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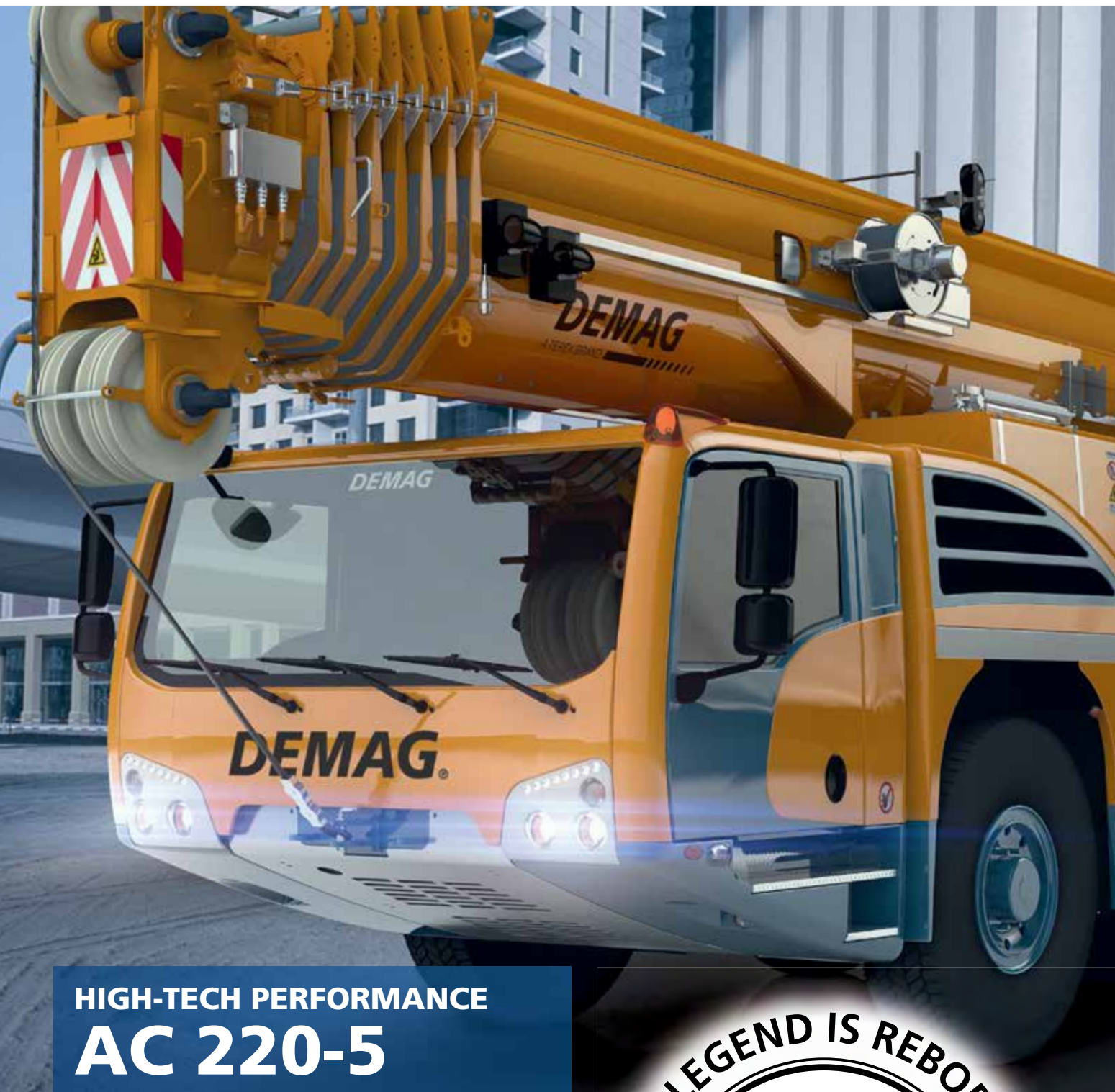
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Manitou establishes new facility in Malaysia

Manitou has opened a new facility in Malaysia to better serve its local customers and further expand its activities in the country. The new Manitou Centre Malaysia, located in Sungai Buloh, Selangor, is the first Manitou Centre in Asia, which sells and rents the group's machines under the brands Manitou, Gehl and Mustang. It also provides other services such as spare parts, guarantee extensions, financing and full service contracts. In addition, the facility offers a fleet of telescopic trucks for rental.

