The tunnel boring works for the southbound tube commenced in November 2015 and lasted for 16 months. Work is on schedule for completion in 2018.

In another project, Atkins has won the consultancy contract from Hong Kong's Civil Engineering and Development Department (CEDD) to undertake the design and construction of the cycle track between Tuen Mun and So Kwun Wat. The track will form the key backbone of the comprehensive cycle track network in the New Territories.

The scope of the multi-disciplinary project comprises the construction of a new cycle track of about 4.5 km long from Tuen Hing Road at Tuen Mun to So Kwun Wat Road near Gold Coast; and



Atkins team celebrates first TBM breakthrough on the Liantang/Heung Yuen Wai BCP project.

a 500 m long branch from Castle Peak Bay Bus Terminus to Hoi Wah Road. Provision of supporting facilities including an entry/exit hub at Hoi Wah Road and two resting stations at Tuen Hing Road and So Kwun Wat Road respectively, as well as the associated landscape, traffic aids and other ancillary works are also included.

Atkins' services include civil, highway structures, traffic, geotechnical, environmental, electrical and mechanical, architectural, landscaping, cost estimation, public consultation, Building Information Modelling (BIM), contract management and site supervision. Construction is scheduled to commence in 2019 for completion in 2022. ■

XCMG to invest in new manufacturing facilities in India

XCMG plans to invest US\$150 million to build new manufacturing facilities in India. The first one is expected to be ready by the end of the year.

The new facility is aimed to help Schwing Stetter India expand its product range. The products will be sold in India as well as in neighbouring countries. Schwing Stetter India is a subsidiary of the Schwing Group GmbH, which was acquired by XCMG in 2012.

"The Indian market possesses huge potential," said Wang Min, chairman and president of XCMG. "2017 marks XCMG's India Year, so we will accent on bringing more products with competitive advantages to India and further expand our operation scale here through establishing manufacturing facilities on the ground."

He added, "As key to our success in the global market, XCMG's emphasis on product localisation not only ensures the products comply with international standards, but also targets research and development specifically to the clients' needs. Upon building new factories in India, XCMG will also make the best of Schwing Stetter India's sales network to provide better services to our clients in India."

Global acquisitions and R&D are part of XCMG's key strategies to ensure the company's leading position in technological development. XCMG has established research centres in Germany, Brazil and the US, while completing the acquisition of German company FT and Dutch company AMCA that specialise in producing hydraulic valve



XCMG will expand its operation in India with new factories.

and developing systems respectively.

XCMG has integrated global resources by establishing KD assembly factories in Poland, Uzbekistan, Kazakhstan and Iran to respond faster to the regional markets. XCMG's factory in Brazil started its operations in 2014. ■



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Arup secures contract for Tibet airport extension

Arup has been appointed by Beijing Zhonghang Zhucheng Airport Construction Consulting (Zhonghang Zhucheng) to provide engineering services for the reconstruction and extension of Lhasa Gonggar International Airport in Tibet.

Arup, in joint venture with Zhonghang Zhucheng, won the feasibility study and preliminary design competition in 2016 organised by the Bureau of Civil Aviation Administration of China in Tibet Autonomous Region to extend the airport in response to the rapidly expanding airport transportation needs for Tibet. The 4E level airport is on the southern bank of Yarlung Tsangpo River and is considered as one of the highest altitude airports in the world. The airport first became operational in 1965.

Terminal 3 is a major part of the overall reconstruction and extension, with a usable area of 88,000 sq m. With the current extension plan, the airport is expected to handle an annual capacity of 5.5 million passengers by 2020. Arup will provide full-stage structural, mechanical, electrical and public health engineering consulting services (SMEP) for the new Terminal 3, and scheme design stage consulting for all ancillary buildings at the airport.

According to Arup, the high altitude was taken into account to utilise natural sunlight in highland of Lhasa, in order to achieve energy efficiency. Arup also adopted the structural smart design tools and SMEP integrated design strategy to achieve the optimum design. Construction of the project is scheduled to start later this year, with completion at the end of 2020.

Furthermore, Arup is also part of the team that has been appointed by the Singapore Urban Redevelopment Authority (URA) as consultant to develop the detailed masterplan for Jurong Lake



© Beijing Zhonghang Zhucheng Airport Construction Consulting Co Ltd

An aerial view of the Lhasa Gonggar Airport Terminal 3.

District. The team consists of KCAP Architects&Planners (lead company), SAA Architects, Arup, S333 and Lekker. It developed a high-density mixed-use concept masterplan for the area around the future high-speed rail (HSR) terminus in Singapore. The aim is to develop the area into a new mixed-use business precinct and home to the future HSR terminus, which will further anchor Jurong Lake District as 'a district of the future' and as Singapore's second central business district (CBD). A key focus of the masterplan involved the integration of new waterways and a series of green spaces within Jurong Lake District whilst manifesting a strong, distinctive identity. ■

Kobelco Construction to restructure in Southeast Asia

Following its merger with Kobelco Cranes, Kobelco Construction Machinery (KCM) has been reorganising and consolidating its group companies in Japan and overseas. After the Middle East, Africa and the Americas, KCM will now undertake restructuring in Southeast Asia.

The manufacturing of hydraulic excavators in the region is currently carried out by Thai Kobelco Construction Machinery Ltd (TKCM). Overall sales and service of hydraulic excavators is handled by Kobelco International (S) Co Pte Ltd (KISCO) in Singapore and its directly managed dealers in the region. Overseeing the sales and service of cranes is Kobelco Cranes Southeast Asia Pte Ltd (KCSA), also in Singapore.

Upon restructuring, the new Kobelco Construction Machinery Southeast Asia Co Ltd (KCMSA), located in Rayong province, Thailand, will serve as the Southeast Asia regional headquarters integrating both manufacturing and sales. It will oversee the manufacturing of hydraulic excavators as well as the sales and service of hydraulic excavators and cranes in the Southeast Asia region.

KCM will also develop a strong local sales network through more efficient operations and by strengthening its sales, dealer and after-sales service networks in the region. Furthermore, KCSA will be merged into KISCO, and KISCO, as the surviving company, will continue with the crane business. ■

Admaterials Technologies to provide earthwork testing for Changi East Development

Admaterials Technologies Pte Ltd, an Exova company, has won a contract with construction and property development specialist, Koh Brothers, to provide earthwork testing for the Changi East Development at Changi Airport in Singapore.

As well as handling standard laboratory, grading, compaction and classification earthworks testing, Admaterials Technologies will also conduct plate loading, field density and swell testing. California Bearing Ratio (CBR) tests, used to determine the effectiveness of compaction on soil materials needed for the proposed road construction, are also included in the contract.

The testing will be conducted on-site at Changi Airport and also at Exova's specialised laboratory in Singapore. "By setting up a dedicated on-site laboratory we have been able to meet our customer needs in a flexible way, ensure we meet their high standards, deliver solutions to complex technical challenges and help create an airport of the future," said Lu Jinping, MD of Admaterials Technologies.

In February 2016, Exova Group acquired a majority stake in Admaterials Technologies, a Singapore-based company that provides testing in the construction sector, as well as chemical, environmental, and mechanical testing and certification services. ■



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More support for Singapore's construction industry

The Building and Construction Authority (BCA) recently announced that the Singapore government will provide more support for construction companies to improve their productivity and explore growth opportunities.

The total value of construction contracts to be awarded in Singapore this year is forecast to reach between S\$28 and S\$35 billion. However, private sector demand is expected to remain subdued. To moderate this, the government will be pushing out a strong pipeline of major infrastructure projects in the next few years. This includes Tengah HDB Town, LTA's Circle Line 6 and Changi Airport Terminal 5.

In addition, the government will be bringing forward S\$700 million worth of public sector infrastructure projects to start construction in 2017 and 2018. These are smaller building projects such as the upgrading of community clubs and sports facilities, which small and medium-sized companies may be able to take up.

The government will also encourage public agencies to parcel out larger projects into smaller ones where appropriate, to help diversify risk and enable more local companies to participate.

Enhancing construction productivity

Annual site productivity has improved from 0.3 percent in 2010 to about 2 percent per year from 2014 to 2016, said BCA. To further raise productivity in the sector, a S\$150 million Public Sector Construction Productivity Fund (PSCPF) will be introduced to spur the adoption of innovative and productive solutions for public sector projects. This will help to offset the cost premium of adopting these technologies.

Companies can also tap on BCA's Construction Productivity and Capability Fund (CPCF) to purchase or lease equipment, implement process improvement plans, adopt info-communications technologies (ICT) and upgrade their workforce. According to BCA, as of 2016 around S\$450 million of the CPCF has been committed, benefitting

more than 9,000 companies - of which about 90 percent are small and medium-sized companies.

The Land Intensification Allowance (LIA) scheme will be extended to support the development of Integrated Construction and Prefabrication Hubs (ICPHs), which are multi-storey advanced manufacturing facilities for producing prefabricated construction elements. Under the scheme, companies will receive a tax relief on the capital expenditure incurred in the construction of ICPHs.

To improve productivity in the built environment sector, the online submission of building plans will also be enhanced to make the process easier and more transparent. BCA is exploring the use of automated checking software to identify non-compliances of building requirements when processing building plans.

Since November 2014, selected sites under the Government Land Sales (GLS) programme are required to use high-impact productive construction technologies to drive the adoption of Design for Manufacturing and Assembly (DfMA). To date, 15 GLS sites have been specified to adopt Prefabricated Pre-finished Volumetric Construction (PPVC), where building modules complete with internal finishes and fittings are manufactured off-site before they are transported to site for assembly.

Moving forward, the government is also looking at piloting a GLS site that specifies productivity outcomes. This is to encourage innovative solutions by providing developers the flexibility to propose the most suitable technologies to adopt.

Lastly, to help local companies venture overseas and secure market opportunities, an internationalisation taskforce has been formed to identify synergies across the Construction, Environmental Services, Landscape, Real Estate and Security sectors to enable local companies to band together and provide integrated services as part of the internationalisation push. BCA said that recommendations by the taskforce will be announced when ready. ■

LiuGong opens Global Customer Experience Centre in Liuzhou

LiuGong has completed the first phase of its new Global Customer Experience Centre in Liuzhou, China. The facility not only drives the cooperation between LiuGong and Liuzhou Vocational and Technical College (LVTC), but also extends LiuGong's offering to its global dealers and customers.

With a total investment of RMB 50 million, the facility covers an area of 40,000 sq m in which the building area is 10,000 sq m. The first phase includes practical labs for axles, gearboxes, engines, hydraulic systems and electrical systems of construction equipment. Training classrooms are put into use as well. The second and last phase of the development is scheduled to start in July 2017, and will include the construction of outdoor fields that will provide stimulated operation and customer experience opportunities.

The Customer Experience Centre will be managed by both LiuGong and LVTC as a cooperative and innovative platform for talent cultivation, service training to LiuGong employees and dealers as well as for its customer experience. The centre can provide multi-functional support including training, hands-on operations, professional skill appraisal, competition, customer experience and technology exchange. This initiative aims to build a practical base for both LiuGong and LVTC to cultivate industry talent within the



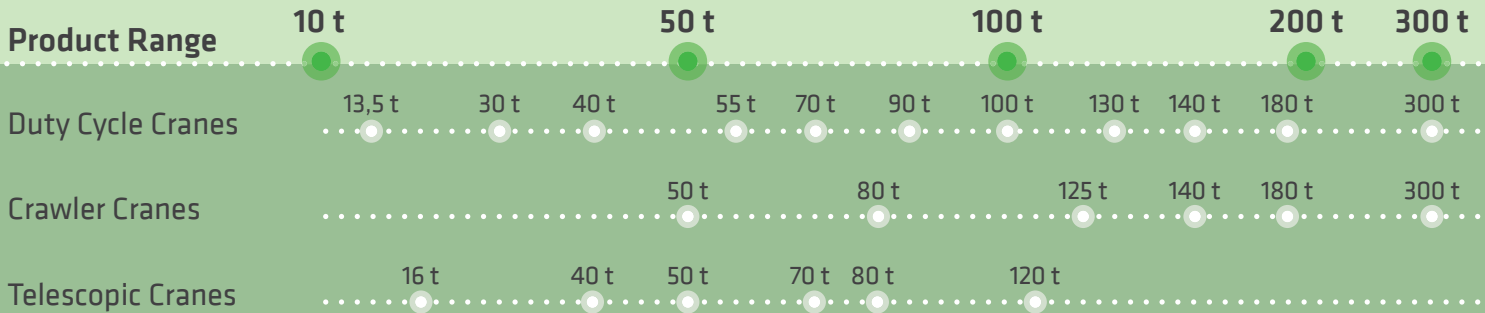
LiuGong introduces its new Global Customer Experience Centre in Liuzhou.

region, as well as to offer a world class customer service centre for LiuGong in order to improve its customer service and enhance after-sales service. ■

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Surbana Jurong partners with China Highway

Surbana Jurong has formed a joint venture (JV) with China Highway Engineering Consulting Corporation to provide design and consultancy services for highway and municipal projects. The new JV, China Highway-Surbana Jurong Transportation Design and Research Co Ltd (China Highway-SJ), is 51 percent owned by China Highway and 49 percent owned by Surbana Jurong. It was formally established late last year and its office in China was officially opened in March 2017. China Highway is owned by CCCG, a state-owned transportation infrastructure group listed in Hong Kong and Shanghai.

The partners of China Highway-SJ have complementary strengths, and the JV aims to leverage the experience of China Highway in transportation infrastructure and Surbana Jurong in overseas planning and project management, to pursue highway and infrastructure-related projects globally as well as to undertake projects under the Belt and Road initiative.

The JV currently has over 100 experienced engineers based in its Beijing office, which is planned to be gradually expanded. “Surbana Jurong is pleased to join hands with our esteemed partner China Highway, to seize more opportunities in the global infrastructure market together. This China Highway-SJ JV not only combines our complementary capabilities, it makes us an even bigger player on the world stage jointly. We look forward to the many exciting projects ahead,” said Teo Eng Cheong, CEO International (Singapore, Southeast Asia, North Asia), Surbana Jurong.

“This JV is formed between two leading organisations - CCCG’s major design institute and Surbana Jurong, one of the largest Asia-based consultancy firms in urban, industrial and infrastructure development. It is strategic to complement our respective strengths to achieve a win-win partnership. China Highway attaches great importance to the collaboration and believes that this partnership will contribute to the development of local talents, and raise practices to international standards. The JV will open up more markets domestically and internationally for both partners, and will be competing on the global stage as a world-class organisation,” said Dr Shang Guan Su, chairman of China Highway.



The official opening of China Highway-SJ office took place in March 2017. The new company is a joint venture between Surbana Jurong and China Highway Engineering Consulting Corporation.

In addition, Surbana Jurong, through Surbana International Consultants (Myanmar), has signed a Memorandum of Understanding (MOU) with the Myanmar Construction Entrepreneurs Association (MCEA) to be the association’s lead technical consultant for low cost and affordable housing projects in Myanmar.

According to Surbana Jurong, the signing of the MOU comes at an important time as the association works with the Union Government to meet the demand for low cost and affordable housing and increasing home ownership in the country. The Government’s Five-Year Plan aims to deliver one million residential units by 2030. Surbana Jurong will assist MCEA in the development of a low cost and affordable housing prototype design that focuses on the 3Cs: Community, Connectivity and Constructability.

The MOU with MCEA enhances Surbana Jurong’s extensive presence and success in Myanmar since its entry into the market four years ago. The company has also provided its expertise in masterplanning, architecture and engineering to various residential and industrial projects including the 220 acre Ayeyarwun – Yadanar affordable housing project in Dagon Seikkan Township. ■

MTU Yuchai Power officially established

MTU Yuchai Power Co Ltd is now in place – a joint venture between MTU Friedrichshafen and Guangxi Yuchai Machinery Company Ltd (GYMCL) to build large MTU-brand diesel engines in China. Both companies, MTU Friedrichshafen (a Rolls-Royce Power Systems subsidiary) and GYMCL (a subsidiary of China Yuchai International Ltd), first agreed to forge the partnership in February 2016.

The joint venture, based in Yulin in southern China where GYMCL’s headquarters is located, will build engines of version 03 of MTU’s Series 4000. This unit is suitable for use in the oil and gas and power generation industries. Production machinery with the capacity for delivering up to 1,500 engines per year is currently being procured and will be set up in Yulin. Sebastien Jin, who previously headed MTU’s Business Development in China, has been appointed as general manager for the new joint venture.

“Yuchai, with its technological prowess, sales network, and production potential is seen by Rolls-Royce Power Systems as the ideal partner for its MTU brand,” said Andreas Schell, president of the Power Systems division of Rolls-Royce.

“Both partners stand to reap huge benefits from this enterprise,



Andreas Schell (left), CEO and president of the Power Systems division of Rolls-Royce, and Yan Ping, chairman of GYMCL, jointly unveil the logo of MTU Yuchai Power Co Ltd.

which fully accords with the overall strategy of Guangxi Yuchai Machinery Company,” said Yan Ping, chairman of GYMCL. ■

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Hyperloop One: The future of mobility

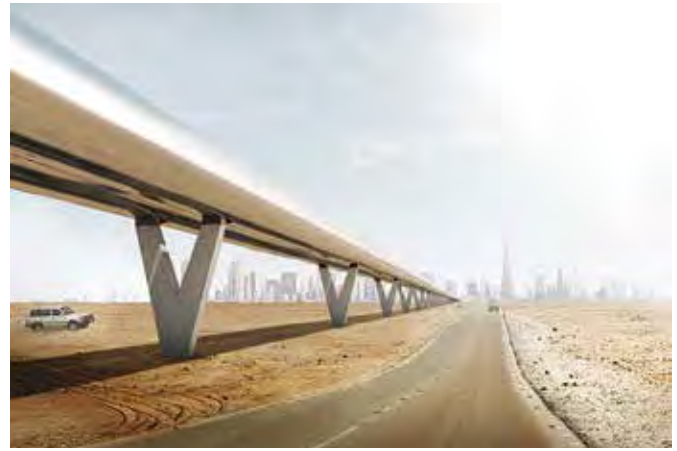
Hyperloop One has partnered with BIG (Bjarke Ingels Group) on a detailed feasibility study financed by the Dubai Roads and Transport Authority (RTA). Since May 2016, the team has been working on a concept for autonomous transportation in the UAE, including designs for the world's first Hyperloop One Portals and Hyperloop One Pods that take passengers from downtown Dubai to downtown Abu Dhabi in 12 minutes, instead of a two-hour drive.

The design is based on a study of how an urban and inter-city transport network should integrate with existing infrastructure. Hyperloop is autonomous, point-to-point and greatly simplifies the experience of getting from front-door to final destination. The locations of the initial route in the UAE are selected by passenger density and proximity to existing or planned transportation hubs.

The main objective of the design is to eliminate waiting from the passenger experience. Thus, the stations are called portals. All departure gates are immediately visible upon entering the portal, and a simple numbering system allows passengers to quickly identify them. Passengers will travel in pods that have room for six people. The pods are contained within a transporter, a pressure vessel attached to a chassis for levitation and propulsion that can accelerate the transporter to 1,100km/hr.

Passengers board the next pod that is available, which moves onto a transporter to their final destination. The relatively small unit-size of the pods paired with a high arrival- and departure-rate allows for on-demand travel. The pods operate autonomously from the transporter, which means they are not limited to the portal area and can move on regular roads and pick up passengers at any point. At portals, pods are loaded onto the transporter and hyperjump to another portal, where they merge onto the street and drop passengers off at their final destination.

Hyperloop One is reinventing transportation by developing the



Above and left: Hyperloop One and BIG are working on a concept for autonomous transportation in the UAE. Passengers will travel in pods, which are contained within a transporter.

Left: The pods can also move on regular roads.

world's first Hyperloop, an integrated structure to move passengers and cargo between two points immediately, safely, efficiently and sustainably. The team is also working with global partners and investors to make Hyperloop a reality. ■

Terex Trucks appoints new dealer in Turkey

Ascendum Makina has been appointed as Terex Trucks' official dealer in Turkey. With customers active in infrastructure, road construction and mining, the company will now take charge of distributing and supporting Terex Trucks' articulated and rigid haulers throughout Turkey. "The total market in Turkey has a lot of potential, and with the addition of Terex Trucks to our portfolio we will be able to offer customers a wider range of products, as well as the highest standard of after-sales across our 19 branches in Turkey," said Mahir Hocaoglu, CEO at Ascendum Makina.

Founded in 1959, the Ascendum Group is currently one of the world's largest distributors of Terex Trucks' parent company Volvo Construction Equipment. With global operations in countries such as Angola, Mexico, Portugal, Spain and the US, Ascendum Makina has been present in Turkey for nearly 20 years.