Manitou Centre Malaysia occupies a surface area of 900 sq m, including a sales area, a spare parts shop and offices. As of now, the team consists of an operations manager, a sales executive, three technicians and support functions, all managed by the Manitou Asia subsidiary. The team aims to double the capacity of operations within three years and triple the number of telescopic trucks, to reach 50 percent market share in this segment.

"The opening of this Manitou Centre is very important for the development of Services and Solutions offers to our customers. We want to provide them with a service adapted to their requirements. In particular, we have a rental fleet of new telescopic trucks to enable our customers to develop their activities with latest-generation equipment," said Julien Poupard, Manitou's operations manager.

According to Manitou, the new facility will initially be targeting the construction, rental and oil markets, with possible developments



The newly opened Manitou Centre Malaysia is the first Manitou Centre in Asia.

in other sectors. Malaysia currently represents the second largest fleet of Manitou telescopic trucks in Asia and thus, it requires a commercial presence and increased provision of services on site, the group said. ■

Singapore 'most attractive for infrastructure investment'

Singapore, with its stable political situation, secure business environment and strong growth potential, remains the most attractive market for infrastructure investors, according to the global design and consultancy firm Arcadis. The country has retained its position as the world's most attractive market for the third edition of the Global Infrastructure Investment Index. The report highlights the most dynamic and attractive markets for infrastructure investment worldwide.

Singapore ranked consistently highly across business, risk, infrastructure and financial indicators, and despite a slightly lower score for economic factors, it maintains a strong overall economic environment. Whilst most projects have traditionally been publicly funded, Singapore is seeking to develop involvement from private institutional investors. Work is underway in the country to improve understanding of infrastructure as an asset class to make it more attractive to investors, part of which includes the development of new benchmarking tools.

Currently, Singapore invests around 5 percent of its GDP on infrastructure, equivalent to US\$20 billion in 2015, and this continues to rise. By 2020, Singapore aims to invest 6 percent of GDP, the equivalent of US\$30 billion, which makes the market even more attractive for investment. Priority schemes are planned in healthcare and transport, including the expansion of Changi Airport through the construction of a fifth terminal. Previous expansion of the airport, which involved construction of Terminal 4, saw Arcadis acting as lead surveyor.

In addition, Malaysia rose in the ranking to fifth place. Its strong economic performance and continued long-term investment in infrastructure, such as the capital's metro system, have made

the market attractive for investment. However, in the short term, investment is threatened by a number of risks, including its currency depreciation against the dollar and a high-profile corruption scandal that has delayed some projects. In terms of economic score, China ranks first among the 41 countries analysed, yet its less attractive business conditions and higher risk environment keep it ranked at number 17 in the index.

Based on the report, the top 10 most attractive countries for long-term infrastructure investment in 2016 are (from first to last): Singapore, Qatar, UAE, Canada, Malaysia, Norway, Sweden, USA, UK and the Netherlands.

"The index gives us valuable insights into how long-term political and economic stability leads to greater investment, so it is no surprise that Singapore remains at the top of the table. In the region as a whole, there is clearly a lot of social and public need for new infrastructure. There are a whole host of project ideas and plans out there, but they are not investible or bankable enough, which is the basic problem. The key to unlocking investments in the region hinges on making the projects bankable, an area which we have been supporting," explained Graham Kean, head of client development at Arcadis Asia.

"We have already seen Asia-based investors taking positions globally as infrastructure becomes an increasingly popular asset class for private sector investors, particularly in times of increased risk and uncertainty. Income streams are relatively more stable and will be around for 30 years or more, the sort of timeframe some investors are increasingly drawn to. Short-term impacts can also create investment opportunities, such as a change of government or currency devaluation, and these need to be weighed with the underpinning long-term situation," added Mr Kean. ■

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JCB strengthens in SE Asia with new system and dealers

JCB Southeast Asia has introduced a new customer support package, the JCB LiveLink. This software system enables JCB dealers to support machine owners by monitoring and managing their machines remotely, helping to maximise machine performance and productivity. In addition, JCB has appointed three new dealers in the region – Mitra JCB in Kalimantan, Indonesia; Persada JCB in Sumatra, Indonesia; and T&C JCB in Vietnam.

The JCB LiveLink uses satellite and cellular technology and is compatible with the vast majority of JCB machines. JCB dealers can access the information via an internet connection, as the LiveLink computer is built into JCB's machines, where it collects information from a number of sensors. This information is sent, using mobile communications technology, to JCB's secure data centre. This machine management information is then displayed to users via the LiveLink website, by email or via mobile phone.

Besides enabling JCB dealers to view a customer's fleet and guaranteeing timely servicing, the benefits of this machine monitoring system include maintenance reporting, critical machine health alerts, real time location data and geofencing alerts. This step to advance machine monitoring and security is part of JCB's effort to ensure owners investments are protected, whilst providing their customers with excellent customer support.



“At JCB, we are constantly looking for new and innovative ways to help customers get the most of their machines and LiveLink telematics is just one way we are improving our customer service support,” said Tom Cornell (left), managing director of JCB Southeast Asia. “Another way we are doing this is by delivering global expertise at a local level by expanding our dealers’ network coverage across the region. We

have recently appointed two new dealers in Indonesia, Mitra JCB in Kalimantan and Persada JCB in Sumatra, as well as T&C JCB in Vietnam.” ■

T.Y. Lin secures Anh Duong-Soleil Danang project in Vietnam

T.Y. Lin International Pte Ltd has been appointed by PPC An Thinh Danang Joint Stock Company to provide the civil, structural, mechanical and electrical design for Anh Duong-Soleil Danang, a new five-star hotel and luxury apartment complex in Da Nang, Vietnam. T.Y. Lin will be responsible for the concept, preliminary and detailed engineering design for the \$446.7 million project.

Located near the My Khe beach, and adjacent to the arterial road of Vo Nguyen Giap and Pham Van Dong, the 233,577-sq-ft, coral-inspired mixed-use development consists of two 58-storey residential towers and two 47-storey towers for residential use and the hotel. The development also includes other amenities, such as a gym, a spa, swimming pools, game rooms, a dance studio, an art gallery, function rooms and retail shops, among others.

For the successful delivery of this fast-track project, T.Y. Lin will work closely with both the contractor and the architectural team during the design phases. The team is focused on preempting and minimising construction stage risks through the design process, as well as optimising constructability. The Anh Duong-Soleil Danang development will be delivered on a phased basis up until 2021, with the first phase scheduled to be completed by the end of 2017. ■



T.Y. Lin will provide a civil, structural, mechanical and electrical design for Anh Duong-Soleil Danang, a new hotel and luxury apartment complex project in Vietnam.

New Philippines distributor for Rammer and Bretec product lines

Sandvik Construction has appointed MB Rock Services as its new distributor for Rammer and Bretec product lines in the Philippines. Apart from supplying a comprehensive range of breakers and Sandvik rock tools, MB Rock Services will also be providing full aftermarket care, spare parts and customer service.

MB Rock Services has offices, workshops and service engineers located throughout the Philippines. When the situation requires it, the company will also be able to call on round-the-clock support from Sandvik Construction's regional office in the country.

“We are sure that the combination of Sandvik equipment and global aftermarket support, together with the local knowledge and industry expertise of MB Rock Services, will enable Sandvik customers throughout the Philippines to benefit from a winning combination,” said Kauko Juuri, global distributor manager of Sandvik Construction. ■



David Scurr (left), sales manager of Sandvik Construction, and Herbert Dela Cruz, owner of MB Rock Services.



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Rubble Master's new distributor in SE Asia

Austrian manufacturer Rubble Master has appointed Multico Equipment & Parts as its distributor in Brunei, Vietnam, Cambodia, Laos, Malaysia, Myanmar, Philippines and Taiwan. Based in Singapore, Multico Equipment & Parts is the heavy equipment division of the Multico group and provides construction equipment, material handling equipment as well as environmental landscaping and recycling equipment.