An emerging economic force, Turkey is a member of the MINT (Mexico, Indonesia, Nigeria and Turkey) countries as it is expected to show growth and deliver significant returns for investors in the coming decade. The construction of Istanbul's third airport, which is set to be the biggest international terminal in the world, is just one of a handful of ambitious projects underway in Turkey. Others include the Istanbul Canal project, the production of 500,000 homes and the Trans-Anatolian Natural Gas Pipeline (TANAP) venture.



Terex Trucks' TA400 articulated hauler.

Designed for heavy-duty hauling operations, Terex Trucks' machines feature an excellent balance of power, torque and effective gearing, coupled with optimum weight distribution to move more material in less time, with less fuel, even in the toughest terrains. Made in Motherwell, Scotland, the rigid dump trucks – the TR45, TR60, TR70, and TR100 – offer payloads ranging from 41 to 91 t, while the three models of articulated haulers – TA250, TA300, and TA400 – provide payloads from 25 to 38 t. ■

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Positive outlook for global construction equipment market

Global sales of construction equipment are expected to increase 8 percent this year, according to the latest forecasts from specialist market intelligence company Off-Highway Research. The number of machines sold in 2017 is projected to reach 704,942 units worldwide, compared to the 650,140 pieces of equipment sold in 2016, which represented the bottom of the industry's economic cycle.

"Sales of construction equipment last year were affected by weak economic growth worldwide and low global prices for many commodities. These factors had a knock-on effect for the demand for most types of machinery, particularly equipment used in mining and other extractive industries. However, with commodity prices rising as 2016 went on, sales picked up in a number of key markets," explained David Phillips, managing director of Off-Highway Research.

Of particular significance this year is the expected return to growth for the Chinese market, which bottomed out in 2016 after five years of steeply falling sales. However, even with the 13 percent rise in sales forecast for 2017, demand in China will still only be some 30 percent of what it was in the boom years of 2010 and 2011.

Meanwhile, the robust Indian market is forecast to go from

strength to strength. Equipment sales grew 40 percent in 2016, thanks to increased investment and a pick-up in project implementation in the country's market. This is expected to drive consistent and steady growth in Indian construction equipment sales for the next five years, and as the industry matures India could emerge as a significant regional manufacturing hub.

The mature markets of Europe, Japan and North America suffered a 3 percent fall in sales last year, with factors such as uncertainty in the run up to the US presidential elections and the UK's Brexit referendum harming business confidence. Growth is expected to return this year, particularly in Japan and North America, while the outlook in Europe is for a flatter market.

The long-term outlook for the global construction equipment market is for a period of moderate growth, which should see sales rise from the low point of 650,140 units in 2016 to around 817,000 machines being sold in 2020 and 2021. In value terms, sales are projected to increase from US\$69.8 billion in 2016 to US\$90.5 billion in 2020. This reflects an expected resurgence in some higher value types of equipment over the coming years, most notably crawler excavators and rigid dump trucks. ■

Seattle NEXUS



Skanska has signed a US\$152 million contract with Burrard Development to build a high-rise condominium in Seattle, USA (above). The 40-storey tower (about 122 m high) is called NEXUS and will be a recognisable landmark in the city. It features a series of cubes offset by 8-degrees, creating dynamic transition floors with amenities and residential terraces. In addition to the 382 condominium units, the 55,000 sq m building will include ground-level retail and seven stories of underground parking. Construction is now underway with completion scheduled for mid-2019. ■

Rubble Master achieves record growth

Rubble Master has achieved a record growth in 2016, with a 27 percent increase in turnover; its sales rose from €47 million to €60 million within 12 months. The company aims to continue this success, along with a significant expansion of its global sales network in Asia, America and Australia in 2017.

Rubble Master is currently represented by 70 sales partners throughout the world. "We have managed to grow our business activities, particularly in Asia and Australia, thanks to some new dealers with strong local ties," said Gerald Hanisch, CEO of Rubble Master. According to the company, in 2016 around 170 mobile crushers were delivered worldwide from Linz (Austria), including to Nepal and Indonesia for the first time.

Rubble Master emphasised that the relationship with its suppliers is very important. This is why the long-term integration of the supply chain was a key project for the company, which will be continued accordingly in 2017. "As a company exporting 95 percent (of its products), we are conscious of our local roots. The supplier strategy, which is based on sustainability, is a further development of our CSR strategy that we already practice in respect of our employees, customers and products. We aim to take this development and exchange even further over the coming years," said Mr Hanisch.

This year Rubble Master intends to keep focusing on innovative solutions, such as Spec2App, which was launched last year as a concept in which a multitude of different requirements can be fulfilled with one crusher, thanks to a platform strategy. ■

Vinci wins Grand Paris Express contract

The joint venture between Vinci Construction (lead company) and Spie batignolles has been awarded a major Grand Paris Express contract, which is to build the T3C section of Line 15 South between the Fort d'Issy-Vanves-Clamart and Villejuif Louis Aragon stations. The contract covers the construction of a tunnel with a length of more than 8 km, involving two 10-m-diameter earth pressure balanced tunnel boring machines (EPB TBMs) to operate simultaneously. It also includes the construction of five new stations (Châtillon Montrouge, Bagneux, Arcueil-Cachan, Villejuif Institut Gustave Roussy and Villejuif Louis Aragon) and eight shafts. Expected to be completed within 70 months, the project will require the removal of 3.2 mil t of spoil and placement of more than 470,000 cu m of concrete. ■

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Date	Events in Asia	Organiser & Contact
18 to 20 May 2017	BuildTech Yangon 2017 Myanmar Convention Centre Yangon Myanmar	Sphere Exhibits Pte Ltd Tel: +65 6319 4037, Fax: +65 6319 6140 Email: btyangon@sph.com.sg Website: www.btyangon.com
8 to 10 Jun 2017	Intermat ASEAN IMPACT Exhibition & Convention Centre Bangkok Thailand	Comexposium & IMPACT Tel: +662 833 5315 Email: info@asean.intermatconstruction.com Website: www.asean.intermatconstruction.com
15 to 17 Jun 2017	Laobuild 2017 Convention Hall, Don Chan Palace Vientiane Laos	AMB Tarsus Events Group Tel: +603 2692 6888 Email: fatia@ambtarsus.com Website: www.laobuild.com
10 to 12 Aug 2017	LankaBuild 2017 Sri Lanka Exhibition & Convention Centre Colombo Sri Lanka	AMB Tarsus Events Group Tel: +603 2692 6888 Email: darren@ambtarsus.com Website: www.lankabuild.org
23 to 25 Aug 2017	Our World In Concrete & Structures (OWICS) conference Singapore	CI-Premier Pte Ltd Tel: +65 6733 2922 Email: cipremie@singnet.com.sg Website: www.cipremier.com
7 to 9 Sept 2017	Cambuild 2017 Diamond Island Exhibition & Convention Centre Phnom Penh Cambodia	AMB Tarsus Events Group Tel: +603 2692 6888 Email: charley@ambtarsus.com Website: www.cambuildexpo.com
13 to 16 Sept 2017	Concrete Show Southeast Asia 2017 Jakarta International Expo Kemayoran, Jakarta Indonesia	PT. UBM Pameran Niaga Indonesia Tel: +62 21 2930 5959, Fax: +62 21 2930 5960 Email: niekke.budiman@ubm.com Website: www.concreteshowseasia.com
20 to 23 Sept 2017	BICES 2017 New Beijing International Exhibition Center Beijing China	CCMA, CNCMC & CCPIT-MSC Tel: +86 10 52220946, Fax: +86 10 51183612 Email: info@e-bices.org Website: www.e-bices.org
24 to 26 Oct 2017	Singapore Construction Productivity Week (in conjunction with BuildTech Asia 2017) Singapore Expo Singapore	Building and Construction Authority/Sphere Exhibits Tel: +65 6319 4037, Fax: +65 6319 6140 Email: bca_scpw@bca.gov.sg/buildtechasia@sph.com.sg Website: www.scpw.sg/www.buildtechasia.com
2 to 4 Nov 2017	OneBuild 2017 Kuala Lumpur Convention Centre Kuala Lumpur Malaysia	One International Exhibition Sdn Bhd Tel: +603 8943 7488, Fax: +603 8943 7599 Email: enquiry@oneinternational.com.my Website: www.oneinternational.com.my
9 to 12 Nov 2017	Philconstruct 2017 SMX Convention Centre Manila World Trade Centre Metro Manila The Philippines	Global-Link Exhibitions Specialist Tel: +63 2 893 7973, Fax: +63 2 550 1148 Email: info@gesi.com.ph Website: www.gesi.com.ph/philconstruct
30 Nov to 2 Dec 2017	Myanbuild 2017 MEP Mindama Yangon Myanmar	AMB Tarsus Events Group Tel: +603 2692 6888 Email: ei@ambtarsus.com Website: www.myanbuild.net
4 to 6 Dec 2017	World of Concrete Asia Shanghai New International Expo Centre Shanghai China	Informa Exhibitions Tel: +86 21 2326 3669 Email: info@wocasia.com Website: www.wocasia.com
Date	Events outside Asia	Organiser & Contact
23 to 26 Jan 2018	World of Concrete 2018 Las Vegas Convention Centre Las Vegas, Nevada USA	Informa Exhibitions Tel: +1 972 536 6379 Email: info@worldofconcrete.com Website: www.worldofconcrete.com

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Intermat ASEAN 2017 set to bring key players

Scheduled to take place at the IMPACT Exhibition and Convention Centre in Bangkok, Thailand, from 8 to 10 June 2017, the inaugural Intermat ASEAN is set to bring many of the industry's key players from the region.

The show will feature both indoor and outdoor areas. The outdoor area is planned to occupy 5,000 sq m of exhibit area and 5,000 sq m of demonstration area. The demonstration area will provide visitors with an excellent opportunity to see and test-drive the latest machinery and equipment in live action.

According to the organiser, industry players that have confirmed their participation at the show include: Bobcat, Case Construction, Hitachi, JCB, Liebherr, Manitou, Putzmeister, Sany, Wacker Neuson, Volvo, Allpacks, Bell Dredging Pumps, Big Machinery, Husqvarna, Komac, Quadra, MB Crusher, Padley&Venables, Peri and Precast Software, among others.

Intermat ASEAN 2017 will also organise seminars and conferences, presented by speakers from Thailand and across Southeast Asia. This section will deliver a wide range of industry topics covering the entire supply chain of the industry, from technical to non-technical aspects, trends, technology and digitalisation, best practices, risk management and cost control, strategic thinking/approach and other key topics crucial to the future success of the industry.

Among the speakers will be: Sangvorn Lipatapanlop, president of Thai Contractor Association; John Shelton, technical director of Ecopanel International; Seri Sirisayan of Autodesk Asia; Ihab Eldessouky, regional general manager of Atlas Copco; Nattaphorn



The Intermat show, held every three years in Paris (above), is a global exhibition for construction and infrastructure. The show organiser is now bringing Intermat to Southeast Asia, which will be held for the first time in Bangkok, Thailand, in June 2017.

Bhromsuthi, president of ASEAN Constructors Federation; a representative from the Department of Highways, Ministry of Transport, Thailand; as well as representatives from other industry associations and organisations, such as the Engineering Institute of Thailand. ■

Website: <http://asean.intermatconstruction.com>

OWICS 2017 to focus on 'A Sustainable and Resilient World in Concrete'

Our World In Concrete & Structures (OWICS) in Singapore will hold its 42nd edition from 23 to 25 August 2017, with the theme 'A Sustainable and Resilient World in Concrete'.

The conference aims to celebrate the achievement of American Concrete Institute (ACI) - Singapore Chapter of being awarded the ACI Excellent (2013) and outstanding (2014 and 2015) Chapter Award, three times, in the last five years. The Chapter also plans to recognise the invaluable contributions of all the past presidents in earning these accolades over the years.

As part of the celebration, besides the ACI - Singapore Chapter 2017 lecture being one of the major highlights at the conference, the Chapter intends to invite its past presidents to join event. OWICS 2017 also expects to have representatives from ACI in the US as well representatives from the regional and other international ACI chapters.

According to the organiser, OWICS 2017 will feature at least 10 prominent professors and professionals, many of whom have supported the conference for over 15 years, including Prof Franco Mola, Italy; Emeritus Professor Shoji Ikeda, Japan; Emeritus Professor G M Sabnis, USA; Emeritus Professor N

Otsuki, Japan; Willie Kay, Singapore; and Kiat Huat Seow, Singapore.

OWICS 2017 will focus its discussion on concrete and structure, especially in the areas of: concrete design and analysis for buildings and structures; concrete mix design, quality control and production; concrete technology, ready-mix, SCC and RCC; concrete plant, equipment and machinery; concrete repairs and rehabilitation; concrete materials and composites; concrete construction and safety; and concrete application in roads, bridges, tall buildings, tunnels, underwater, underground, etc.

In addition, the conference will continue the 12 Highly Commendable Paper Awards, four of which will be dedicated to honour the memory of the late Tibor Javor (Czech), late Ken Francis (HK), late Hoe Peng Lim (Singapore) and late C R Alimchandani (India).

The previous edition of OWICS focused on the theme 'Advances in Concrete', which was held from 25 to 27 August 2016 in Singapore, attended by over 200 participants from 12 countries. ■

Website: www.cipremier.com

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IPAF Asia Conference 2017 to be held in China

The IPAF Asia Conference is returning this year from 13 to 14 June, to be held at the Meixi Lake Hotel in Changsha, the capital city of Hunan province, China. Several speakers have been confirmed, including Nick Selley, AFI Group business development director and newly elected IPAF president; Tomie Chan, Singapore Country Council immediate past chairman; Daniel Ho, Singapore Country Council new chairman; Jason Woods, IPAF Middle East & India representative; Bai Ri, IPAF China representative; Tim Rule, United Rentals vice president of market development; Ange Dove, Proof Perfect founder and CEO; and Chris Wraith, IPAF technical & safety executive.

A wide range of topics will be discussed at the conference, such as developing powered access rental fleets in a new market like the Middle East, the MEWP rental industry in Southeast Asia, the future of MEWP manufacturing in China, and problems with rapid rental growth and fall protection for MEWP operators, to name a few. According to IPAF, there will be simultaneous translation in English and Chinese.

The IPAF Asia Conference is believed to be the only show in Asia focusing on powered access, where delegates will be able to learn about the safe and productive use of mobile elevating work platforms (MEWPs) and mast climbing work platforms (MCWPs). In 2016 the conference took place in Singapore, drawing more than 250 delegates from countries including China, Malaysia, Taiwan and Vietnam. The two-day educational and networking event comprised conferences in the morning and product showcases in the afternoon. ■

Website: www.ipaf.org/en/services/asia-conference

Top right and right: The IPAF Asia Conference 2016 in Singapore was held at the Institute of Technical Education (ITE).



IAPAs 2017 winners revealed

More than 450 industry professionals gathered on 4 April 2017 in London, the UK, to honour the winners of the International Awards for Powered Access (IAPAs). Jointly organised by Access International magazine and IPAF, the IAPAs celebrate best practice and excellence in the powered access industry. The winners included:

Access Rental Company of the Year: Riwal, Europe/Eurasia

Powered Access Pioneer: Alo Group, Chile

Contribution to Safe Working at Height: Modern (Access) & Scaffolding, Hong Kong

Product of the Year – Mast climbing work platforms/hoists: Alimak Hek's Mammoth Triplex System

Product of the Year – Self-propelled above 20 ft/6.1 m: Teupen's Puma 42GTX

Product of the Year – Vehicle/trailer-mounted: CTE's B-Lift 17E

Project of the Year: Sea Lock Maintenance System, by Smart Platform Solutions

Innovative Technology: The VRsL AWP Trainer, by Serious Labs, Canada

IPAF Training Centre of the Year: Manlift, Middle East & India

IPAF Training Instructor of the Year: Anderson Puff of Mills, Brazil

Access Photograph of the Year (sponsored by Facelift): 'Platform Inspecting a Gloster', by Ed Darwin, Nationwide Platforms

IPAF/Access International Lifetime Achievement Award: Roger Bowden, founder and chairman of Niftylift, UK

The awards event is held annually, the next edition of which is scheduled to take place on 8 March 2018 at the Hilton Miami Downtown Hotel, Florida, USA. ■

Website: www.iapa-summit.info



Winners of the IAPAs 2017.



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Proceq ultrasonic array detection solution

Designed primarily for the concrete testing market, Proceq's new Pundit 250 Array takes ultrasonic multi-channel pulse echo testing to a new level. With eight channels featuring three transducers each, the device is substantially faster and more accurate than any other standard equipment currently available on the market, said Proceq.

The new Pundit 250 Array can scan deep into concrete – and also fibre reinforced concrete. Its lightweight and compact design boasts increased accessibility and faster scans. One of the benefits offered to the user is the ability to perform high resolution live view scanning. By holding the device against the concrete, an image of the inside can immediately be seen – showing defects, pipes and reinforcement, etc. It also features a panorama mode whereby the scans are automatically joined into one long image so that, for example, the whole of a scanned wall can be viewed.

According to Proceq, flexibility has been a key consideration in the design of the new Pundit 250 Array. It is expandable up to 16 channels and various handle arrangement options are available to address customer preferences and fulfill application needs. The new device also comes equipped to receive additional enhancements, which is expected during 2017. ■

Website: www.proceq.com



Above and left: Proceq's new Pundit 250 Array detection solution can scan deep into concrete - and also fibre reinforced concrete. By holding it against the concrete, an image of the inside can immediately be seen, showing defects, pipes and reinforcement, etc.

New Demag three-axle all terrain cranes

The new Demag AC 55-3 and AC 60-3 from Terex Cranes are three-axle 55-t and 60-t capacity models respectively, suitable for a wide range of applications including general lifting, equipment loading and unloading, inside building lifts, as well as performing auxiliary crane work.

These all terrain cranes have an automated counterweight rigging system for easy and fast setup, a one-engine concept that minimises operational and maintenance costs and the IC-1 Plus control system that provides a maximum allowable lifting capacity, based on the slewing angle, for every crane configuration. Such innovations help make the cranes a one-person operation.

Both models have a 50 m single cylinder telescoping main boom. The AC 60-3 can be fitted with a 16 m extension, making it the longest system in its class, said Terex Cranes. The main boom on the cranes can be lowered to 5 degrees below horizontal to avoid working at heights for easy and fast setup. The outriggers can be positioned independently from each other for efficient positioning, taking advantage of the IC-1 Plus system's ability to calculate the maximum allowable lifting capacity based on the crane's configuration. Also, the optional remote control gives the operator the ability to safely and easily rig and operate the crane remotely from the ground.

With a width of only 2.55 m, and the ability to stay within 12-t axle weight restrictions, the Demag three-axle cranes provide efficient transportation between jobsites. The AC 55-3 can also be configured to meet 10-t axle weight restrictions when necessary.

The flexibility of these two cranes continues when arriving at the jobsite. They are compact with excellent manoeuvrability to help the operator quickly position the crane. The three-sheave VarioHook system, and powerful hoist, with 60.2 kN of line pull, contribute to help shorten rigging time, reduce the weight of the equipment transported and save time on the job. There is also an optional all-wheel drive feature available for demanding jobsite environments. ■

Website: www.terex.com/cranes



The new Demag AC 60-3 three-axle all terrain crane has a 50 m single cylinder telescoping main boom and can be fitted with a 16 m extension.

Link-Belt 75RT designed for greater simplicity

Link-Belt's new 70-t 75RT rough terrain crane has a five-section, 11.5 – 43.3 m full-power formed boom. To simplify the process of lifting, only two extend modes are offered: EM1 and EM2. For greater flexibility and efficiency, a two-piece (10.7 – 17.7 m) and three-piece bi-folding fly (3 - 10.7 – 17.7 m) are both available, for a tip height of 63.6 m. The matching main and auxiliary winches have 82.8 kN of maximum line pull and a maximum winch speed of 147.8 m/min.

Pulse 2.0 is Link-Belt's next evolution of its crane operating system. In addition to the intuitive design for the operator, which includes a larger 25.4 cm screen and has also added programmable features for greater customisation, Link-Belt Pulse 2.0 can be updated and serviced remotely. The system includes a Wi-Fi hub and uses the serial number of the unit to determine whether any updates are available, and download/installs to the appropriate controls.

The 75RT's operator cab has also been improved with greater visibility and comfort. It incorporates a larger, ergonomical seat with new electronic joystick/single axis controllers. All electrical and hydraulic components coming into the cab are bulk headed for 'plug and play' assembly. The 75RT camera vision package enhances on-board site monitoring and includes cameras for viewing to the right side of the upper, the main and auxiliary winch, as well as one for backing up.