Rubble Master offers various sizes of mobile impact crushers for recycling and the processing of natural rocks. The company's mobile crushers and mobile screens are designed to be highly flexible and easy to move, with a small footprint.

The decision to cooperate with Multico Equipment & Parts was due to the natural match of the two business strategies, with both companies aiming for quick, effective and efficient deliveries to end users as well as short response times, explained Rubble Master. "We are looking forward to a long-lasting successful business relationship, which results in an increase of market share for RM crushers and screens," said Gerald Hanisch, CEO of Rubble Master. Multico also stocks important wear and spare parts for Rubble Master equipment in order to minimise downtime and increase profitability.

"RM does not only have great products, but they also care for their business partners and customers and integrate them into the RM Family," said Michael Wong, Multico's general manager. ■



Rubble Master has appointed Multico Equipment & Parts as its distributor in Brunei, Vietnam, Cambodia, Laos, Malaysia, Myanmar, Philippines and Taiwan.

Aurecon expands SE Asia team

Global engineering and consulting firm Aurecon has appointed Serena Yap as its technical director for Buildings Structures in Singapore. This appointment aligns with the country's Building and Construction Authority's (BCA) vision to create a future-ready built environment for Singapore – one that is 'safe, high quality, sustainable and friendly built'. Ms Yap will be responsible for providing technical expertise to clients and developing, as well as managing, projects. She will also be accountable for all financial, technical, client relationship, contractual, risk and staffing aspects related to projects.

Ms Yap is a licensed professional engineer and a member of the Institution of Engineers Singapore and the Structural Steel Society of Singapore. She has over 30 years' experience in the engineering industry, and is an expert in design and project management within both built environment and infrastructure markets. Prior to joining Aurecon, Ms Yap was at T.Y. Lin International Pte Ltd, where she headed the Building (Civil & Structural) Group.

In addition, Aurecon has appointed Mohit Kumar as its country manager in the Philippines. In his new role, Mr Kumar will be responsible for leading the strategic growth of Aurecon's business in the Philippines, which includes establishing a business unit in the capital city of Manila. He will also work closely with clients in the growth markets of Indonesia, Philippines and broader Asia region to ensure ongoing support for their growth objectives.

Mr Kumar has over 22 years of experience in the engineering industry, having worked extensively across several market segments including buildings, civil and transport infrastructure, water and environment, as well as international development. Prior to joining Aurecon, he was director of operations (Malaysia & Indonesia) and country manager (Malaysia) at Jacobs Engineering. There, he led a business unit of professional, technical and support staff in Malaysia and Indonesia. He has also worked at Sinclair Knight Merz and the Asian Development Bank. ■



Far Left:
Serena Yap.



Left:
Mohit Kumar.

Thailand builds new mixed-use development

MontAzure (pictured), a 73-ha mixed-use community project in Kamala, Phuket, Thailand, is being developed by a joint venture of three property and hotel investment groups in Asia, namely ARCH Capital Management (Hong Kong & Shanghai), The Narai Group (Thailand) and Philean Capital (Singapore) part of Pontiac Land Group.



The first phase of the project features the Twinpalms Residences MontAzure, which occupies 100 m of beach frontage. Other key components of the project includes 13 private hillside estate villas called The Estates at MontAzure, a future hillside development, an international beach club, a wellness centre, retail space and a 32 ha nature reserve of primary rainforest. ■

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Atkins to work on Indonesia's first HSR corridor

Atkins has been awarded the design contract to provide transit oriented development (TOD) masterplan along the new Jakarta-Bandung high speed rail corridor, Indonesia's first high speed rail project. Scheduled for completion in 2019, the route will stretch 142.3 km and stimulate economic growth along the corridor whilst reducing traffic congestion in the region. TOD masterplanning brings together the three key fundamental components: smart planning, land value capture and development/station integration.

The contract was awarded by Kereta Cepat Indonesia China (KCIC), a joint venture between PT Pilar Sinergi BUMN Indonesia and China Railway International Co Ltd, Atkins' scope of work will cover masterplanning, TOD, architecture and urban design, landscape design and station integration for Halim and Manggarai areas.

"These TOD projects will support Jakarta's national vision for sustainable development hubs around key transport links and incorporate positive social, cultural, economic and community benefits for residents and visitors to the region. The project involves complex design challenges and we will address each development as a fresh challenge and provide design solutions tailored for the individual locations," explained Bertil de Kleynen, Atkins' head of architecture in Asia Pacific.

Atkins has a long history of creating transit oriented developments, which are mixed-use residential and commercial areas designed to maximise land values and return on investment



Atkins-designed Cadre International TOD Centre.

through optimising access to public transport and incorporating features to encourage the development of integrated environments for live, work and play.

Examples of Atkins' work in this area include Cadre International TOD Centre (ITC), one of China's first real TOD projects, comprising an 800,000 sq m mixed use development fully integrated with a local metro line, a regional railway and adjacent to a high speed rail station; and Meixi Lake TOD, Changsha, a new town masterplan for a population of 250,000, with comprehensive transport planning and integrated TOD centres. ■

Enerpac has new authorised service centres in Southeast Asia

Enerpac Southeast Asia has certified its three distributors as new authorised service centres in the region, including Multi-flow Engineering Services Pte Ltd in Singapore, CAPE Industrial in Rayong, Thailand and PT Ekatama in Bekasi, Indonesia.

"Having authorised service centres across Southeast Asia will give our customers confidence that their tools are being repaired and maintained to high standards of quality and safety," said Joseph Wang, country leader, Enerpac Southeast Asia.

In order to be given the 'authorised service centre' status, each distributor must pass an audit that covers the factory or workshop, equipment, contracts, safety and other factors that contribute to a successful and quality centre. Once this audit has been passed, the authorised centres can then bring the knowledge, service and support of the Enerpac organisation to their local customers.

"The authorised centres will receive additional support from Enerpac in terms of training, standards, tools and backup, so it will further strengthen our relationship with our valuable distributors," added Mr Wang.

Singapore achieved its certification in 2015, followed by Thailand and Indonesia in 2016 and Enerpac has plans for more. "We are aiming for Malaysia, Vietnam and the Philippines to have authorised centres by the end of 2017, and the remaining countries in the region by 2018," said Mr Wang.

Key advantages of authorised service centres include better service network; improved repair quality; shorter repair times; additional services (such as 24 hour service and on-site repairs); and greater support from Enerpac (such as training, repair job referrals and tool backup). ■



Ken Chang, left, of Multi-flow Engineering Service Pte Ltd in Singapore with Enerpac's Asia Pacific regional director, Anders Mangen.



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Skyjack appoints new dealer in Singapore

Skyjack has appointed Modern Access & Equipment Pte Ltd as a new dealer in Singapore. At the same time, Modern has added 60 Skyjack machines to boost its rental fleet, which include the first SJ86T telescopic boom to arrive in Asia plus additional booms for sale and rental.

The Modern Group is based in Hong Kong, with branches in Macau and Singapore. The office in Singapore, established in 2008, offers aerial work platforms, scaffolding and fall arrest equipment for sale and rental, making the company a comprehensive specialist in all kinds of access equipment offerings.

“Our customers demand products that are easy to use, and we look for machines that are easy to service,” said Klein Phua, assistant general manager at Modern. “Skyjack machines are back to basics, featuring the relay-based system, making them easy to use. The parts are also common throughout the Skyjack range, so it is simple to repair a machine. When there is a breakdown, we can be sure the machines will be back in operation with minimum costs and delays.”

Prior to the latest delivery, Modern’s fleet already included over 700 Skyjack machines. Mr Phua said that adding the latest batch of machines will help the company cope with increasing demand from customers. Included in Modern’s recent order were around 50 DC scissor lifts, with model numbers ranging from SJIII 3219 to SJIII 4632. The machines have a working height ranging from 7.79 to 11.75 m.

“We were very impressed with the performance of the initial 260 machines we ordered at the end of 2013. Adding more units to the existing fleet will ensure we have enough machines to meet increasing demand for both rental and sales activities,” said Mr Phua.