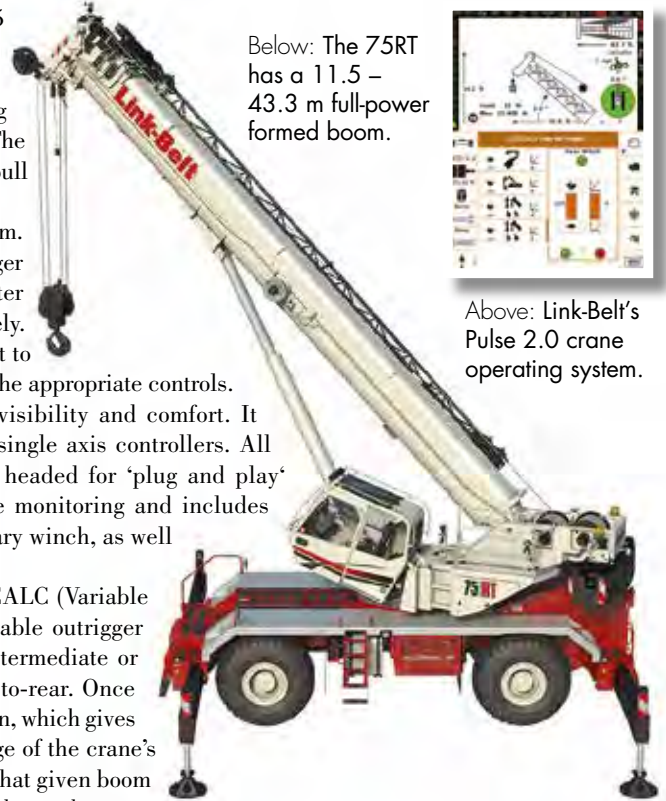
The 75RT will be the first Link-Belt crane model to showcase V-CALC (Variable Confined Area Lifting Capacities). This feature provides more selectable outrigger configurations by allowing outrigger beams (either fully retracted, intermediate or fully extended) to be set up in pairs either from side-to-side or front-to-rear. Once outriggers are set, the Pulse 2.0 system provides an outrigger configuration, which gives different previews representing workable areas, indicating a percentage of the crane's available capacity. The system also previews the next five radiuses for that given boom angle. Upon selection, Link-Belt Pulse 2.0 will provide a live view of the work area.

The 75RT has an overall height of 3.7 m and multiple transport options to accommodate road laws anywhere – it can transport fully equipped at just under 45,359 kg and under 40,823 kg with removal of 6,577 kg of counterweight. Another new feature of the 75RT is the evolution to a 24 V electrical system from a 12 V. The wiring is a Controller Area Network (CAN bus) system, but the increased voltage on the unit yields the ability to multiplex with modules placed near dedicated functions like outrigger beams and winches. In total, there are five modules located throughout the machine that allow for crane functions to continue working in instances where other modules are being diagnosed or serviced. ■

Below: The 75RT has a 11.5 – 43.3 m full-power formed boom.



Above: Link-Belt's Pulse 2.0 crane operating system.



Website: www.linkbelt.com

Hobas launches new generation of GRP pipes

The new Hobas Top Performance Pipe is equipped with a durable inner protective layer made of polyurethane resin; the thickness of which is customised for each project individually, typically starting at 2 mm, according to Hobas. This special layer makes the pipe resistant to abrasion, corrosion and impacts. Thanks to its particularly smooth inside surface, it also features excellent hydraulics and prevents sedimentation.

With its special properties, the new pipe is suitable for a broad range of challenging applications, from main sewers and sewers with retention function to drainage pipelines with very high slopes, culverts, efficient pressure pipelines, and industry applications. Apart from the thickness of the inner protection layer, the wall structure of the centrifugally cast (CC) GRP pipe can also be customised for special project conditions, said Hobas.

Moreover, the standard Hobas CC-GRP Gravity Pipe has also been upgraded. The structural properties of the pipe wall have been redesigned, leading to a significantly better wet creep factors. A new resin used in pipe production further improves the durability and



Hobas Top Performance Pipes.

impact resistance of the pipe, and the new transparent inner liner features a better bonding with the subsequent structural layer. ■

Website: www.hobas.com

Manitowoc MLC300 with fixed-position counterweight

Manitowoc has introduced a new version of the Manitowoc MLC300 crawler crane that utilises a fixed-position counterweight. This new model has many of the same features as the original MLC300, but does not feature Variable Position Counterweight (VPC) technology. It is targeted at customers who want the 300 t size platform and compact footprint of the original-model crawler crane, but without the additional investment in features and moving parts that come with VPC. For this configuration, the MLC300 VPC trolley and tray have been replaced by a two-position, stationary counterweight tray.

The MLC300 with fixed-position counterweight is ideal for equipment owners who focus on limited duty-cycle applications, with lighter loads and more repetitive lifts. The crane features a 96 m boom and has the option of an additional 30 m fixed jib. A 96 m luffing jib can be added to extend its reach to 150 m.

The latest version of the MLC300 is also equipped with Crane Control System (CCS), a standardised operating system across several crane models in different product ranges. CCS reduces training for lifting companies, since the same ergonomic controls and intuitive displays are used across many of Manitowoc's cranes. It also improves parts and maintenance needs, with components working across several crane ranges.

To simplify the new MLC300's design, the VPC system and VPC-Max preparation package are not included - however, all fixed-position counterweight configured machines can be retrofitted to VPC configuration, said Manitowoc. In the place of the VPC is a conventional, fixed counterweight system that is configurable to two positions depending on total counterweight selected: a standard lift crane position and a limited duty-cycle position that enables the counterweight to match the rotating bed's tail swing.

The MLC300 crawler crane can be easily transported anywhere in the world, thanks to its optimised component weights and dimensions. The crane has a removable, live-mast shipping module and its boom inserts are designed to allow luffing jib inserts to ship within them, decreasing shipping costs. The MLC300 with fixed-position counterweight is expected to be available in the second quarter of 2017. ■

Website: www.manitowoc.com



Manitowoc has developed a new version of MLC300 crawler crane that utilises a fixed-position counterweight.

Kohler diesel generators for Asia Pacific market

Kohler has launched a new range of large diesel industrial generators into the Asia Pacific market, the KD-series. It includes generator sets in nodes between 800 and 4,200 kVA, which are powered by a new line of G-Drive engines. These generators meet global emission regulations and are highly customisable to match an end user's specific requirements. Multiple options are also available to ensure optimal performance for the most demanding applications.

The KD-series is designed for high ambient temperature conditions. Thanks to high technology regulation and monitoring control systems on each component, the generators offer a very high power quality and best transient response in compliance with the most stringent regulations standards, said Kohler.

The new line of G-Drive engines has been specifically co-developed by Kohler and Liebherr to power the KD-series diesel industrial generators. There are six engines in total, delivering between 709 and 3,608 kWm standby power at 50 Hz and between 891 and 4,250 kWm standby power at 60 Hz. They are divided into two series - the 135 series and the 175 series - incorporating a modular design with common components, thus allowing for efficient servicing, reduced spare parts inventory and more streamlined technician training.

The G-Drive engines feature an innovative fuel system by Liebherr with common rail injection, which reaches pressures up to 2,200 bar to deliver better atomisation of fuel and improved fuel consumption. This precisely-metered fuel injection system also minimises engine particulates, reduces emissions and helps the new engines to meet global emission regulations in all markets.



Kohler KD-series diesel industrial generators (above) are powered by a new line of G-Drive engines, which has been jointly developed by Kohler and Liebherr (left).

Other key features of the engines include: an advanced Engine Control Unit (ECU), which is supported by Kodia diagnostic software for intuitive monitoring; a turbocharger system that optimises airflow to the cylinders for maximum power, optimal combustion and reduced fuel consumption; and a low-noise combustion system with optimised pressure, which works in combination with a rigid engine block, crankcase and sub-frame to significantly reduce noise and vibration. ■

Website: www.kdseries.com

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JCB enters access market and enhances 3CX Compact

JCB has entered the global powered access market with the launch of new scissor, articulated and telescopic boom lifts. By the end of the year the company plans to offer 27 machines, covering more than 80 percent of the access rental market. All models have been certified by TUV to ensure the highest quality standards, and they also comply with the latest ANSI and CSA legislation, said JCB.

The line-up will include: nine electric scissor lifts from 4.6 to 13.8 m; three diesel rough terrain scissor lifts; four diesel articulating booms from 14.9 to 24.6 m; one electric articulating boom with a 13.7 m working height; and 10 diesel telescopic booms from 20.6 to 41.1 m. According to JCB, this move will see the company grab a slice of a market worth 130,000 units a year, generating an annual revenue of US\$8 billion. Designed in-house to meet the needs of rental companies and contractors worldwide, the platforms will initially be offered in North America, the UK, France and Germany.

The four diesel articulated boom models will be offered with four-wheel drive and two-wheel steer, delivering up to 40 percent gradeability and a maximum stowed driving speed of up to 4.4 mph. These will be joined by a 13.7 m platform height AJ45E electric powered articulating boom model in the third quarter. The electric model has two-wheel drive and two-wheel steering, with up to 30 percent gradeability.

An extensive range of 10 diesel-powered telescopic booms will be added throughout 2017. These machines will offer platform heights from 20.6 to 45.6 m. There will be a high degree of parts commonality between the three model ranges, reducing cost and complexity for customers and dealers.

The scissor lifts have operating weights of between 1,330 and 3,366 kg. The two smallest models, S1530e and S1930e, offer platforms measuring 1.64 m long by 0.76 m wide, while the majority of larger models use a 2.5 m long platform. The largest S4550E model has a 2.64 m long working area. The machines are rated for basket capacities from 227 kg to a maximum of 550 kg and the electric scissors are powered by four 6-V or 12-V batteries, with hydraulic drive. The three diesel models will be introduced later in 2017.

JCB said that its global dealer network has been undergoing full sales and service training to be able to provide world-class back-up for the access platform ranges. JCB's LiveLink telematic system will be incorporated as standard on all booms, and will be available as an option on the scissors, providing customers and rental fleets in particular with a full telematics link to the platforms for increased security and maximum uptime.

In addition, the JCB 3CX Compact backhoe loader will be available with a high-flow front-end auxiliary hydraulic circuit capable of delivering up to 120 l/min at an operating pressure of 200 bar. This, in combination with the option of a skid steer loader mounting hitch, will allow contractors to operate a wider range of high-flow attachments, such as patch planers and trenchers, on the front of the 3CX Compact, further boosting the versatility of this machine.

The high-flow circuit will be available with a multi-function, electronic front loader control lever, with integral proportional rocker switches and activation buttons. This will provide increased control of front-mounted attachments, boosting productivity and performance.

The 3CX Compact will also be available with an optional Powerslide mounting for the backhoe. This allows the operator to slide the backhoe kingpost smoothly from one side of the machine to the other, without the risk of damage to the ground by pushing the boom across with the bucket. Additional safety options will include



As part of its new access platform offerings, JCB will introduce nine electric and four diesel scissor lifts.



The JCB 3CX Compact backhoe loader will be available with a high-flow front-end auxiliary hydraulic circuit capable of delivering up to 120 l/min at an operating pressure of 200 bar.

a second, lower cab entry step, at 430-440 mm from the ground, to provide easier access for operators that move in and out of the cab frequently.

Inside the cab further storage will be provided so operators can stow their belongings safely during a shift. JCB will also offer the 3CX Compact with hammer piping on the dipper arm; previously the breaker circuit ran to the end of the main boom, but additional piping on the dipper will reduce the chance of snagging hoses during operation. ■

Website: www.jcb.com

Bomag BW 28 RH pneumatic tyred roller

The new Bomag BW 28 RH pneumatic tyred roller features a large 3 cu m ballast compartment and efficient weight ballast changing system to boost wheel loads and improve compaction performance across a wide range of applications, from city streets and county roads to highways and airports. This new roller offers a broad range of operating weights from 8,600 to 28,000 kg and a higher maximum wheel load than former models of 3,500 kg for deeper static compaction than previously achievable.

The new flexible ballast system design of the BW 28 RH pneumatic roller features the option of adding concrete, steel and/or underfloor weights plus water, dry sand or wet sand to quickly adapt machine weight to the application, resulting in optimum compaction performance. With the ballast system, contractors can install four 750-kg concrete weights, four 1,500-kg steel weights or two 700-kg underfloor weights in a matter of minutes. The 3 cu m ballast compartment accommodates up to 3,000 kg of water, 4,500 kg of dry sand or 6,000 kg of wet sand to increase machine weight and wheel load.

Offering a 2,042 mm compaction width, the roller's eight offsetting tyres overlap by 32 mm to ensure consistent, full-width coverage on each pass. The roller's front axle boasts three-way pivoting to ensure even weight distribution across all tyres, and the wheels' kneading and flexing action seals the asphalt surface for optimum quality. Helping to improve asphalt quality, the roller's asphalt temperature sensor lets the operator know that the roller is compacting the mat inside the correct temperature range. The optional tyre inflation system varies tyre pressure from 2 to 8 bar, giving operators an efficient way to ensure the right contact pressure.

The roller's distinctive new front-end design significantly improves visibility to the outside tyres and the tops of the tyres, allowing the operator to efficiently compact next to obstructions and detect debris pick-up. To reduce material pick-up and improve surface quality, the BW 28 RH features a pressurised water system with one fully adjustable spray nozzle per tyre to ensure full-width coverage of each tyre.

Available scraper coco mats are spring-loaded and tiltable to help ensure uniform water distribution on each tyre, while optional heat retention shields allow the tyres to quickly heat up and maintain of high heat uniformity during operation.



Above and below: The new Bomag BW 28 RH pneumatic tyred roller features a large 3 cu m ballast compartment and efficient weight ballast changing system. The machine is suitable for a wide range of applications, from city streets and county roads to highways and airports.



Featuring Ecomode load-dependent operation that automatically matches engine output to the application, the BW 28 RH offers up to 30 percent fuel savings over previous models, said Bomag. The roller also runs quieter, boosting comfort for the operator and workers at the jobsite. Oversized steps leading up to the spacious platform allow the operator to quickly and safely enter the workstation. An adjustable seat is fully rotatable along with the steering wheel and slides the full length of the platform, so operators can take advantage of 360-degree machine visibility.

A new rocker brake pedal spans the full length of the platform to give operators safe access to braking function at all times. The

multi-function armrest is connected to the movement of the joystick for comfortable operation, and the driver's seat, joystick and compact steering wheel are placed for the highest levels of operator comfort.

For conducting on-board machine diagnostics, the roller's multi-function display at the operator's station provides a wide range of fault detection and service information, so issues occurring during machine operation can be quickly pinpointed and corrected. All machine service points are quickly reached from the ground to maximise machine uptime operation. The 200-l fuel and 340-l water tanks are conveniently located for fast filling, minimising routine servicing time. ■

Website: www.bomag.com

New LCL700 luffing-jib crane from Linden Comansa

The new LCL700 is currently the largest model in Linden Comansa range of luffing-jib tower cranes. There are two versions available for the global market, one of which features a 64 t maximum load capacity and the other 50 t. With easy manual modifications, the maximum load capacity can be reduced to 32 t and 25 t respectively, resulting in increased hoist speed and productivity. This change on the hoist system from double line to single pull line is one of the many improvements that have been implemented on this new model.

The maximum radius of the LCL700 is 65 m and can be reduced in increments of 5 m to 30 m. The 64 t LCL700 can lift a maximum load of 7.2 t at maximum reach, while the 50 t LCL700 can lift 7.5 t. The minimum reach of both models is just 4 m, allowing maximum use of the space at the construction site. The LCL700 also boasts an excellent 'out-of-service' jib radius of between 20.4 m and 16 m, depending on the maximum reach, providing a greater level of safety on the construction site when the crane is not in use.

The radius of the counter-jib is also very short, measuring just 9.5 m, with the potential to be reduced to 8.7 m by assembling the crane with steel counterweights rather than the standard concrete counterweights. Despite its size, the counter-jib is spaciouly distributed, enabling the operator to work and perform maintenance tasks with great ease.

The maximum freestanding height of the LCL700 is 69.8 m, on an anchor feet. The LCL700 tower sections, with a 2.5-m wide frame, are the same as those for the luffing-jib LCL500 model and the flat-top 21LC750. As such, owners of those models do not need to reinvest in tower sections or the climbing cage.

The LCL700 boasts a 200 kW hoist motor that enables it to reach high speeds: up to 134 m/min for the 64 t LCL700, and 170 m/min for the 50 t LCL700. The hoist speed with maximum load capacity is naturally reduced, but remains highly competitive: the 64 t LCL700 can lift 64 t at a speed of 17 m/min or 32 t at 34 m/min, while the maximum speed for the 50 t version is 22 m/min when lifting 50 t loads and 43 m/min when lifting 25 t loads.

Both models feature a high-capacity Lebus hoist cable drum, allowing them to be used to construct buildings of over 1,000 m in



Above: The new LCL700 features a high-capacity hoist cable drum that enables the crane to construct buildings of over 1,000 m in height.

Below: The hoist motor of the crane allows speeds of up to 170 m/min.



The maximum reach of the new LCL700 is 65 m. The prototype in this image has been assembled with a 45 m reach.

height when using the single pull line, and buildings of over 500 m in height when using the double line.

The LCL700 is simple to set up. The crane leaves the factory ready for quick assembly with pre-assembled luffing reevings, thus allowing on-site erectors to work faster and assembly time to be reduced. The components can be quickly connected using bolts, the accesses are wide and easily assembled, and the erection weights have been optimised. The heaviest weight for a quick crane assembly would be 18.5 t and can be reduced to 13 t by removing some of the components pre-assembled at the factory and lifting them separately.

According to Linden Comansa, the LCL700 is expected to be popular in large cities around the world - in Asia, Oceania, Europe, North America and South America. ■

Website: www.lindencomansa.com

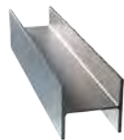
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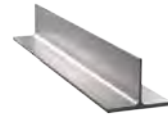
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Tsurumi LH4110W

The Tsurumi LH4110W extra high head pump is equipped with duplex impellers that deliver a maximum head of over 200 m. The upper impeller is attached in the reverse direction of the lower impeller (back-to-back), which reduces thrust load and increases the durability of bearings.

High-chromium cast iron is used for the impellers and mouth ring to ensure wear resistance. The labyrinth ring and shaft sleeve are also made of 630 stainless steel for excellent wear resistance, thus protecting the pump against damage caused by high pressure generated in the casing.

In addition, the LH4110W has seal pressure relief ports that release pump pressure applied to the mechanical seal. The flow-thru discharge function of the pump forcibly cools the motor, so that it can endure an extended operation at low water level.

The LH4110W is also fitted with an anti-wicking cable entry and inside mechanical seal with silicon carbide face, as standard features. Tsurumi said the pump has been designed for high reliability and durability to allow it to operate for a long period of time, even under harsh environments. ■

Website: www.tsurumi-global.com



The Tsurumi LH4110W extra high head pump has been designed for high reliability and durability, to ensure it can operate for a long period of time even under harsh conditions.

Vermeer D10x15 S3 Navigator HDD

Vermeer's compact D10x15 S3 Navigator horizontal directional drill (HDD) is only 3.8 m long, designed to provide more power and carriage speed and lower sound levels than its predecessor, the D9x13 S3 Navigator HDD. The D10x15 S3 has a thrust/pullback of 44.5 kN, maximum torque of 2,033.7 Nm and maximum spindle speed of 220 rpm. It also features a maximum carriage speed of 63.4 m/min and reduced operating noise. The drill's reduced sound levels help reduce noise and disturbance on residential jobsites, and enable easier communication among the crew members.

The combination of the drill's reduced sound levels and compact size, and the drill rod's tight bend radius, makes it well suited for short 'curb-to-home' fibre and service work. These shots are typically less than 91.4 m and 10.2 cm in diameter, said Vermeer. The D10x15 S3 also has an optional DigiTrak Aurora interactive, full-colour touch-screen display. The Aurora screen delivers real-time, easy-to-view location information, and can be used in conjunction with the Vermeer Productivity Tools.

Furthermore, Vermeer has enhanced its line of HDD tooling and accessories with the new Silver Series drill rod. Building on the tradition of Firestick drill rod, the Silver Series drill rod gives contractors a quality aftermarket drill rod. It is composed of S135 common grade steel and is threaded in the same facility and subject to the same rigorous quality inspection process as Firestick drill rod, according to Vermeer.

The company added that both the Firestick drill rod and Silver Series drill rod also have the same column wall thickness, which is thinner than some competitive drill rod options. The Silver Series drill rod is available in four sizes (4.2 cm, 4.8 cm, 5.2 cm and 6 cm) for use on the D7x11 through the D24x40 S3 Navigator HDD models, including all current and legacy models in between. ■

Website: www.vermeer.com



Above: Vermeer's compact D10x15 S3 Navigator HDD is only 3.8 m long, designed with a maximum carriage speed of 63.4 m/min and reduced operating noise.