“Modern is one of the biggest names in equipment rental in Singapore, so when we supplied 260 units to the company back in 2013, it made everyone else sit up and take notice,” said Simon Cracknell, Skyjack’s director of business development in Asia. “Partnering with them as a dealer is really a win-win situation for both companies.”

Skyjack started to expand its presence in Southeast Asia about three years ago, and since then the company has grown significantly. “The aerial work platform (AWP) industry in Southeast Asia is increasing and we have been able to capitalise on this, having increased our distribution and sales with simple, reliable machines that are suitable



Klein Phua, Modern’s assistant GM (second from left) and Ivan Huan, Skyjack’s regional sales manager (in the middle), at a special event to celebrate the partnership of both companies and the arrival of the first Skyjack SJ86T telescopic boom in Asia (in the background).



Simon Cracknell, Skyjack’s director of business development in Asia (left) and Mr Phua at Modern’s office in Singapore.



The Skyjack SJ86T has a 28.21 m working height and an axle-based 4WD system. The unit is now available from Modern.

for the market,” said Ivan Huan, Skyjack’s regional sales manager for Southeast Asia.

Looking back, Mr Phua explained the reasons behind Modern’s decision to partner with Skyjack in the first place. “We always take into account three things: brand acceptance, cost of ownership and company culture.

“Although Skyjack has been recognised globally for decades, at that point (in 2013) the brand was considered new in Asia, particularly in Singapore. So we needed to test whether the market was ready to accept it. The result was positive, and our customers were happy with the Skyjack machines that we offered – and still are.

“Cost of ownership is also important when it comes to rental business – no one can remain competitive if the cost of ownership is high. It has taken us three years to be sure of this, but I can say now that Skyjack machines have a low cost of ownership due

to their durability and simplicity.

“Last but not least, Skyjack also values our partnership as much as we do, and that’s the kind of company culture we appreciate. Because of this, we wanted to bring it to the next level.”

Among Modern’s newly delivered Skyjack machines was the first SJ86T telescopic boom to arrive in Asia. It is currently Skyjack’s largest telescopic boom, with a working height of 28.21 m and is fitted with an axle-based 4WD system. The SJ86T also has a horizontal outreach of 23.42 m and 45 percent gradeability for excellent manoeuvrability. The jib has a range of +65 to -60 degrees and features optimised designs that improve its strength.

According to Mr Huan, Singapore is the first market in Southeast Asia to receive the SJ86T boom. The model is also being launched into other markets across the region, he said. ■

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LiuGong continues cooperation with Cummins

LiuGong has signed a global service and service parts agreement with Cummins, renewing an agreement between the two parties originally constructed in March 2014. The current version optimises the list of engines and territories covered, as well as the parts supply chain.

According to the agreement, service and parts supply will be managed directly from LiuGong dealers in the territories and for these engines agreed, while Cummins will help LiuGong to provide claim settlement, technical support and training for dealers. In the agreed regions, through the designated channel by Cummins, LiuGong parts distribution centres will directly provide services parts to dealers in the region. This partnership renewal will ensure both sides leverage each other's global resources, achieve win-win cooperation in business mode, optimise parts supply chain and improve the aftermarket service in overseas business.

"Overall, the new agreement combines LiuGong's global dealer network and Cummins' engine and technical support network. It helps us to realise the one-stop service and speed up the after-sales support response speed therefore enhance customer satisfaction," said Luo Guobing, VP of LiuGong.

In addition, LiuGong and Cummins have expanded their joint venture investment in the manufacturing of non-road engines at

Guangxi Cummins Industrial Power Co Ltd (GCIC). LiuGong has contributed to a cash injection of RMB 240 million, an investment equally shared by LiuGong and Cummins. This will go towards key capability building and product & technology enhancements.

As a result of investment expansion, GCIC can now further utilise its production capacities and key advantages, optimise manufacturing efficiency, and lower operational cost by strengthening the cooperation on the supply chain with partner enterprises. More enhancements will also be made to the whole value chain system, including research and development, manufacturing, quality assurance and marketing after-sales services. This enhancement will further build GCIC's competitive edge, and create better value for customers.