Left: Vermeer has also enhanced its line of HDD tooling and accessories with the new Silver Series drill rod, which is available in four sizes (4.2 cm, 4.8 cm, 5.2 cm and 6 cm) for use on the D7x11 through the D24x40 S3 Navigator HDD models.

Jekko mini cranes go to Asia

The Jekko SPX312 and SPX1040 mini cranes have recently been introduced to the Singapore market by the company's distributor, MS Holdings.

The SPX312 is light and versatile, featuring a compact dimension of 2.8 m long x 0.77 m wide x 1.6 m high, with a low ground pressure of 0.44 kg/sq cm. The crane has independent extendable tracks to increase ground clearance and steering capacity. There are two different jibs available, a 400 kg mechanical flying jib and 800 kg searcher hook jib. The crane is also fitted with either a mono-phase or three-phase external power pack to work indoors, as well as a 600 kg radio remote controlled vacuum manipulator.

The SPX1040 is fitted with a 2 t pick and carry capacity. It has three types of jibs: a 600 kg hydraulic flying jib, 1,000 kg lattice flying jib and 3,500 kg searcher hook jib. The crane is available with an 800 kg radio-controlled vacuum manipulator and 300 kg pipe and beam manipulator. The SPX1040 is also designed with a three-phase external power pack, plus independent extendable tracks to increase steering capacity.

Jekko is currently strengthening its presence across Asia, in countries like South Korea, Singapore, Hong Kong and China. The company has received an order for 10 mini cranes in South Korea, including four units of SPX527, two units of SPX1040, two units of SPX424 and two units of SPX312 with glass manipulators and hydraulic jibs. In China, its dealer has sold 11 units of SPX527. According to Jekko, the Asian market will provide an important growth opportunity for the company in the next 10 years. ■

Website: www.jekko.it

Right: The Jekko SPX312 mini crane is versatile, featuring a compact dimension.



FAV excavator mounted side grip pile driver

The FAV excavator mounted side grip pile driver from Foundation Associates Engineering (FAE) is suitable for use in a wide range of ground conditions and depths. The 60SG can tilt +/- 30 degrees while the 70SG can tilt +/- 40 degrees.

The vibratory pile driver is powered by the hydraulic system of the excavator it is fitted to. The vibro hammer can be easily fitted without any modifications required to the excavator and is controlled directly by the operator. FAE said that the side grip vibratory hammer is an effective solution for pile driving on most sites, including open areas, confined spaces or limited headroom.

According to FAE, the side grip pile driver has many other advantages. It is fast, accurate and suitable for driving sheet piles and casing (pipe) into a variety of different soils; and it is capable of carrying out the whole pile driving process without need of manual handling of the piles or other machinery.

An advanced control system also makes the operation of the grip accurate and easier to manage. In addition, all hydraulic cylinders are designed for vibratory duty, while the tilt and rotate mechanism is designed for digging duty, and has sealed lubrication for bearings and worm gear. ■

Website: www.fnapl.com



The FAV excavator mounted side grip pile driver can be used in a wide range of ground conditions and depths.

Efficient crushing with Sandvik cone crushers

The new Sandvik CS550 cone crusher is a secondary stage crusher for 700- to 750-t applications. In addition to flexibility and sheer tonnage, it offers advanced automation and maintenance features for maximal productivity and uptime. The CS550 is the latest cone crusher that complements the first two 500-series crushers, the CH550 and CH540.

The CS550 is designed for construction applications, such as aggregate quarries, while contractors looking for mobile solutions may also benefit. The crusher can also be used in mining applications. It achieves up to 25 percent higher reduction ratios compared to similar types of crushers, according to Sandvik. This enables a more efficient process already in the secondary stage and relieves the tertiary stage of some of its size reduction load, allowing a sharper quality focus.

Furthermore, it decreases the recirculating load by up to 50 percent with no decrease in the output of high-value product. In other words, less material goes back into the crusher to be reprocessed. This extends the service life of the wear parts, including particularly the costly manganese steel used in the crushing chamber.

A major highlight of the CS550 is the complete elimination of plastic backing materials in the crushing chamber and substantial improvements in the maintenance ergonomics, including extensive commonalities with other Sandvik cone crushers.

The automatic setting regulation system, which comes as standard with the crusher, optimises crusher operation for efficiency and adapts to variations in feed conditions by means of continuous liner wear measurement and compensation. The Hydrosset system provides automatic hydraulically powered mainshaft positioning and overload protection to enable the passage of uncrushables. The automation and control system offered as standard for Sandvik 500-series crushers ensures optimal capacity and reduction settings for the high-powered equipment.

The CH540 is one of the first two models in the 500-series crushers. Its capacity, low environmental impact and high quality



The new Sandvik CS550 is a secondary stage crusher for 700- to 750-t applications. A major highlight of this cone crusher is the complete elimination of plastic backing materials in the crushing chamber and substantial improvements in the maintenance ergonomics. Here, the CS550 being introduced at ConExpo 2017.



make the cone crusher ideal for any quarry or aggregate plant looking to increase production capacity, eliminate bottlenecks, reduce cost per ton produced, or improve the quality of the end product.

The CH540 can be easily configured for either secondary or tertiary applications. The crusher has a capacity of 39 to 295 tph, maximum permitted power of 250 kW, CSS range of 4 to 38 mm and maximum feed size of 44 to 185 mm.

Other notable features of the CH540 include: Sandvik's new automation and control system, SanRemo for Crushers; a dump valve that ensures quick, safe tramp relief if something unbreakable gets into the crusher; wear parts that have been adapted; and reduced noise emissions. ■

Website: construction.sandvik.com

Left: The CH540 cone crusher on a jobsite.

Wirtgen TCM 180 texture curing machine

The Wirtgen TCM 180 texture curing machine has a modular design that permits working widths between 4 and 18 m. With a new operating concept, the machine can now be operated intuitively, just like the Wirtgen slipform pavers of the SP90 and SP60 series.

The operator's console of the TCM 180 features a more modern and clearer arrangement, as well as a number of new service and control functions that optimise the work process. The new hydraulic concept also has a positive impact on the work process, as the traction drive can now be switched at different speeds (between working and transport mode), for example. Proportional control supports precision height adjustment to meet every requirement.

Wirtgen has also expanded its range of different surface textures to cater to the various needs of its customers around the world. In addition to the established functions of transverse brooming and spraying, longitudinal brooming and spraying – and



The Wirtgen TCM 180 texture curing machine has a working width from 4 to 18 m.

even the application of a diagonal finish – will be possible in future, said the company. The machine can also be fitted with mounts for a burlap or synthetic turf.

Furthermore, a film unwinding device (known as a Polyroll) helps to protect the

concrete quickly and effectively from the negative effects of sudden rain. Travelling in reverse gear directly behind the slipform paver, the machine spreads plastic sheeting to protect the concrete from rain. ■

Website: www.wirtgen.com

LINNHOF ASPHALT MIXING PLANT



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Linnhoff Technologies is a manufacturer of asphalt mixing plants originating from Germany since 1900s. Linnhoff product range includes various capacities of mobile, portable, containerized, and stationary batch-type asphalt mixing plants, as well as ancillary equipment.

With the unique dual-function LINNHOF Screen Drum™ technology that combines the drying and screening processes of aggregates in one drum, fuel consumption and maintenance are reduced, thus maintaining low operating costs. LINNHOF asphalt plants have been utilized in road development projects, airport projects, and highway projects all around the world.

As an ISO-certified company with near-century long of experience in the industry, Linnhoff is always committed to constant innovation to develop more productive, more efficient, and eco-friendlier asphalt mixing plants for robust conditions for all types of job sites and different climates.

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Elematic and Eurobend team up for precast production

Elematic and Eurobend have signed a co-operation agreement, which will see Elematic offer Eurobend reinforcing equipment as part of its precast production line. The collaboration is aimed to benefit precast factories worldwide.

Eurobend provides a comprehensive range of rebar processing and welding equipment covering every precast application. It has more than 100 machine types, comprising fully automated and electronically controlled machines for the straightening, cutting and bending of all types of steel wire as well as mesh welding machines.

Elematic has a wide portfolio of precast manufacturing solutions including plants, production lines, single machines, the related services and knowledge network that covers all aspects of precast concrete in buildings – manufacturing as well as the method and the design.

According to Elematic, both companies have a similar product philosophy and therefore, their products match very well together. Eurobend's system is modular, and the degree of automation in the machinery can be increased by adding more modules to the machines. Elematic has a similar approach - the company's most basic technology level ensures that getting started with precast production is easy, and over time, if more capacity is required, the level of automation can be increased.

Elematic and Eurobend offering

Elematic's precast production line features three technology levels – Semi, Pro and Edge - where capacity and automation levels differ. Together with Eurobend, the company can now offer automation levels that best meet the needs of a particular precast factory.

Firstly, Elematic Semi technology level plant is an easy startup of precast production with a low investment. It is suitable for precast pioneers, precasters who only need a few products or builders who need production for just one particular project.

Eurobend's machines that accompany the Semi version include an entry level straight bar fed flexible mesh welding line, together with either a single-line or flexible multi-line rotor straightening and cutting machine and an entry level rebar bending machine.

Secondly, Elematic Pro production lines and machines are especially designed for producing different types of precast products with medium capacity. For this mid-range



Elematic sandwich wall production circulation line.



Eurobend fully automatic mesh welding machine, the PLC AMM series.

solution, Eurobend suggests an increased capacity straight-bar-fed flexible mesh welding line, or a fully automatic, coil-fed machine version for more demanding precast operations, together with a flexible multi-line rotor straightening and cutting machine, an advanced rebar bender version and a shear line for processing larger diameters of straight bars.

Lastly, Elematic Edge production lines and machines are ideal for precasters seeking

very high capacity, a wide product range and highly automated precast production. Eurobend machines for such high capacity production line will include both a flexible, coil-fed, or a high output, coil-fed mesh welding line, a flexible multi-line rotor straightening and cutting machine, an advanced rebar bender version, and a shear line for processing larger diameters of straight bars. ■

Website: www.elematic.com

JLG redesigns 600-series telescopic boom lifts

JLG has redesigned its 600-series telescopic boom lifts with two new machines, the 600S and 660SJ. The new 600S has an unrestricted capacity of 272.2 kg, which represents a 20 percent increase over its prior model, and a restricted capacity of 453.59 kg. The unrestricted capacity of the 660SJ has increased by 50 percent to 340.19 kg, with a restricted capacity of 249.47 kg.

Lift speeds on these new booms are faster with the ability to operate multiple functions at once significantly improved, enabling them to reach full height quickly for increased productivity. In addition, the machines are easier to transport. Their lighter-weight telescopic booms allow for multiple transport configurations. With a properly equipped truck, two of these units can be moved at one time, said JLG.

The new 600S and 660SJ include the JLG SkyGuard enhanced control panel protection system as standard equipment. The SkyGuard sensor, when activated by approximately 22.67 kg of force, stops all functions in use, temporarily reversing the unit for enhanced operator safety. These two new booms also benefit from extended wire rope and sheave replacement intervals - from eight to 12 years - up to 7,000 hours. Longer replacement cycles reduce maintenance costs, increase uptime, and deliver a lower total cost of ownership.

A wide range of accessories and attachments amplify the versatility of the 600S and 660SJ. Among them is the optional JLG SkyPower system that improves fuel economy and saves time, while providing additional power for hand tools and accessories. ■

Website: www.jlg.com



The newly redesigned JLG 600S telescopic boom lift.

Compact Sennebogen telescopic crane

The Sennebogen 613 telescopic crane features a compact design, with a 16 t lifting capacity. It is ideal for use in many construction projects as well as for the rental industry.

The Multicab 2 operator cab combines a modern design with maximum comfort and ergonomic equipment. Plus, it has a concave windshield for an excellent front view and a hinged rear window. An air conditioning system and a comfort seat including adjustable control elements are also standard features. The seat can be adjusted 1.75 m in height and allows a good overview of the working range.

In addition, the Sennebogen 613 is equipped with a standard full-power boom, which means that all extensions can be telescoped continuously and smoothly using a joystick, enabling it to work in any position. Telescoping under load is also possible, said Sennebogen. With its maximum boom length of 18.8 m and folding 5 m fly boom, the crane covers a convenient working range and remains compact and agile at the same time. Thanks to its uppercarriage width of only 2.55 m, the crane can also be transported easily and cost effectively on a flatbed trailer. ■

Website: www.sennebogen.com



The Sennebogen 613 telescopic crane has a compact design, with a 16 t lifting capacity and maximum boom length of 18.8 m.

Liebherr installs piles for Myanmar lake condominium

Myanmar-based foundation contractor Golden Tri Star Co Ltd is using a Liebherr LB 28-320 rotary drilling rig to install piles for a new condominium in Yangon, which is currently under construction on the west bank of the Inya Lake. The rig is owned by the contractor and was supplied by Octagon Automobile and Machinery Services Co, Liebherr's distributor for Myanmar.

Golden Tri Star is believed to be the first Myanmar contractor to invest in Liebherr rotary drilling technology. The project, Inya Lake View Residence, is expected to be completed within two years featuring 26 storeys and a two-level basement. A total of 206 piles, each with a diameter of 1.2 m, are being installed to help build the foundation of the building. The LB 28-320 rig has a high torque rating of 320 kNm and can drill down to 70 m.

The Liebherr rig is used to bore down to a maximum depth of 59 m. The soil is mostly silty sand, with the ground water level at a depth of 12 m. Golden Tri Star said it takes less than six hours to drill one pile hole with the Liebherr rig, which is considerably faster than the other machine it is using.

Golden Tri Star is also using a Liebherr R 906 excavator on site. After the pile holes are completed, the excavator is used to tamp the pile casing into place. The contractor employs 45 site personnel on the project, and it also has two operators who are experienced in working with the Liebherr rig.

At the Inya Lake View Residence, the ground is extremely soft, said Golden Tri Star. The colonial British dug the Inya Lake during the 1880s as a reservoir; the site was chosen because it was marshy land fed by a number of streams. The largest in Yangon,



the Inya Lake is still a reservoir but it is also a popular recreational area and important to some of the most exclusive neighbourhoods in the city.

According to Golden Tri Star, the present contract is for four months and after that the rig will be moved to the Landmark development, one of the most high profile projects in Yangon that will see retail, residential and office space constructed around the heritage-listed Burma Railways building. ■

Website: www.liebherr.com

Top, above and left: A Liebherr LB 28-320 drilling rig being used by Golden Tri Star to build the foundation of a new condominium in Yangon, Myanmar. The contractor also deploys a Liebherr R 906 excavator on the project.

Genie helps to transform Singapore historic church

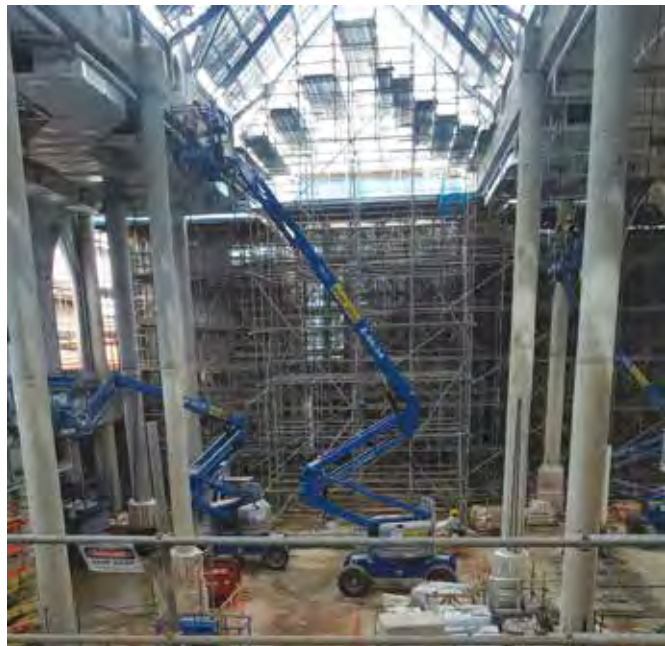
Since 1 October 2014, Novena Church, a Roman Catholic Church in Singapore, has been closed for major renovation. When completed, it will feature towering pillars, high arches and a grand dome rising high above the altar. The church will also sit on bigger premises, doubling its capacity to accommodate 1,500 people.

To help carry out the lifting tasks on the project, Aver Asia (S) Pte Ltd relied on its fleet of Genie lifts, including articulated boom lifts and scissor lifts. Aver Asia is a Genie distributor based in Singapore. The Genie machines were first introduced to the project to lift up marble slabs that cover the walls and pillars of the church, each of which weighs between 50 and 70 kg.

One of the models used was the Genie Z-60/34 articulated boom lift, which features a lift capacity of 227 kg and height of 2.7 m, with a tight turning radius and zero tail swing. It offered excellent manoeuvrability and thus was perfectly suited to work in the confined space with many pillars. According to Genie, the boom took less than a minute to reach the highest point, which is the cone shaped steeple that rises up to 20 m.

Given the various height profiles in different parts of the church, other Genie models were also deployed on the project, including the GS-4069 RT, GS-1930, Z-45/25 RT and S-45. The reopening of Novena Church is scheduled for 1 August 2017. ■

Website: www.genielift.com



Genie Z-60/34 boom lift helps to renovate the Novena Church.

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Complex formwork solution for HK-Zhuhai-Macao Bridge

The Hong Kong - Zhuhai - Macao Bridge (HKZMB) is being constructed in phases. With concrete works due for completion in 2017, once operational, the HKZMB will establish a new transport link between Hong Kong, Macao and Zhuhai, towards the western Pearl River Delta. It is set to be one of the world's longest bridges.

For the latest phase of the project, RMD Kwikform has supplied a range of formwork and shoring solutions to the contractor, Dragages - China Harbour - VSL Joint Venture (DCV-JV), including its heavy-duty Megashor shoring to support the construction of the turnaround facilities in the water, over the marine viaducts.

Composed of different concrete elements, the formwork and shoring solutions required to support the construction of the whole turnaround structure, were both complex and varied. One of the main challenges was to design support structures for the placement of two precast segment on pier (SOP) base slabs. This was followed by formwork and shoring for two sets of in-situ cast side and end walls, and top and wing slabs, with the structure completed using shoring mounted on steel beams to cast the final in-situ decks.

In order to form an elevated road across the existing new bridges, further support was required to place four precast girders, four precast I-beams and four precast corner beams. Once these main precast sections were installed, shoring solutions were designed to cast the elevated bridge decks and key connection segments to the main precast slabs.

With two sets of SOP's required in total, each set needed to be complete simultaneously in just four months for this section of the project to stay on programme. To achieve this, RMD Kwikform worked with the DCV-JV team to plan the construction sequence of the project, in line with the lift capacity of the barge crane.

The turnaround facility is located in the western waters of Hong Kong and spans over the top of the main dual three-lane bridge, which meant the overall structure had to be built using both deck-mounted and barge-mounted cranes, explained RMD Kwikform. To cope with the loads from the precast sections and the additional Hong Kong typhoon wind loads, the company designed solutions based on its modular Megashor heavy-duty shoring system. With a requirement to support the turnaround facility from the top of the cast in-situ pier,



Top, above and right: For the latest phase of the HKZMB project, RMD Kwikform has supplied its formwork and shoring solutions to support the construction of the turnaround facilities in the water, over the marine viaducts.

two identical Megashor tower arrangements were developed, each side of the main bridge, reaching a height of just over 19 m.

Positioned on top of cast in-situ pile caps, each matching tower arrangement was pre-assembled in two blocks on a large barge and lifted into place using a deck-mounted crane, said RMD Kwikform. To complete the 19-m height, two types of steel spreader beams were connected to the tower, which in turn supported the main primary beams.

RMD Kwikform further explained that the bottom half of the tower measures 6.7 m long by 6.3 m wide by 7.7 m high and was made up of four sets of nine Megashor legs. This base section supported a more complex second section consisting of a main tower and Megashor raker frame arrangement.

The upper section was designed to have

a total span of 16.9 m to support the spreader beam and in turn the SOP precast base slab, said RMD Kwikform. To achieve this, the block was made up of a 6.7 m long by 6.3 m wide six leg inner tower together with outer raker frames.

RMD Kwikform added that, to connect the six leg upper section and Megashor side raker frame arrangement to the base section, specially fabricated heavy duty, angled nodal brackets were mounted onto the top of the base section creating a strong and stable support tower arrangement.

Apart from the main tower support structure, RMD Kwikform also designed safety platforms, access and egress solutions to support the teams working on the project throughout the construction phase. ■

Website: www.rmdkwikform.com

Manitowoc delivers low costs on Korean wind farm

The MLC650 crawler crane from Manitowoc has been used by Shinui Petra, one of South Korea's largest construction equipment rental companies, to help with a complex and compact assembly project for Young-gwang Yak-su Wind Power. Over 12 weeks the crane worked at the new wind farm, located in Jeolla-namdo province on the southeastern coast of South Korea. It assembled six turbines and lifted components that weighed up to 140 t.

The original plan was to lift the turbine nacelles in separate sections, one of which weighed 80 t and another at 60 t. However, the 650 t capacity of the MLC650 enabled the company to lift and install the nacelles as a single 120 t unit, which was then lifted to a height of 120 m at a radius of 30 m. This delivered considerable cost and timesavings for the company.

According to Shinui Petra, the MLC650 is smaller than the other options available, which means fewer trailers to transport the crane and less time to set it up. The company said it took only 45 trailers to mobilise the MLC650 and three days to erect it, compared to five days and many more trailers for alternative options.

The crane's Variable Position Counterweight (VPC) provides another advantage. This extending, suspended counterweight allows the crane to achieve excellent lifting ability without the need for a ground-mounted counterweight solution. The VPC design also means the counterweight does not have to be fully extended to the rear of the crane during set up, nor does it touch the ground, saving space on the jobsite.

The MLC650 has a standard 650 t maximum capacity that can be increased to 700 t with VPC-Max attachment, while a total of 203.8 m tip height can be attained by the crane when combining its 101 m luffing jib with its 104 m of main boom.

The new Young-gwang Yank-su wind farm in South Korea is now up and running. The facility is generating 22,176 kW of energy per day and is expected to record a turnover of US\$4.9 million a year. ■

Website: www.manitowoccranes.com



Manitowoc MLC650 crawler crane assembles turbines and lifts heavy components on a new wind farm in South Korea.



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Outokumpu to work on Kuwait major bridge project

Outokumpu has secured a contract to provide 1,600 t of stainless steel rebar for the construction of Sheikh Jaber al-Ahmad Al-Sabah Bridge in Kuwait. The contract was awarded by South Korean contractor Hyundai Engineering & Construction, which includes stainless steel rebar in grade Forta DX 2304 from Outokumpu Bar Mill in Sheffield, the UK, supported by a local stock in Doha, Qatar.

The 36-km-long Sheikh Jaber al-Ahmad Al-Sabah Bridge is currently one of the largest infrastructure projects in the GCC region. It is expected to be operational at the end of 2018. According to Outokumpu, stainless steel rebar is the ideal material for the project due to its high corrosion resistance and low life-cycle costs. Deliveries of the product started in early 2016 and will continue through to 2017.

Outokumpu is a global manufacturer of stainless steel, headquartered in Espoo, Finland. The company's products have been used in various infrastructure projects around the world; they are designed to be 100 percent recyclable, corrosion-resistant, maintenance-free and durable. ■

Website: www.outokumpu.com/rebar

Above right: The 36-km-long Sheikh Jaber al-Ahmad Al-Sabah Bridge is scheduled to be operational towards the end of 2018.

Right: Outokumpu supplies 1,600 t of stainless steel rebar for use in the project.



Gammon boosts productivity with 'zero-gravity arms'

Hong-Kong based contractor Gammon Construction recently invested in two sets of 'zero-gravity arms' (Zero G Tool Arms) from Sigma Ergonomics, an Australia-based company that provides ergonomic systems to a wide range of industries. Manufactured by US company Ekso Bionics, the Zero G arm is an innovative mounted exoskeletal system that functions without the need for power, allowing workers to comfortably operate heavy tools including impact drills, chipping hammers and grinders for extended periods.

With the zero-gravity arms shouldering the weight of the equipment, workers are not affected by the strain and fatigue caused by repetitive tasks such as drilling, tiling, chipping and grinding. The Ekso Bionics Aerial System, to which the Zero G system is mounted, is designed to increase safety and productivity while working from an elevated work platform. It eliminates the risk of dropping heavy tools from heights, and also reduces the risk of injury from heavy tool usage and awkward body position.

According to Gammon Construction, the Ekso Bionics Aerial System has been successfully deployed at a construction site of a data centre in Hong Kong's Tseung Kwan O district and at a transport terminus in Kowloon. The company plans to expand the trial scheme to several other work sites in the region.

Sigma Ergonomics said that in a recent direct comparison with an aerial work platform (AWP) at a height services installation, the Zero G system improved the productivity of the drilling work by over 50 percent while reducing worker fatigue and improving safety and efficiency.

The Ekso Bionics Zero G arms are designed to hold tool payloads of up to 19 kg and fully balance the weight, thus enabling the user to freely, safely and accurately manoeuvre the load in any direction



Above and left: Gammon Construction has invested in Zero G Tool Arms, an innovative mounted exoskeletal system that allows workers to comfortably operate heavy tools for extended periods.

without injury or fatigue. The ergonomic tool arms also have a variety of mounting options to suit the application including portable gantries, carts, jib arms and linear rails. ■

Website: www.sigmaergonomics.com

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HERE COMES THE BOOM

SKYJACK HAS UNVEILED ITS LARGEST ARTICULATING BOOM LIFT, THE SJ85AJ. DESIGNED FOR GLOBAL OPERATORS, THE MACHINE IS SCHEDULED TO ENTER THE ASIAN MARKET AROUND THE MIDDLE OF THE YEAR.

The new SJ85AJ fills out Skyjack’s offering in the core 40 ft (12 m), 60 ft (18 m) and 80 ft (24 m) boom classes. With dual platform capacities of 340/227 kg and three/two personnel rating, the machine is highly suitable for operators looking to maximise productivity and jobsite performance.

“The SJ85AJ combines the best of the SJ86T telescopic boom and the SJ63AJ articulating boom,” said Corey Connolly, product manager at Skyjack. “We’ve gone one step further with this new articulating boom. Having a large unit with excellent up-and-over clearance to complement the great working height and horizontal reach will enable operators to complete many tasks across all kinds of applications.”

Powered by a Deutz diesel engine, the SJ85AJ delivers a working height of 27.91 m, platform height of 25.91 m, horizontal outreach of 17.07 m and an up-and-over clearance of 10.36 m. According to Mr Connolly, production of the machine is planned to start in April 2017.

The SJ85AJ is designed with a



Top and above: The new Skyjack SJ85AJ articulating boom lift features dual platform capacities of 340/227 kg and three/two personnel rating. It delivers a working height of 27.91 m, platform height of 25.91 m, horizontal outreach of 17.07 m and an up-and-over clearance of 10.36 m.

360-degree continuous turret rotation, thus it is ideal for working in tight spaces and saving time when platform repositioning is needed. The machine has a drive speed of 4.8 km/hr and jib length of 1.68 m.

“The SJ85AJ also features a minimal tailswing of just under 3 ft (0.91 m), making it very compact, thanks to the riser design,” added Mr Connolly.

Distinctive features

One of the key features on the SJ85AJ is SkyRiser functionality, Skyjack’s innovative riser design that offers true vertical rise. “This system sets our new boom apart from similar machines in its class. When the operator uses the riser control function, the boom pivot point will go straight up and down, it doesn’t drift forward or backward,” said Mr Connolly.

SkyRiser is standard on Skyjack articulating boom lifts. It minimises the amount of repositioning the operator needs to do in order to stay close to a building facade.

SpeedyReach is also an innovative feature on Skyjack boom lifts, added Mr Connolly. Utilising a riser geometry similar to the SJ63 AJ, it allows the operator to position the riser at full height and cycle between maximum height and ground by just using the boom function.

“You can have the riser up, with the boom all the way extended, and then bring the boom down to reach the ground level without having to move the riser. So you only need to perform one function, instead of two, increasing efficiency,” said Mr Connolly.

As such, the time spent restocking material or supplies can be greatly reduced. This feature adds to the machine’s versatility. Operators will be able to function between maximum platform height and ground level in 60-70 seconds, said Skyjack.

In addition, the EasyDrive system allows the machine to drive and steer with respect to the orientation of the boom and counterweight, regardless of the turret position, explained Mr Connolly. There is no need to have arrows, decals, or colours to remember or reference while operating. Continuous drive feature also prevents controls from reversing unexpectedly.

Furthermore, at the heart of every Skyjack machine is Skycoded - a simplistic colour coded and numbered wiring system that makes the machines easy to troubleshoot and repair. For example, Black #14 represents the lift function on a scissor lift and similarly represents the lift function on a boom lift.

Another highlight of the SJ85AJ is



The SkyRiser system is standard on Skyjack articulating boom lifts, including the new SJ85AJ. Here, the system is demonstrated by the SJ63AJ (left). It allows the boom arm to operate in a true vertical manner, without drifting forward or backward.



Like the SJ63AJ (above), the SpeedyReach system is also a key feature on the new SJ85AJ. It allows the operator to position the boom at full height, and then bring it down to the ground without moving the riser.



Simon Cracknell (left), Skyjack’s business development director for Asia and Corey Connolly, Skyjack’s product manager, stand alongside the prototype of the SJ85AJ articulating boom lift at the ConExpo exhibition, which took place in March 2017.

AxlDrive, a mechanical ‘axle based’ drive system that provides excellent traction, terrainability and 45 percent gradeability. Skyjack said this four-wheel-drive system is rugged and robust, similar to those found on wheel loaders and telehandlers. The AxlDrive system is found on all rough terrain Skyjack booms - telescopic and articulating. It features a limited slip differential on the front axle and an operator controlled locking differential in the rear.

For superior rough terrain performance, Skyjack boom lifts also employ rough terrain grip lug tyres. The front steering axle also oscillates on all Skyjack boom lifts, helping to tackle various jobsite debris, obstacles and rolling terrain.

Ideal for Asia

“Skyjack scissor lifts have been quite established in Asia, but our boom lifts are still considered new to the market,” said Simon Cracknell, business development director for Asia at Skyjack. “Last year we introduced the SJ86T telescopic boom and now the SJ85AJ articulating boom. There are already customers in Asia expressing their interest in the SJ85AJ, so we hope that this new model could come into the market by the end of the year.

“Self-propelled boom lifts are gaining their popularity across Southeast Asia, such as in Malaysia, where we see a transition from



Left and below: AxlDrive, Skyjack’s mechanical ‘axle based’ drive system, provides excellent traction and terrainability for the SJ85AJ.

Above: Skyjack machines also feature a simplistic colour coded and numbered wiring system, which makes the machines easy to troubleshoot and repair.

truck-mounted to self-propelled boom lifts. In view of this, we are also strengthening our presence in the region with an expanded dealer network.

Mr Cracknell continued, “Our products are well suited to rental companies worldwide, and they are also our main customers in Asia. For example, the SJ85AJ is easy to transport as it can fit into a 40 ft container, making it very cost efficient – this is due to the riser design. Such benefit is important for trading markets like Singapore, which typically buys new machines and later exports them (as used equipment) to neighbouring countries or to other developing countries in the Indian continents.”

Using a relay-based control system, Skyjack machines also operate with fewer components, resulting in less maintenance. “They are easy to service, no special equipment required, and customers can replace the components locally. This way, our machines are able to work in remote locations without any difficulties,” said Mr Cracknell. “They have also been designed to withstand harsh weather conditions, including heat and humidity in the Asian countries.”

“We anticipate that the SJ85AJ will redefine the 80-ft articulating boom class and are confident that it will offer a great return on investment for rental customers, in Asia and globally,” concluded Mr Connolly. ■

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RAISING THE ROOF

The Bangkok International Trade & Exhibition Centre (BITEC) in Thailand has recently undergone expansion, featuring a new innovative roof. It is currently believed to be the largest column-free exhibition space in the country. Owned by Bhiraj Buri Co Ltd, the facility was opened in 1997 and is located in the Bang Na district of Bangkok.

As the lead structural engineer, Aurecon played a key role in the expansion project. The company worked closely with the architect to balance aesthetics and engineering practicalities, optimising the design while also respecting the architect's desire for a dramatic addition to the Bangkok skyline – complete with elegant masts and cables. In addition to the detailed design of the finished structure, the company worked out a detailed construction sequence to facilitate the erection of this unusual structure for the main contractor, Italian-Thai Development.

Creating space and width

Stretching to 108 m between columns at its widest section, the new long-span structure gives the venue its impressive floor space possibilities. The expansion more than doubles the area of the exhibition centre, adding 40,000 sq m to the existing 35,000 sq m.

The expansion has two distinct, large areas, each with a different clear height. The first section features a 25 m height with a 108 m column-to-column span; while the second has a 15 m height with a 90 m column-to-column span. The lightweight roof also has the capacity to support large hanging loads.

One of the biggest challenges for the design was supporting the weight of the roof, said Aurecon. To counter this, the company used advanced modelling and structural analysis to evaluate the size, specification and siting of the cable-stays, together with the optimum lattice design for the roof truss.

To create such long column-to-column spaces, Aurecon designed an innovative support system for the roof structure. This design has the main roof truss supported by fore stays on each side, with these cables then supported on masts around the edge of the building. A further cable from the top of each mast is anchored to the ground, via a configuration that incorporates a back



An artist's impression of the newly upgraded Bangkok International Trade & Exhibition Centre (BITEC).



Above: The renovated facility features a new, innovative roof. It is currently believed to be the largest column-free exhibition space in Thailand.

Below: Aurecon was appointed as lead structural engineer for the project. One of the biggest challenges for the design was supporting the weight of the roof, so to counter this, the company used advanced modelling and structural analysis to evaluate the size, specification and siting of the cable-stays, together with the optimum lattice design for the roof truss.



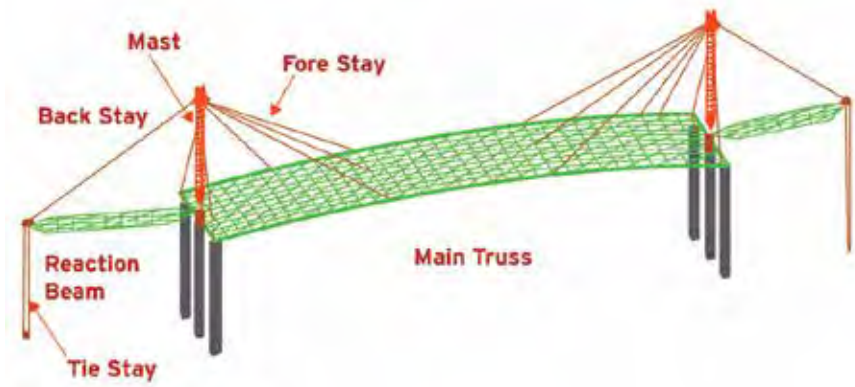
stay, tie stay and reaction beam. There is one mast design for every three roof trusses.

Getting the sequence right

More importantly, a detailed erection sequence was developed for the building contractor, which required the roof's lattice structure to be jacked above its final resting height during assembly, explained Aurecon. Doing this meant that as the contractor systematically removed the jacks - in line with the erection sequence - the downward motion induced the required tension in the cable stays to meet design requirements.

“One of the most significant engineering challenges was making sure we got the erection sequence right,” said Pisit Yingmanokit, technical director of Aurecon in Thailand, the project’s senior structural engineer. “It was quite a meticulous process to ensure the roof would maintain its desired shape and strength, but the end result is something unique in Thailand, allowing the venue to stage much bigger and better events.”

The new BITEC venue welcomed its first exhibition on 23 November 2016. ■



Above and left: To create such long column-to-column spaces, Aurecon designed a support system for the roof structure. This design has the main roof truss supported by fore stays on each side, with these cables then supported on masts around the edge of the building.

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HONG KONG T · PARK

DESIGNING A VISUALLY ATTRACTIVE YET FUNCTIONAL AND SUSTAINABLE SLUDGE TREATMENT FACILITY WAS NOT AN EASY TASK FOR ARUP. HERE, THE COMPANY SHARES SOME OF THE CHALLENGES IN PLANNING, ENGINEERING AND PROVIDING TECHNICAL SERVICES FOR THE PROJECT.

The new sludge treatment facility in Hong Kong, known as T · PARK, started its operation in early 2015. The plant signifies the continued efforts to shape the city's 'waste-to-energy' ambitions for the good of the community. In addition to the treatment plant, T · PARK offers a combination of educational, recreational and ecological facilities.

The Hong Kong Government's Environmental Protection Department owns the facility. Veolia won the design-build-operate (DBO) contract and Arup worked with Veolia-Leighton-John Holland JV on the engineering-procurement-construction (EPC) contract.

T · PARK treats the sewage sludge collected from 11 major

sewage treatment works. The design capacity of the plant is up to 2,000 t of wet sludge per day. This foul wet sludge - which would otherwise be dumped in landfills - will be incinerated to give ash and residues, reducing its volume by about 90 percent. The heat generated by the treatment process is used to power two separate steam turbine generators, each has a 14 MW of power rating, enough to run the whole facility and export to the grid. The facility employs the fluidised bed incineration technology, which is an effective means for incinerating sludge with water content of around 70 percent.

Arup's scope of work included detailed engineering design for all civil, structural, geotechnical and building services associated with

The development of a new sludge treatment facility in Hong Kong signifies the continued efforts to shape the city's 'waste-to-energy' ambitions for the good of the community.



© Sky Eye Co Ltd

the buildings, as well as mechanical and electrical engineering for the facility: site-wide electrical power distribution system, HV grid connection, site-wide interconnecting pipework and mechanical support systems, performance specification for balance of plant and specialist services for fire engineering. Arup also worked with Vasconi Architects on the architectural concept.

Distinctive, practical and sustainable

The building's flowing roofline reflects and integrates the sea view in front and ridge lines at the back, blending with the surrounding scenery. The facility was built in modular form in order to meet the tight construction timeline of just 37 months.

There are two main process buildings on either side of the central administration building. The sectional roof profile, developed to emulate the wave symbolism, also yielded north lights for ventilation and natural day lighting. The ancillary buildings for power generation – comprising two turbine generators and condensers, desalination and wastewater



© Marcel Lam Photography

The facility is highly sustainable, with a self-sufficient process and almost 70 percent of the site is landscaped or has green roof coverage.



T • PARK was built in modular form in order to meet the tight construction timeline of just 37 months.

© Veolia Water - Leighton - John Holland Joint Venture

treatment facilities – were aligned symmetrically behind the main process buildings and interlinked by a high level viewing gallery, accessed from a central environmental education centre. The viewing gallery doubled as a pipe and cable bridge between the process buildings.

T • PARK is highly sustainable, with a self-sufficient process and almost 70 percent of the site is landscaped or has green roof coverage. The project has achieved the provisional platinum rating of the BEAM Plus accreditation (Hong Kong’s scheme for recognising and certifying environmental excellence in building design). The seawater recovered through desalination is used on site for drinking and industrial processes; rainwater is collected from roofs and used to supply non-potable water and fire service tanks.

Driven H-piles

The facility occupies a 7 ha site of the former Tsang Tsui Ash Lagoons. These were formed within reclamation areas bound by a lined seawall that were used for disposal of pulverised fuel ash (PFA) from the adjacent Black Point Power Station and subsequently capped with general fill. Investigation and monitoring were undertaken upon taking possession of the site to determine the selection of the foundation and site formation solution.

Given the likelihood of ongoing settlement and the sensitivity of the process equipment and interconnection pipework between process facilities, piling was selected to mitigate differential settlement as the general foundation system. Driven H-piles were considered the most appropriate, because they could be installed quickly and mitigated the need to dispose of excavated PFA that would have been necessary for a bored pile approach.

Placement of driven H-piles within the PFA caused some durability concerns due to the high chloride content of the PFA within the inter-tidal zone. Arup assessed the corrosion environment, and while these assessments determined that the likely corrosion rates



© Marcel Lam Photography

The facility offers a combination of educational, recreational and ecological facilities. Among them are a spa pool within the visitor centre (above) and a visitor viewing gallery (below).



© Marcel Lam Photography

were low (from the results of leaching trial tests), it was decided to provide mitigation from corrosion.

Moreover, the facility lies within a landfill gas consultation zone, and although the risk of landfill gas migration is extremely low (the site is separated from the landfill by a river channel), Arup conducted a landfill gas impact assessment. As a result, a landfill cut-off trench that extends 1 m below the groundwater table was formed along the boundary of the facility facing the landfill.

Below-ground tanks such as the sludge bunker, basement level plant rooms and site-wide common utility trench were lined with a gas-impermeable membrane, and below-ground services were routed within this trench or embedded within the concrete suspended slab structure. This meant that no utility services were in direct contact with fill that may be subject to landfill gas conveyance.

Complex roof

The 400-m-long roof spans over, and unites, the two incinerator plants and the centrally located administration building. In the longitudinal direction, the roof height varies from 6 to 35 m above ground level to reflect the internal usage of the building, with the highest point housing the main incineration plant. To achieve natural light penetration into the 50 m width of the building, a series of varying height north-light roof features project from the roof surface, forming a stepped profile to the transverse roof cross-section.

The detailed design of the secondary transverse steelwork was one of the more challenging aspects of the design process. The variable saw-tooth external profile was architecturally required to have maximum saw-tooth depth towards the centre of a longitudinal cross-section of the building and to flatten out at the two ends of the building. Thus, the transverse roof profile was constantly changing along the building length.

A further complication was that the lowest points of the saw-tooth profile fell below the top chord level of the primary trusses. A variety of structural schemes was investigated, with the main drivers being the response to geometrical changes and the need to simplify the erection process.

Continued overleaf...

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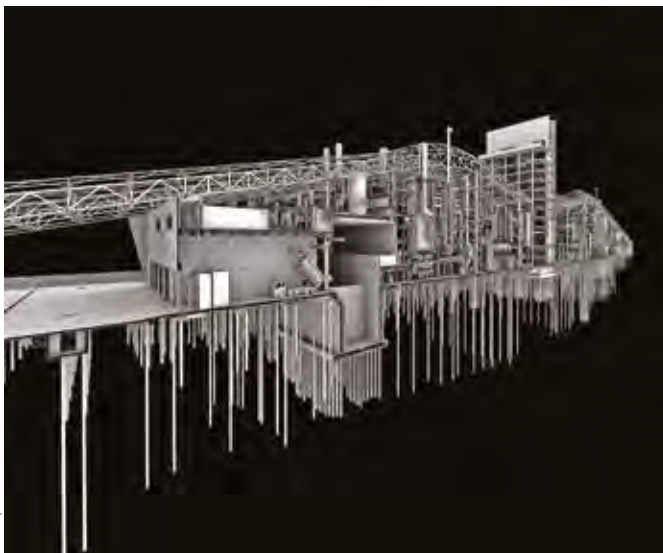


Arup then proposed the use of secondary A-frame trusses connected to the bottom chord level of each truss. These A-frames provided a point of vertical support midway between the trusses that could act as a propping point to the standardised inverted A-frame cladding support assemblies. The latter were essentially supported at their apex directly by the truss top chords, and the two ends could be rotated about this point to achieve the required saw-tooth profile.

The roof is also sensitive to temperature changes, and this was a key consideration in the design. The two extreme ends of the roof, which are the lowest points, are supported by the large concrete buildings that house the sewage sludge receiving bunkers. These stiff (and low) concrete structures with many longitudinal concrete division walls were ideal for conveying the longitudinal wind on the roof back down to foundation level. The main issue was that these stiff end structures would constrain any longitudinal expansion and contraction of the roof due to temperature variations.

The longitudinal profile of the roof, forming a vertical wave-form shape in elevation, led Arup to investigate the beneficial effect of curvature in mitigating any longitudinal temperature-induced forces. A curved element, subject to axial force, tends to react by deflecting out-of-plane, thus reducing the shortening or extension of the element that would otherwise occur. Consequently, this out-of-plane movement would reduce the temperature-induced axial forces.

© Arup



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Above: The building's flowing roofline reflects and integrates the sea view in front and ridge lines at the back, blending with the surrounding scenery.

Top left: The sectional view of the roof not only emulates the wave symbolism, but also provides north lights for ventilation and natural day lighting.



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Above: The detailed design of the secondary transverse steelwork of the roof proved to be one of the more challenging aspects of the design process.

Left: The sectional view through BIM model indicating integration of roof with process equipment.

Continued on page 64...

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Continued from page 62...

BIM application

The entire design process was carried out using Building Information Modelling (BIM) that established complex three-dimensional models, which were used for coordination, drawings production, operational and maintenance simulation, as well as material take-off for the design and construction of the facility. Due to the scale and complexity of the project, Arup established a BIM execution plan that defined the zoning and layering of the models and the respective checking and coordination reviews that were imposed at 30 percent, 60 percent and 90 percent design stage completions.

The GSA structural analysis models were linked with the Bentley Structures Model so that the general arrangement and geometry of the structure could be accurately acquired and changes easily facilitated between modelling platforms. The model was used to directly extract drawings and piping scripts to enable accurate development of piping isometrics and material take-off for all fits and fittings. This enabled the contractor to place precise orders for materials.

The greatest benefit of the model related to the collaboration and coordination of the design. The model became an invaluable tool to facilitate discussions between disciplines and enable rapid resolution and visualisation of conflicts. The implementation of structured reviews reduced queries and clashes during construction on site. ■

Below: The facility occupies a 7 ha site of the former Tsang Tsui Ash Lagoons.

Project Team:

Client: Veolia - Leighton - John Holland JV

Project Owner: Environmental Protection Department, The Government of the Hong Kong Special Administrative Region

Contractor: Veolia Water - Veolia Environmental Services

EPC Contractor: Veolia - Leighton - John Holland JV

Civil engineering, structural engineering, building services, energy strategy, process engineering, fire engineering, landfill gas assessment, water engineering, geotechnics and management consultancy: Arup



Above: The floor plan of the two-mirror image main process buildings, housing identical processes.



Further information on the project: www.tpark.hk

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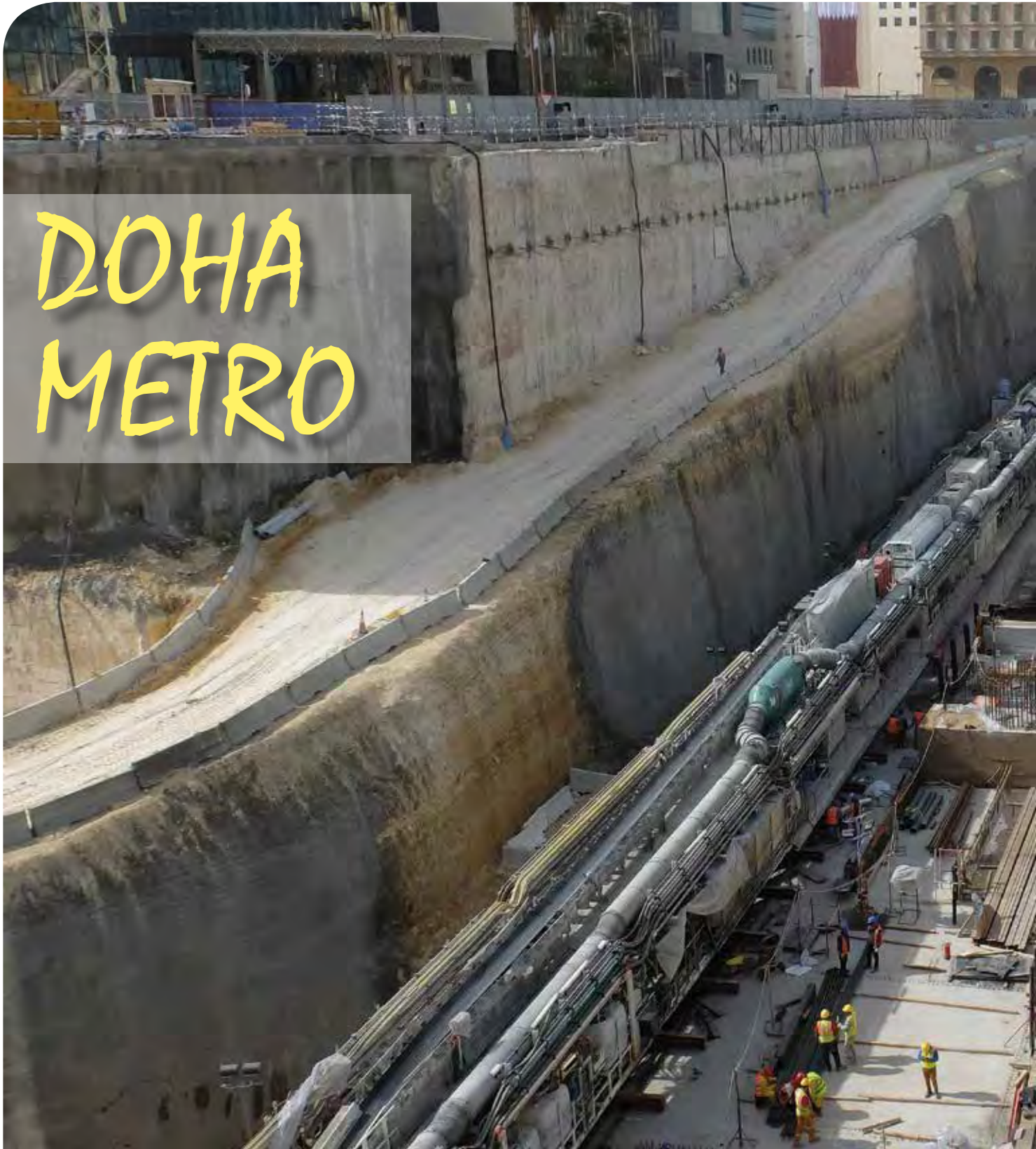


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DOHA METRO

Tunnelling work on the first three lines of the Doha Metro (namely Red Line, Green Line and Gold Line) has recently been completed, with the final breakthrough taking place in September 2016 at the Red Line South. Overall, the 111 km underground tunnel system was built in 26 months, comprising 76 breakthroughs.

Further construction work at the individual stations and finishing

of the segmentally lined tunnels will continue until 2020, when the stations are scheduled to open. Another metro line is currently being planned. The Msheireb Station is a major interchange, where all lines meet here; 12 breakthroughs are said to have occurred at this station alone.

“The Doha Metro project represents the supporting backbone of an integrated public transport system,” said Qatar’s Minister of



Main image: Tunnelling work on the first three lines of the Doha Metro has been completed. Further construction work at the individual stations and finishing of the segmentally lined tunnels will continue until 2020.

Below, inset: The three lines include the Red Line, Green Line and Gold Line, featuring 111 km of underground tunnels.

Transport and Communications, H.E. Jassim Saif Ahmed al Sulaiti. Four joint ventures incorporating local and international contractors have been involved in the project. They include:

- Red Line North: ISG joint venture (Salini Impreglio SpA/SK Engineering & Constructing Co Ltd/Galfar Al Misnad Engineering & Constructing WLL)
- Red Line South: Qatari Diar Vinci Construction JV (QDVS)/GS

Engineering & Construction Corp (GSE&C)/Al-Darwish Engineering WLL (ADE)

- Green Line: PORR Bau GmbH/Saudi Binladin Group Company Ltd/Hamad Bin Khalid Contracting Co WLL
- Gold Line: Aktor SA/Larsen & Toubro Limited/Yapi Merkezi Insaat VE Sanayi Anonim Sirketi/Sezai Turkes Feyzi Akkaya Marine Construction/Al Jaber Engineering LLC

Underground challenge

The metro lines required 21 earth pressure balance (EPB) tunnel boring machines (TBMs), which were specially designed and supplied to the project by German manufacturer Herrenknecht. A total of 470,497 individual concrete segments (so-called lining segments) were mechanically assembled into 70,071 tunnel rings. According to Herrenknecht, at peak times 20 TBMs tunnelled their way forward simultaneously, 2.5 km per week. All lines were built as parallel twin tunnels.

Six TBMs feature a shield diameter of 7,050 mm, drive power of 1,440 kW and torque of 4,769 kNm. The other six TBMs have a shield diameter of 7,110 mm, drive power of 1,440 kW and torque of 4,769 kNm. The rest of the TBMs are designed with a shield diameter of 7,050 mm, drive power of 1,280 kW and torque of 4,239 kNm.

In addition to the geology consisting primarily of Simsima limestone, the demands on each TBM were complex – just from the dense urban development alone, said Herrenknecht. The routes of the individual metro lines run under highly populated areas, for example near the Doha Corniche waterfront promenade, under the high-rise neighbourhoods of Doha City and the tourist centre with hotel facilities. Therefore, settlement-free tunnelling was one of the core requirements during construction.

In order to cope with the tight schedule, the TBM crew was in operation around the clock, seven days a week. Up to 125 Herrenknecht service staff and specialists from 19 countries were available on the project. The Herrenknecht full-service competence centre set up near Doha specifically for the project also provided additional support. ■

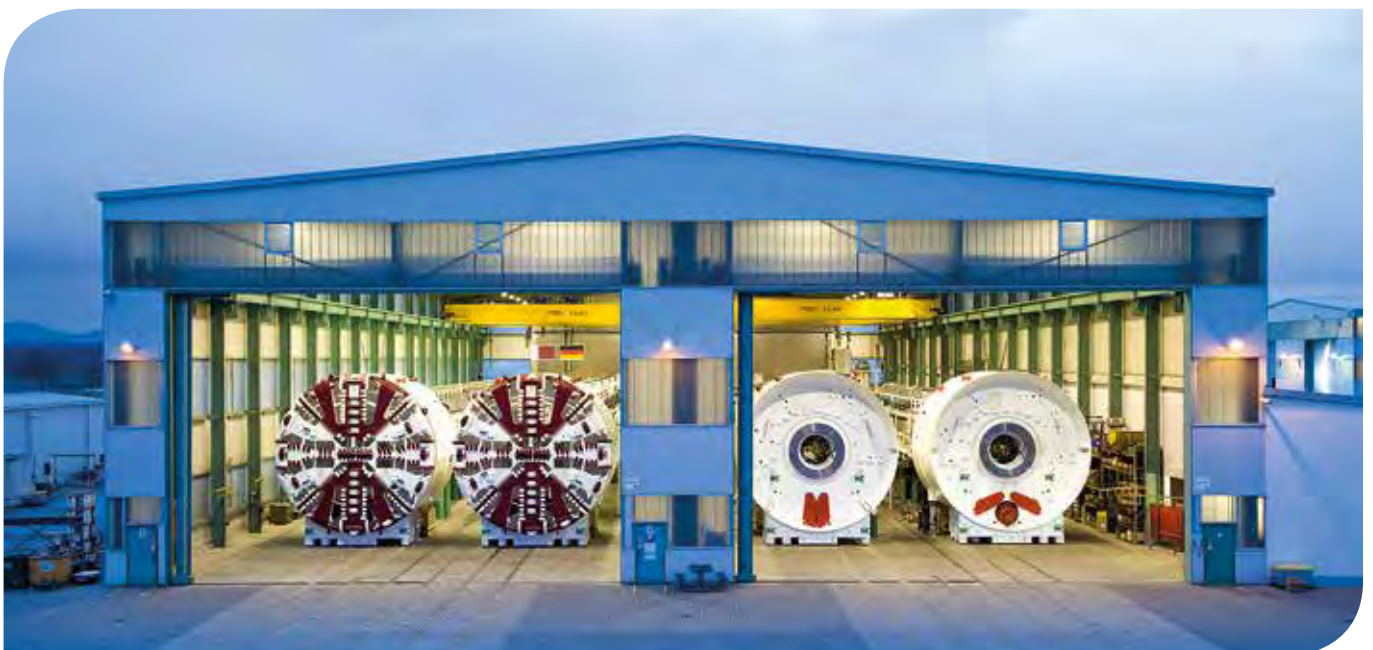
Website: www.herrenknecht.com

Right: Tunneling work on the metro lines began in August 2014 and lasted for 26 months.

Below: A total of 21 Herrenknecht EPB TBMs were used to excavate the 111 km new tunnels.



Left: The final breakthrough ceremony was attended by (from left): Abdulla Abdulaziz Turki al Subaie, CEO and chairman of Qatar Rail; Hans-Udo Muzel, German ambassador to Qatar; H.E. Jassim Saif Ahmed al Sulaiti, Qatar's Minister of Transport and Communications; and Martin Herrenknecht, chairman of the board of management at Herrenknecht.





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BRIDGING THE RIVER ARADE

The bridge over the River Arade is located in the Portuguese city of Portimão, in the region of Algarve. Inaugurated in 1991, it is a three-span cable-stay bridge made from prestressed reinforced concrete. The central span is 256 m long and each of the two lateral spans is 107 m long.

There are also two 107-m reinforced cement towers in the shape of an upside-down 'Y' between the three spans, to which the steel tie rods for the cables are attached. The viaducts for the road access at the eastern and western ends of the bridge have spans measuring 30 m, 24 m and 27 m.

The bridge has a road deck for vehicles, which is supported by beams and safety parapets made from iron. The upper deck, which forms the actual road for the traffic, is from 12 to 17 m wide and has two lanes running in each direction, with a hard shoulder running alongside each carriageway. The road surface is made from reinforced cement prestressed in a longitudinal direction, with steel reinforcement running transversally across the road.

The foundations for the reinforced cement towers and the support pillars sit on 1.10 m diameter piles, which are from 50 m up to a maximum of 63 m long. The total length of the River Arade Bridge, including the two access viaducts, is 842 m.

One of the highlights of the bridge, which makes it such an original structure, is the total lack of any form of rigid connection along the suspended road surface. This particular configuration impedes any movements in a horizontal direction.

The structure has a series of oscillation dampers, which give the bridge anti-seismic properties so that it behaves like a pendulum and can oscillate in any direction. Portugal, and this area in particular, are considered prone to seismic activity.

Upgrading work

After around 25 years of use, the bridge had to be upgraded. The surface of the reinforced concrete showed signs of ageing due to



Top: A view of the River Arade Bridge.

Above: The bridge features two 107-m reinforced cement towers in the shape of an upside-down 'Y' between the three spans, to which the steel tie rods for the cables are attached.

the aggressive action of atmospheric agents and the water flowing in the river below the bridge. Moreover, the level of stress in the cable-stays needed to be checked and the condition of the supports for the road decks needed to be verified.

The contractor, Conduril, was commissioned to carry out the upgrading work. Mapei was asked to recommend the most suitable materials to overcome the problems found on the structure.

The concrete of the support pillars was locally and partially deteriorated, and portions of the material had become detached, exposing the steel reinforcement. All the damaged and detached concrete was removed by hydro-blasting to expose the steel reinforcement, which was then treated with Mapefer 1K one-component mortar. This product, made from cementitious binders, powdered polymers and corrosion inhibitors, has anti-corrosion and re-alkalisation properties that prevent rust forming on steel reinforcement. Also, when the mortar hardens, it is impermeable to water and aggressive gases present in the surrounding atmosphere.

The areas of the pillars where the damaged concrete had been removed were integrated with Mapegrout Gunita, a one-component, ready-mixed, cementitious mortar for renovating concrete. It can be applied using either the dry or damp spraying technique.



The towers as seen during upgrading work.

Since the structure is exposed to strong winds the mortar could have dried too quickly, so Mapequick AF 300 dry alkali-free set-accelerator, which is designed for shotcrete, was added directly to the mixing water.

The areas of the towers where the damaged concrete had been removed, and for other areas that were not suffering from the problems mentioned above, were repaired

with Mapegrout Thixotropic shrinkage-compensated fibre-reinforced mortar.

In the areas where the site surveys had highlighted cracks on the surface of the structure, Mapei strengthened and consolidated the structure by injecting the cracked areas with Epojet super-fluid epoxy resin and Adesilex PG1 thixotropic adhesive. ■

Website: www.mapei.com.sg



Above right and left, and below left: After removing the damaged concrete by hydro-blasting, the steel reinforcement was left exposed and treated with Mapefer 1K one-component mortar.

Below right: The areas of the towers where the damaged concrete had been removed were repaired with Mapegrout Thixotropic fibre-reinforced mortar.





GOING SHOPPING DOWN UNDER

The Chadstone Shopping Centre in Melbourne, Australia, has recently been expanded. It now has a total area of around 212,000 sq m and can accommodate up to 70,000 visitors a day. It is believed to be the largest shopping centre in the country.

Construction work on the 34,000 sq m expansion started in 2014. It had to be carried out not only within a tight time schedule, but also while the facility was open for business to the general public.

Scaffolding solution

In close collaboration with the scaffolding contractor, Nomad Scaffolding, Peri developed a project-specific solution that was adapted to match the extraordinary geometry and scaffolding heights of up to 20 m. It was necessary to be able to reach every angle of the steel construction along with bridging large areas and ensuring the reliable transfer in part of concentrated loads, said Peri.



Top: The newly expanded Chadstone Shopping Centre in Melbourne features a gigantic glass roof, which provides a distinctive design. The facility is now able to accommodate up to 70,000 visitors per day.

Above: The expansion work was carried out while the shopping centre was open for business to the general public.



Above: Peri supported the scaffolding contractor with a comprehensive planning solution for the up to 20 m high load-bearing shoring and working scaffold up to 85 m long. Thanks to the lightweight system components, the scaffolding could be erected and dismantled without a crane.

Above left: The Peri Up Flex modular scaffolding was customised to suit the complex-shaped glass roof structure. All working areas could be easily and safely reached, while every load transfer was optimally planned.

Left: The working levels were also fully covered with Peri Up Flex, and thus the flat and even work areas were free of any tripping hazards.



One of the systems used was the Peri Up Flex modular scaffolding. With its high level of flexibility, the loads generated by the steel roof construction could be easily transferred from all areas. The system also offered access points to all areas of the complex-shaped steel roof as well as the safe and level work spaces.

According to Peri, this modular scaffolding can be adapted to suit almost any local conditions due to the continuous metric system grid of all components, along with the possibility of changing the direction of the decking. Through the self-locking ledger connection on the rosette and integrated lock against lifting, Peri Up Flex can also be installed quickly.

A particular advantage of the Peri Up Flex modular scaffolding is its lightweight individual system components. They can be moved by hand and transported easily to the place of use. This meant that on the project, the entire construction was dismantled without a crane, helping to meet the tight schedule.

By using system components and Peri Up connection technology such as rosette nodes, time-consuming tube-and-coupler operations were avoided during scaffold assembly. In addition, thanks to the different part lengths from 25 cm, all working areas could be fully covered with Peri Up Flex, while obstacles and rising steel profiles were accommodated and covered virtually gap-free. As a result, all working areas could be safely reached without any dangerous tripping hazards. End-to-end guardrails and yellow toe boards as well as non-slip decking ensured a high level of operational safety. This allowed safe and cost-effective working operations at heights of up to 20 m above the ground on work platforms up to 85 m long. ■

Website: www.peri.com

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UNIBATCH GOES GREEN

Roadworx, an Australian provider of road maintenance services, has been delivering infrastructure solutions to local councils, government departments and public and private companies for over 20 years. The company recently commissioned a new Ammann ABA UniBatch asphalt-mixing plant in Wollongong, about an hour south of Sydney.

The plant provides all the environmental features Roadworx needed, including an ability to use recycled asphalt (RAP) and options that dramatically reduce noise and odour. “Australia is quite onerous when it comes to environmental standards,” said Darryl Byrne, general manager of Roadworx.

One of the challenges was that there was an operational plant nearby, built by another manufacturer. Surrounding residents and other community members had concerns about the combined air and noise emissions from having two plants in close proximity. “We had to make sure we did everything we could to minimise the impact,” said Mr Byrne. “We put most of the optional features we could on the UniBatch plant.” Noise mitigation systems were utilised, including installation of an Ammapax Stack Silencer. Additional cladding helped to reduce the noise further and created an appealing look. “We monitor the noise, and the levels are very, very good,” said Mr Byrne.

Odour was another challenge. “We put the blue smoke extraction system in place throughout the plant,” said Mr Byrne. The system routes any smoke and odour through the baghouse for filtration. “Odour is extremely minimal on the site,” continued Mr Byrne. “Even the bitumen tank farm has no odour.”



Above, below and bottom: Roadworx has commissioned an Ammann ABA UniBatch asphalt-mixing plant in Wollongong, Australia. The plant has comprehensive environmental features, such as an ability to use recycled asphalt (RAP) and options that dramatically reduce noise and odour.



Another environmental nod was the use of the asl EcoView system, proprietary Ammann operating software that monitors the energy consumption of the entire plant, including fuel and electricity. This dynamic software makes the investment more efficient and therefore reduces emissions, too.

“The energy figures we get out of the plant are very good and better than expected,” said Mr Byrne. “We can really fine-tune a lot of the plant settings to minimise energy consumption.”

The features have made a big difference. “We’re producing a quality product, which our customers are extremely pleased about,” said Mr Byrne. “We’re getting good numbers in terms of fuel through the burner and energy consumption. The plant itself has been running extremely well, and the noise and odour are not issues – not in the least. In addition, the local support from Ammann Australia has been exceptional.” ■

Website: www.ammann-group.com



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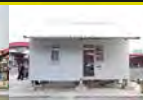
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BREAKING INTO BRISBANE

Australia-based Earthmoving Contractors Pty Ltd (EMC) has developed a strong reputation in the Queensland bulk excavation basement market over the years. The company is currently experiencing strong demand for its services from a large number of high rise developers in the Brisbane area.

To meet this growing demand, Atlas Copco and its local dealer BA Equipment Group, worked on a trial of the Atlas Copco HB 10000 hydraulic breaker (10 t) to assess its power, production, noise levels and vibration levels. The breaker was delivered and commissioned in Fortitude Valley, Brisbane in June 2016 and put to work for the trial.

“The HB 10000 is breaking out more than double compared to our existing 7 t breaker HB 7000,” said Jim Dupuis, EMC’s managing director. The vibration levels were measured using calibrated vibration monitoring equipment. Two types of monitors were used to ensure there were no incorrect or inconsistent readings. The vibration levels were found to be within the required parameters. Mr Dupuis said this was critical as a heritage-listed building is on the boundary of this excavation site.

Productivity was also tested. EMC marked out a 10 cu m section of Brisbane’s hardest rock (Brisbane Tuff) and went at flat out with its 7 t breaker, which completed the works in 10 minutes. The test was then repeated with the 10 t Atlas Copco HB10000 breaker. It completed the works in five minutes. “If you work that out over an hour, day, week, month or a year, that is a massive production increase,” said Mr Dupuis.

The Atlas Copco HB10000 breaker suits excavators from 80 to 140 t. It has an operating weight of 10,000 kg and impact rate of 380 blows per minute with a 240 mm diameter tool. The breaker comes standard with several features, including: AutoControl, which automatically adjusts the piston stroke length to suit the ground conditions, ensuring that the breaker’s blow frequency and impact energy are optimised for each blow; PowerAdapt, which automatically shuts down the breaker if its operating pressure exceeds the maximum allowed pressure, protecting customers from costly down time and repairs; dual oval tool retainer bars, a tool locking system that ensures safe and



Above: EMC uses an Atlas Copco HB10000 hydraulic breaker for inner city bulk excavation work in Brisbane, Australia.

Left: The HB10000 breaker suits excavators from 80 to 140 t. It has an operating weight of 10,000 kg and impact rate of 380 blows per minute with a 240 mm diameter tool.

fast tool change outs, and can be rotated to use both sides and deliver longer wear life than older styled round retainer pin systems; StartSelect, which makes it possible to pre-configure both start up and shut down behaviour of the breaker; EnergyRecovery, which uses piston recoil energy to generate increased impact energy without additional hydraulic input power being required; and Dust Protector II, which allows sustainable

operations under dusty conditions.

EMC was said to be the first to pioneer large breakers for use in basement excavation in Queensland with its investment in the Atlas Copco HB7000 breaker back in 2011. Since then, the company has seen demand for its business services grow substantially creating the need for completing more excavation jobs in less time. ■

Website: www.atlascopco.com



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PAVING THE WAY TO NZ

The New Zealand city of Christchurch has been undergoing reconstruction since the earthquake that rocked the island nation in 2011. With many buildings ‘red-zoned’ and deemed unsafe after the quake, it has taken time for the city’s damaged infrastructure to be rebuilt.

A E Smith Contractors is one of the companies taking part in the construction of new roads and developments in the city. It uses the slipforming technology to replace handformed curb and paths. “It’s a much stronger product and goes in more quickly, so that has to be more appealing for new construction in an area like Christchurch,” said Shayne Smith, owner of A E Smith Contractors.

A E Smith is aided by its Power Curber 5700-C to carry out the slipforming work. The company has been pouring 530 mm curb and gutter in a new housing development.

The transition from handforming to slipforming has been a smooth one for A E Smith. “It really is the future for us in New Zealand,” said Mr Smith. “The concrete and set up is a little different to what we’re familiar with, but we have all that sorted out now.”

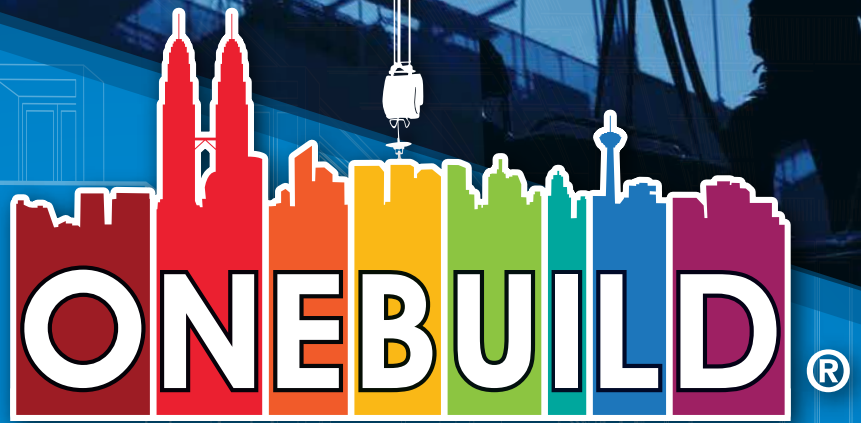
Aran Australia, the Power Curber dealer for Australia and New Zealand, has been instrumental in ensuring the success of the project. “It’s been great to have the support of Power Curbers and our local dealer, Shane Dunstan (of Aran Australia),” said Mr Smith. A E Smith also mentioned that in the future, the company plans to move to stringless machine controls. ■

Website: www.powercurbers.com

Top right: Construction of new roads and developments is still underway in the New Zealand city of Christchurch, following the earthquake that rocked the island nation in 2011.

Right: A E Smith Contractors is one of the companies that helps rebuild the city, using the slipforming technology to replace handformed curb and paths. The company is aided by a Power Curber 5700-C curb & gutter machine to carry out the work.





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CONCRETE EXPERTS GET TOGETHER



World of Concrete 2017, the international event for the concrete and masonry industries, took place from 17 to 20 January at the Las Vegas Convention Centre, USA, drawing 50,770 registered professionals with more than 1,455 companies exhibiting across more than 681,196 net sq ft of space.

“Exhibitors and attendees seemed very pleased with WOC 2017 from the show floor to the educational opportunities. Although the show was earlier than in past years, the industry showed up in force to see new products, network with their peers, and prepare for business in 2017. International attendance was strong with representation from India, Italy, Philippines, Costa Rica, Brazil, China, Japan, South Korea, Chile, Argentina and many other countries,” said Jackie James, director of World of Concrete.



All images: World of Concrete 2017 took place from 17 to 20 January, attracting 50,770 registered professionals and featuring more than 1,455 companies exhibiting across more than 681,196 net sq ft of space.

Among the new features at the show this year were Concrete Masonry and Concrete Reinforcement, both of which were located in the North Hall. The Concrete Masonry area showcased everything for the producers of concrete masonry (block, segmental retaining wall units, veneer, slabs, pavers, etc), including admixtures, equipment and supplies, and pigments. The Concrete Reinforcement section featured the leaders in concrete reinforcement, such as reinforcement bending, cutting, straightening and fabricating machinery. It also included reinforced positioners and locators; epoxy-coated, steel, glass fibre, galvanised bar; and all types of reinforcement accessories.

Also presented at World of Concrete was the Weatheron Scholarship, which provides funds to help the next generation of concrete professionals attending the CIM (Concrete Industry Management) programme. Dan Regad, from New Jersey Science & Technology University, was the recipient of the US\$2,500 scholarship. In addition, CIM held its annual unreserved silent and live auctions at

World of Concrete. The silent and live auctions raised an initial tally of approximately US\$875,000.

World of Concrete is organised by Informa Exhibitions. It is believed to be the industry's only annual international event dedicated to the commercial concrete and masonry construction industries. "We are very pleased with the results of this 2017 event. As the construction industry continues with its upward momentum over the past few years, World of Concrete has successfully kept pace, providing the industry with the latest products, technologies and educational offerings. This once again positions WOC as the event for concrete and masonry professional," said Tom Cindric, senior vice president, Informa Exhibitions US, Construction & Real Estate.

The next World of Concrete will take place from 23 to 26 January 2018 at the Las Vegas Convention Centre. According to Informa, currently about 73 percent of the exhibitors have rebooked their booth space for the 2018 edition. ■

Website: www.worldofconcrete.com

WIRTGEN

The Wirtgen SP 60 series slipform pavers include the SP 61/SP 61i, SP 62/SP 62i and SP 64/SP 64i models, replacing the SP 500. The machines that meet EU Stage 4 and US Tier 4 Final emission regulations have a 180-kW Deutz engine, or about 40 percent more power than the SP 500 (+20 percent at EU Stage 3A/US Tier 3). Despite the higher output, fuel consumption can be reduced with Eco Mode, which automatically adapts engine output to power requirements.

Thanks to a new hydraulic concept, energy is now used more efficiently, so it is available for new equipment options, such as trimmers and a large delivery screw for offset applications, or the four swivel arms used to switch the machine from transport to working mode faster. The system starts as a basic version, and grows along with the number of modular equipment options selected.

The SP 60 series features an advanced control system. Interfaces for the WIDIAG service diagnosis and WITOS FleetView systems support users, as does the optional Paving Plus package. Combined with this package, the swivel arms can actively circumnavigate obstacles during the concrete paving process.

The option of hydraulic rotational drives, available for all SP 60 series models, provides better manoeuvrability. With hydraulic rotational drives, the 90° or 120° steering angle of the crawler tracks becomes a major advantage, for example when setting up the machine at a jobsite.

Various features make the SP 60 series both simple and flexible to operate, including a walkway that now extends across the full width of the machine; and a standardised operating and control concept like that in the SP 90 series, comprising a central control system and four additional local control systems. Intelligent interfaces support the plug-and-play connection of additional options. For example, remote controls can be connected to each of the crawler tracks to simplify and speed up setup of the slipform paver, such as the positioning and zeroing of the crawler tracks and swivel arms.

Customers can now choose between different slipform systems for inset paving. The slipform modules are fully compatible with the SP 90 series. Thus, the SP 64/SP 64i (four crawlers on swivel arms) and SP 62/SP 62i (track steering) can pave concrete in widths of up to 6 m and thicknesses of up to 450 mm or more on customer request.



The SP 60 series slipform paver.

Widths of up to 7.5 m are also possible, if the machine is equipped with electric vibrators (without DBI).

In addition, different offset moulds and a variety of typical offset options are available, such as trimmers, different conveyor belts or augers. The three- or four-crawler version of the SP 61/SP 61i can slipform medium to large concrete profiles to the left or right of the machine. Contours of almost any shape

– roadway edging, concrete safety barriers, water gullies and paths up to 3.6 m wide – can be produced cost-efficiently and in high quality. Thanks to their increased stroke, the lifting columns can now be raised 1,100 mm, and have 17 percent more power than in the SP 500. This gives the user much greater flexibility particularly at tight jobsites, for instance when lifting a slipform for a concrete safety barrier. ■

BLASTRAC

Blastrac has a new design for its portable, lightweight shot blasting system. Perfect for smaller jobs such as residential garage floors, pool decks and small industrial floors, the 1-8DM runs on single-phase common power. With manual travel speed and 8.75-in blast pattern, this small blast machine is also ideal for balconies, areas around equipment and obstructions, and other tight spaces.

The 1-8DM is frequently used as a complementary unit for larger jobs, and can also be used in preparation of concrete prior to wood floor installations or for applications such as overlays, paint, or coatings and for decorative uses. It makes close-up work next to walls and other vertical protrusions simple and can blast within 1½-in of front wall and edges to within ¾-in when side magnet seals are removed. Shot pattern reducers are available in 4-in, 5-in and 6-in.

The 1-8DM can prepare, strip, clean and profile in one easy step. Blastrac said there is no rinsing or drying time as with chemical acid etching, and the profile provides a better surface for coating adhesion. ■



Right: Blastrac 1-8DM shot blaster.

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BROKK

The new Brokk 120 Diesel Mark 2 is said to be the world's smallest diesel driven demolition robot, with a length of 2,030 mm, height of 1,250 mm and width of 780 mm. It is the updated version of the Brokk 120 Diesel.

Featuring such compact size, the Brokk 120 Diesel Mark 2 can enter through any standard door opening and manoeuvre in tight spaces. Its low weight of only 1,230 kg enables it to work on weak floors and makes it easy to transport to and from jobsites. The machine has a transport speed of 3.2 km/hr.

Powered by a diesel engine, the Brokk 120 Diesel Mark 2 can operate for a minimum of eight hours without refuelling, allowing it to be independent from any power source for at least a full work shift, said Brokk.

Other upgrades on the Mark 2 version include a new smarter design, improved headlights, extra options for smarter integration of additional attachments, and even further enhanced serviceability. The machine is designed for use in various industries, including the construction, underground, security and rescue, and nuclear industries. ■



Right: The new Brokk 120 Diesel Mark 2 demolition robot.

AIRPLACO

The PumpMaster PG-35 from Airplaco is an innovative pump for grouting and shotcrete. It has a maximum output of 7.7 cu m/hr and maximum line pressure of up to 500 psi, with a 142-l hopper. The pump is available as skid mount or with an electric power option.

The PG-35 can empty a ready-mix truck in an hour, said Airplaco, reducing labour costs as it increases efficiency and portability. The pump features proxy switch hydraulics, variable speed pumping with forward and reverse capabilities. Fork slots are also included for convenience.

The Airplaco C-10SL is a rotary bowl-type gunite machine designed for high production concrete construction applications. It has a maximum output of 11.5 cu m/hr, maximum aggregate size of 19 mm and is powered by a 9 hp air motor.

The C-10SL provides excellent performance due to its heavy-duty design and powerful output. It offers a premium-life feed system, continuous feed hopper and exhaust suppression chamber. The optional hydraulic direct drive model, the C-10HHD, is available for use with external power sources such as a dry-mix batch plant.

The Airplaco Handy-Grout HG-9 is a hand-operated grout pump for smaller grouting jobs, such as door frames, encasements, waterproofing, void fill, etc. It



Airplaco PumpMaster PG-35 on display at WOC 2017.

is designed for durability while still offering a lightweight grouting solution. The HG-9 features cast assembly, ball-check manifold,

polyurethane hopper and pressure gauge. It has a maximum output of 424 l/hr and a 19-l hopper. ■

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MITRI

EZ-Slab from Mitri Products is designed to simplify concrete finishing process. After concrete is poured on a flat area such as a driveway, contractors bring the surface to the proper grade, smooth the concrete and get it ready for finishing. Trowels, floats and a concrete broom are used to achieve the finished look. Water is essential during finishing, as the broom must be wetted throughout. This is where EZ-Slab comes in.

In the past, contractors working on driveways, parking lots, slabs and other projects had to deal with carrying various hand tools as well as several heavy buckets of water. Thanks to EZ-Slab, this often painful and messy process no longer needs to take place.

EZ-Slab is a sturdy aluminium system that functions as carrier, washing station, drying rack and storage system. A powder coated compact rack that stores its portable components may be bolted to the bed of a truck or van. Once at a jobsite, the lightweight EZ-Slab components are quickly assembled. First, two heavy-duty spill-proof tubs attach to the sides of any standard wheelbarrow to safely transport the necessary



The Mitri EZ-Slab offers a system that can simplify concrete finishing process.

water. These containers are sized for easy dipping and cleaning of the broom, and may also be used individually in hard-to-reach places. A perforated centre piece then snaps into the tubs, creating a flat staging and washing area for skids and other tools. This

piece is specially designed to channel the washing water back into the side tub, and can serve as a drying rack. When the job is complete, hand tools and brooms are stored safely and out of the elements in the EZ-Slab containers, which include snap-on lids. ■

SKYJACK

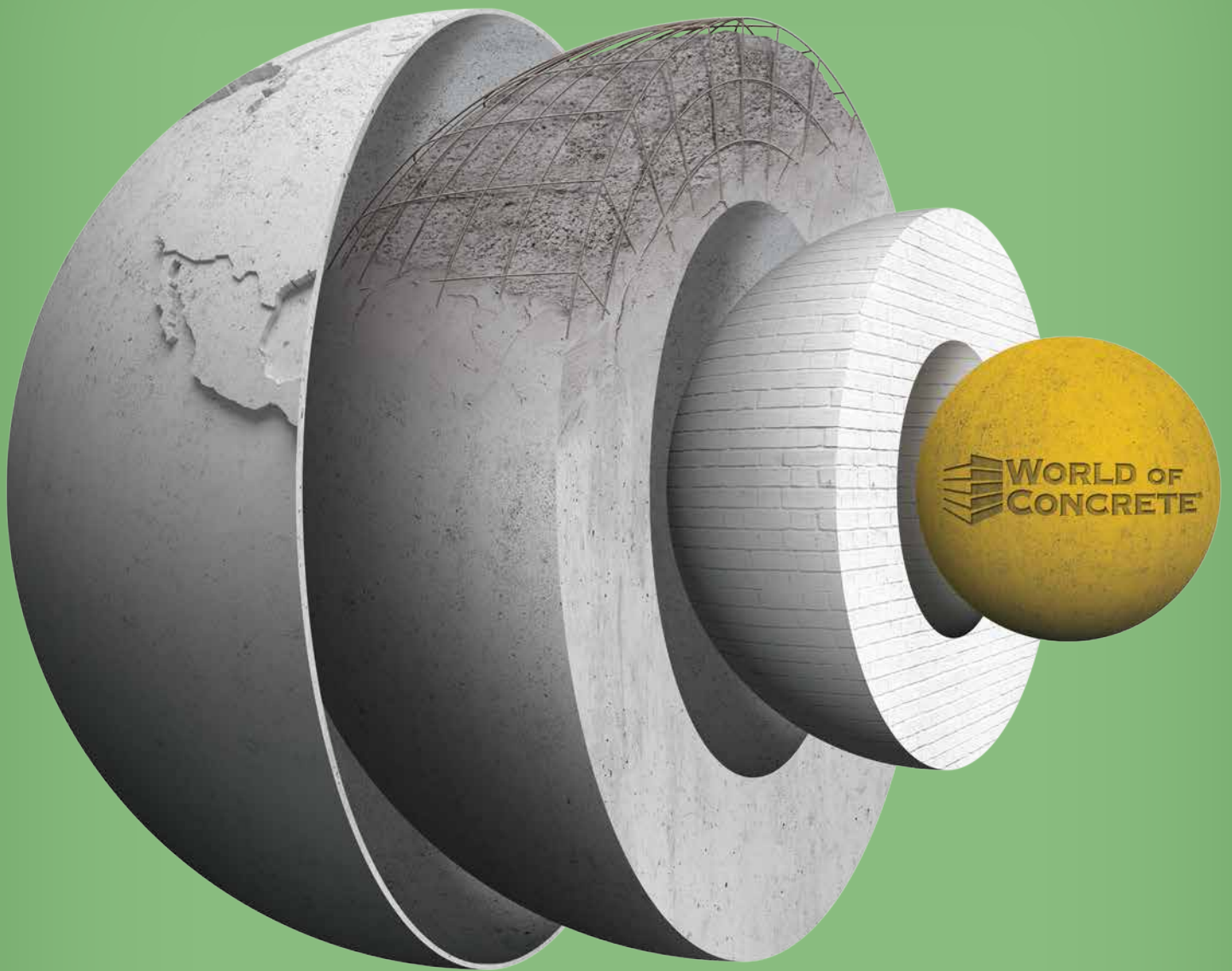
The new Skyjack SJ1256 TH telehandler is ideal for heavy-duty applications, targeted at the North American market. It features a 5,443 kg maximum lift capacity, 17.1 m maximum lift height, 12.95 m maximum forward reach, 3,175 kg lift capacity at maximum lift height with outriggers deployed and 2,721 kg lift capacity at maximum lift height without deploying outriggers. The machine is powered by a Tier-IV final 107 hp Deutz TCD3.6L engine that uses diesel exhaust fluid but requires no regeneration.

Skyjack has made several changes to the SJ1256 TH, such as integrating a heavy-duty cab door so there is less chance of customer damage, and offering hybrid hard surface/grip lug style tyres as standard to provide significantly longer wear life and to help customers reduce operating costs. These improvements were also rolled out to the rest of the TH range with no increase to acquisition costs.

Based heavily on the SJ1056 TH, the SJ1256 TH shares 70 percent commonality of parts as well as the layout and easy maintenance features with the TH series. Skyjack's TH series offers innovative features, including Flexcab that allows fleet operators to easily convert between open and enclosed cabs with simple hand tools; and Readyhook, Skyjack's yoke mounted lifting hook that is fitted as standard and has capacities that match the maximum lift capability of the telehandler. Readyhook allows the appropriate under-slinging of loads and avoids the practice of using the forks as an underslung lifting device. ■

Skyjack's new SJ1256 TH telehandler.





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MFE FORMWORK

Malaysia-based manufacturer MFE Formwork Technology offers a versatile, modern aluminium formwork construction system for forming cast-in-situ reinforced concrete building structures. The company said that by using this system, all walls, floor slabs, lift cores, columns, beams, stairs, balconies, together with door and window openings can be cast in situ in a single site based operation.

According to MFE, its formwork is made entirely from aluminium and is 100 percent recyclable. The main characteristic of the product is that it makes use of concrete as the principal building material for the prime reasons of cost and accessibility.

Every component of the formwork is light enough, said MFE, thus minimising the need for heavy lifting equipment. The aluminium panels are manufactured in standard and non-standard sizes and shapes, adapted to the requirements of each project.

MFE formwork system can be used for various applications, from straightforward wall and slab construction to more



MFE offers a versatile, modern aluminium formwork construction system for forming cast-in-situ reinforced concrete building structures.

complicated structures involving bay windows, stairs and airconditioning hoods.

It is suitable for both high- and low-rise construction. ■

JABE

Spanish company JABE showcased its innovative solution for wall formwork - the Rivestop, Rivepipe and Riveout – designed for environment-friendly construction.

The Rivestop is a rivet with a mechanical system that can achieve watertight sealing for holes in formwork in a fast and cost effective manner. It is simple to install, using a rivet tool. Compared to other non-mechanical or mechanical solutions currently on the market, the Rivestop saves more than 90 percent in labour costs, said JABE.

The Rivestop Plus is a new model, which comes in three sizes with hole diameters from 3/4- to 7/8-in. Its new references and parts, once installed, will have a 2-in long seal/internal hole depth (capillarity) and a pressure resistance of up to 20 bar.

The Rivestop D17x48 SS is a new reference in the current product range, which adapts to narrower 7- to 8-in hole diameters. Thus it is ideal for the taper tie formwork systems.

The Rivepipe is a removable, reusable and recyclable formwork tube designed to create holes that protect tie bars in concrete formwork. The result is a clean, empty

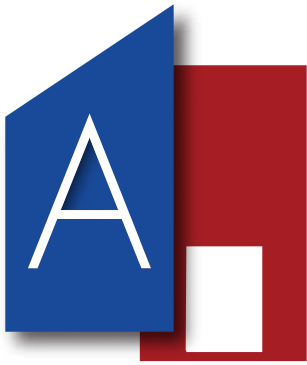
uniform hole ready to be sealed with the Rivestop. According to JABE, the Rivepipe can be removed quickly and easily (within five seconds) without damaging the wall, and without leaving any parts, tubes or material in the concrete.

The Riveout is the extracting tool for quickly and effortlessly removing the Rivepipe.

JABE is currently expanding its presence globally. The company aims to export its products to the American market and is looking for specialised distributors in the US, Latin America Oceania and Canada. ■



All images: JABE has developed new products for wall formwork - the Rivestop, Rivepipe and Riveout.



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ENAR

The Enar-brand light construction equipment is manufactured by Spain-based company, Enarco, which is headquartered in Zaragoza. It includes concrete vibrators, concrete screeds and other light compaction equipment like tamping rammers, compaction plates and walk-behind vibratory rollers.

Enar concrete vibrators consist of different types, such as eccentric, pendulum, pneumatic and motor-in-head vibrators, to ensure they can be used in a wide range of applications around the world. Among the highlights of its pendulum vibrators is the TNR/ANR series, which produces a 12,000 rpm frequency from a rotation at 3,000 rpm in input. The series features high vibration amplitude and is powered by electric motors or petrol/diesel engines. The hose has a diameter of 36 m, except for the ANR25 model.

Enar tamping rammer was also on display at the show. It features a light and wear resistant foot for optimum soil compaction; robust and ergonomic handle with incorporated wheels for easy vehicle loading and unloading; and easy-to-use throttle protected against blows and drops. The rammer is suitable for gutters and narrow areas of work. ■



Enar tamping rammer (above) and concrete vibrator (below) on exhibit at WOC 2017.



ALLMAND

Allmand has expanded its product offerings by introducing a full line of Maxi-Power mobile generators. There are currently seven models, ranging in power output from 25 to 150 kVa to accommodate a variety of applications.

A heavy-duty, oversized alternator with separate excitation winding provides the capacity to easily start large motors and seamlessly handle variable loads. The automatic voltage regulator (AVR) quickly adjusts to provide stable and consistent voltage to power even the most sensitive equipment. For flexibility on any jobsite, the Maxi-Power line includes a switch to change frequencies between 50 and 60 Hertz. All models adjust to 120-, 240- or 277-V in single-phase power and 208-, 240-, 415- or 480-V in three phase.

An electronic governor maintains engine speed independent of the load to provide consistent power. The Maxi-Power line features programmable start and stop capabilities for use as a standby system, allowing ease of mind and operator-free starting. A large capacity fuel tank allows for more than 24 hours of operation before refuelling. In addition, external fuel connections extend operational time by allowing the unit to run off outside fuel. Should a Maxi-Power generator run out of diesel, the electric fuel primer and air-bleed (EFPA) pump help to easily restart the engine without the need for a service call to prime the unit and related downtime. A high-capacity cold start battery provides extra cold-cranking amps for easier starting in any climate or condition.

A dual filtration system, protected in an acrylic filter housing, removes fine contaminants, providing enhanced protection and a long engine life. Designed for 110 percent full-fluid containment, the unit captures all leakage in an internal reservoir to avoid site contamination. Moreover, a lockable switch voltage selector protects the engine by preventing an operator from switching voltage while the engine is running.

All fluids are plumbed to the curbside edge of the generator's enclosure for easy access for maintenance. Likewise, all lugs and receptacles on the machine's curbside or rear to keep users off

the street when performing maintenance checks. For added convenience, a 120-V GFCI receptacle can be used in any voltage setting while oversized electrical lugs provide a wider range of connectability usage options. ■



Above and right: Allmand MP25 Maxi-Power mobile generator.





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GOMACO

The new three-track Commander III Xtreme from Gomaco has the ability to slipform a 610 mm radius. The new Extreme Package for multi-application pavers includes rotary-sensored slew drives for steering, sensed leg positioning, independent travel circuits to each track, radius software, Gomaco's three-sensor radius system, and repeatable mould offset.

The Commander IIIx features extreme turning capabilities with rotary-sensored slew drives on each of the three tracks. Gomaco has created the new extreme radius software bundle for the G+ control system that allows the operator to programme the size of the radius into the controller. As the Commander IIIx approaches the radius, with the values already dialled in, the operator activates the radius programme, and the curb and gutter machine slipforms around the radius.

G+ manages all aspects of travelling around the radius, including track angles and variable track speeds. When paving with stringline, the Commander IIIx uses the Gomaco three-sensor steer system for the tight radius. The proper speed of each of the tracks is maintained by G+ with independent hydraulic circuits to each track, so each one is travelling at the necessary, varied speed to maintain the smooth radius. The Commander IIIx's three tracks, equipped with rotary-sensored slew drives, also make slipforming curb and gutter in tight clearance conditions easier. Their extreme turn capability, combined with the Commander IIIx's All-Track Steering and All-Track Positioning, make it an intelligent paver.

The intelligent All-Track Positioning on the Commander IIIx includes a smart hydraulic cylinder on all three legs. Now, because of the smart cylinders, G+ knows the position of all three tracks. Intelligent offset is accomplished with a smart hydraulic cylinder for telescoping the mould mounting system. This provides G+ the ability for repeatable mould offset. And the trimmerhead and mould have independent vertical adjustments for raising and lowering.

G+ quiet technology makes the Commander IIIx one of the quietest pavers on the market today, said Gomaco. The pivoting operator's console allows the operator to have hands-on control and clear view no matter what application is being slipformed or what the direction of travel. It has an optimised cooling package with the hydraulic fan controlled by G+ to adapt cooling needs to jobsite conditions for both a



Above: Gomaco's Commander IIIx at work slipforming curb and gutter on a parking lot project.



Left: The operator can work from the operator's platform or on the ground with the G+ remote control in order to get the best view of the paving operation.

quiet and efficient operation. It has improved fuel efficiency with a power-optimised engine and load-sensed hydraulic circuits. The three-track Commander IIIx is available with an optional on-board camera to monitor designated areas of the slipforming process.

The Commander IIIx's G+ control system easily interfaces with stringline or a 3D guidance system for curb and gutter, tight radius applications. It is also available with Gomaco Remote Diagnostics (GRD) for machine troubleshooting, diagnostic reviews, software updates, and more.

Gomaco also offers its new G+ remote control for hands-on machine control at all times. It features a 109 mm graphic display screen that shows the run functions of the machine, the same information

that is normally viewed at the operator's console on top of the paver. Most paver functions are included on the remote and are controlled with easy to operate and durable dials or switches. It also gives the operator individual control of each leg of the paver with automatic/manual adjustments for elevation and steering.

The lightweight remote control allows the operator to comfortably work from the operator's platform or from the ground, giving them ultimate freedom to move around the machine for the best view of the paving operation. The G+ remote control allows hands-on safety at all times. It has an emergency stop button and an alert horn on the remote that are always within reach for quick access. ■

BOBCAT

Bobcat's M2-series loaders include the 400-, 500-, 600-, 700- and 800-frame-size skid-steer, compact track and all-wheel steer loaders. Altogether, there are 24 models.

For added convenience, operators can now turn the automatic ride control option on or off from inside the cab. Previously, the ride control option could be turned on or off using a valve that was accessed by opening the loader's tailgate.

Operators can also press a switch to toggle between auto and off. When the auto mode is selected, the system will work at any travel speed. The ride control function is automatically activated by detecting increased hydraulic lift arm pressure when the loader is carrying material. It will deactivate when hydraulic lift arm pressure is reduced, such as when there is no load in a bucket.

Automatic ride control reduces material spillage, allowing operators to travel at faster speeds for increased productivity. Thanks to its dampening effect, the option also increases comfort by offering a smoother ride, and is optimised for each Bobcat loader frame size.

A new reversing fan option allows operators to temporarily reverse the cooling fan direction - for several seconds - to blow dust and small debris from the radiator and rear screens. This option helps minimise downtime and can reduce the cooling area cleaning frequency. Three operating modes are available: automatic (reverses fan direction at a regular frequency to keep the loader's engine coolant and hydraulic oil at proper operating temperatures); manual (purges material at the operator's discretion); and off.

The M2-series loaders have been improved to increase operator comfort thanks to new front and rear cab isolators, door seals and side screen dampers. These design elements reduce noise, vibration and dust inside the cab. Also, a new lift cylinder cushioning feature slows down the loader arms before they reach the lift arm stops for smoother movements and increased operator comfort.

Another operator comfort enhancement that is a standard feature for 600- and 700-frame-size M2-series loaders is a low-effort hydrostatic pump, which reduces drive lever effort by as much as 25 percent. Bobcat compact loaders equipped with standard controls or the Advanced Control System (ACS) use this new pump, which will help



Bobcat S650 skid-steer loader (above) and T740 compact track loader (below).



decrease operator fatigue, especially when operators are in the loader for an extended amount of time.

If operators are completing projects at night, such as snow removal or road construction, a dealer-installed side lighting kit is useful to increase visibility. The LED light bars are mounted to the top of the cab on the right and left sides. Bobcat said this side lighting kit is currently available on all of the models, except the S450 skid-steer and T450 compact track loader.

Moreover, the top window of the cab has been redesigned to improve operator visibility, featuring a 34 percent increase

in viewable area. This is beneficial when loading material into a high-sided truck or silage into a mixer.

The S850 skid-steer loaders now come standard with 100-hp Bobcat engines, a 9 percent increase from the prior iteration. The horsepower boost provides increased attachment performance in demanding applications, including operating high-flow auxiliary hydraulic attachments such as forestry cutters, planers and snowblowers. It also delivers more power to operate high-flow auxiliary hydraulic attachments at higher ground speeds during attachment operation, increasing operator productivity. ■

TEREX

The Terex Bid-Well 2418 workbridge features an innovative frame design that allows the machine to fit over barrier wall steel on bridge decks. This design positions workers close to the concrete to boost efficiency and productivity rates when hand-finishing and spray-curing slabs.

With its low 17.9-kg/m weight, the flexible 2418 workbridge design can be used for concrete finishing applications ranging from bridges, roads, canals and side slopes to dams, airports and slabs. Its 61-cm-wide walkway and 45.7-cm-deep truss frame gives crew members the ability to cross freshly laid concrete and efficiently perform required finishing tasks behind the paver.

Available 0.9-, 1.8- and 3.7-m truss inserts allow the flexible machine to meet a variety of operating widths ranging up to 32 m. All-welded construction delivers a stable frame at extended widths, and its snap-together design eliminates dozens of nut-and-bolt connections found on competitive units. Telescoping end segments offer up to 3 m of leg travel – from 4.6 m retracted to 7.6 m extended – to either or both sides of the workbridge for on-the-fly width adjustments. Interlocking bottom truss castings with pin-type top sections deliver fast assembly at the jobsite.

The 2418 workbridge can be equipped with a number of wheel options to meet application specific needs. It can also be manually advanced to allow finishing operations keep pace with the paver.

In addition, the Terex Bid-Well 4800 paver is designed to produce high surface finish quality on bridge deck and flatwork projects. The paving carriage's standard Rota-Vibe system delivers up to 83.3 Hz over the roller's 29.2-cm length to effectively consolidate the top 6.4 cm of concrete, delivering a denser and more uniform concrete surface.

The machine's universal power crown adjuster allows the contractor to mount the crown adjuster in-line for a straight machine or position it on adjacent hinge points to align the adjuster at the skew angle of the bridge deck. This powered option simplifies and reduces the amount of time it takes to make crown adjustments when paving at extended widths.

The show paver features two different leg options: swing leg and pivot leg. The pivot leg option improves efficiency and lowers costs when working at severe cross slopes in excess of 5 percent by allowing



Terex Bid-Well 2418 workbridge (above) and 4800 paver (below).



the leg to pivot to a true perpendicular position, removing stress on the side rails. By offering zero-clearance paving, the Terex Bid-Well swing leg design increases machine efficiency when paving in congested areas.

The Terex Bid-Well paving carriage efficiently completes all paving functions – metering, consolidation, sealing and finishing – in a single pass to lower labour requirements. The fogging system on the show paver features independently adjustable nozzles that can be positioned to direct the fog to where it is needed. Polyethylene tubing eliminates corrosion to improve uptime.

Terex Bid-Well also has three new remote control options for making machine setting adjustments to the 4800 paver. Two tethered

control boxes can be attached anywhere on the paver's frame to conveniently modify, from ground level, machine settings such as paver speed, engine throttle, power crown adjustment and paving width. To fit company needs and budget, contractors can choose from the entry-level keypad control or the local control boasting a user-friendly touch-screen display.

A new radio remote control panel significantly expands operating flexibility by allowing the worker to carry along machine controls and operate the paver from ground level, 360 degrees around the paver. The remote control options can be equipped to operate the Terex Bid-Well 2450, 3600 and 4800 roller pavers. ■



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E-Z DRILL

E-Z Drill's 210B-2 SRA concrete drill maximises accuracy in concrete drilling projects without disturbing the subgrade. The two-gang slab rider drill is easily manoeuvrable, making it ideal for drilling hundreds of holes for lane additions, airport work and full depth repair projects.

Featuring a compact frame, the drill is well suited for jobs with cramped worksites that also require drilling slabs with a range of thickness. The 210B-2 SRA can operate within a 4-ft patch and easily drill to the centre of thick slabs, while still having enough space for workers to move around the drill.

The 210B-2 SRA ensures continuous operations and optimal uptime with its innovative features. E-Z Drill's roller-bearing feed system powers each drill automatically with individually tailored air pressure to suit the material being drilled. This extends the service life of the drill bit as it helps prevent the bit from bouncing against the concrete



E-Z Drill's 210B-2 SRA concrete drill.

due to inadequate air pressure. Quick-release bit guides can accommodate several bit styles, including one-piece whirl bits, two-piece H-thread bits and taper steel bits. The bit guides also allow the operator to replace

bits quickly, which contributes to minimal downtime. And, dual-purpose guide wheels on the 210B help with positioning the drill during operation and can be quickly flipped down and used for transporting the unit. ■

ADVERTISERS' INDEX

AMMANN	9	LIEBHERR	25
AUGER TORQUE	35	LINK-BELT	11
BICES 2017	6	LINNHOF	43
BOMAG	47	MANITOWOC	29
BUILDTECH ASIA 2017	65	MAPEI	63
CAMBODIA ARCHITECT & DÉCOR 2017	89	METAL GALANTE	57
CAMBUILD 2017	4	MTU ASIA	15
CHEMGROUT	73	MYANBUILD 2017	85
CHUN HOE	INSERT	ONEBUILD 2017	79
CONCRETE SHOW SEA 2017	75	OSH KOSH JLG	7
COMANSA	3	PILE DYNAMICS	49
DOOSAN	31	SANDVIK	IFC
EVONIK	55	SENNEBOGEN	19
FOUNDATION ASSOCIATES	1	SIAM YAMATO STEEL	39
GENERAC	51	SKYJACK	23
GOMACO	OBC	TSURUMI	13
HELLA	IBC	VERMEER	27
INTERMAT ASEAN 2017	2	WIRTGEN	21
JPN	61	WOC 2018	87
KOBELCO	GATEFOLD	WOC ASIA 2017	69
LANKABUILD 2017	83	XCMG	5
LAO BUILD 2017	77	ZHEJIANG DINGLI	17

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