The partnership between LiuGong and Cummins was first forged in 2013 to bring GCIC top-level engine technologies to a world-leading machinery plant. This combination has brought many third-generation products to market with ease, including L9.3, QSB7 and QSL9.3.

As Euro-III non-road engine standards are being applied nationwide, and its advantages on products and technologies are becoming more obvious, GCIC has also looked at further conquering the assembly market. ■

Gammon wins Lee Garden Three project in Hong Kong

Hysan Development Company Limited has awarded the building contract of Lee Garden Three, worth HK\$1.6 billion, to Gammon Engineering & Construction Company Limited, a subsidiary of Gammon Construction Limited. The project will be constructed on the former site of Sunning Plaza and Sunning Court.

Lee Garden Three will be a part of Hysan's cluster of commercial buildings in Causeway Bay, fronting the Hysan Avenue. The project will include 20 floors of spacious Grade A offices sitting atop a five-level retail podium of shops and F&B establishments. There will also be a five-level basement, with around 200 parking areas. The

building of the basement started in February 2016, and the entire project is expected to be completed in the fourth quarter of 2017. Advanced construction technologies such as Building Information Modelling (BIM), 4D modelling and 3D scanning will be adopted to enhance the project's environmental friendliness and construction efficiency, said Gammon

The project will be Hysan and Gammon's second major partnership in recent years. The Hysan Place was an earlier Hysan-developed commercial complex, which was also constructed by Gammon. ■

Chinese university goes green

The Duke Kunshan University in Kunshan, China, has received Leadership in Energy and Environmental Design (LEED) certification – it is believed to be the first Chinese university campus to be certified by the LEED campus programme, with all five campus buildings certified according to LEED standards by the US Green Building Council. The LEED gold certificate was recently awarded to its Academic Building and Conference Centre, while the Student Residence, Faculty Residence and Service Building received LEED silver certification. The university was officially opened in mid-2014.

Faithful+Gould was appointed as the building sustainability consultants to help the university realise its green aspirations. The company worked with the client and project team to develop

and integrate green solutions into the planning, design, construction and operation of the campus buildings to reduce environmental impact at every stage of their life cycle.

Faithful+Gould also provided third-party testing and commissioning services on the campus systems and equipment including the HVAC, BMS, plumbing, firefighting, electrical, and extra-low voltage systems to ensure the buildings are handed over to operate safely, and are energy efficient, climate-responsive and in accordance to the university's stringent design requirements. ■



The rendering image of Duke Kunshan University.

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As of April 1st 2016, Kobelco Construction Machinery and Kobelco Cranes merged their management organizations to form Kobelco Construction Machinery Co., Ltd.

Vinci and Bouygues team up for Cairo metro

The joint venture led by Vinci Construction Grands Projets, alongside Bouygues Construction's subsidiary Bouygues Travaux Publics and their Egyptian partners Orascom Construction and Arabco Contractors, has won the Phase 3 contract for Line 3 of the Cairo metro.

The new €1.1 billion, 67-month contract covers civil engineering for Phase 3 of Line 3, including 17.7 km of new line and 15 stations (eight underground, five elevated and two at ground level). The works will require construction of a new tunnel under the Nile. Once completed, Line 3 will increase the overall length of the Cairo metro system to 100 km and serve five million passengers daily.

Work will start in the residential and administrative parts of the capital, including Zamalek Island, and end in the city's densely populated and highly urbanised northern and southern districts. The project is expected to generate about 5,000 jobs and continue the longstanding French-Egyptian cooperation in underground works.

Furthermore, the joint venture is also working on Phase 4a of Line 3, which will extend the system towards the eastern part of the



The proposed elevated metro station design.

city. The contract was signed in February 2015 and handover is set for the end of 2018. ■

Volvo Penta to produce industrial engines in India

Volvo Penta plans to start production of 5- and 8-l industrial engines in India, aimed at the Indian market, next year. The company has already been supplying engines for industrial and marine applications to customers in the country for more than two decades. The 5- and 8-l engines will be made for Indian customers at the VE Powertrain (VEPT) plant in Pithampur, near Indore. A new line will be added at the plant exclusively for the Volvo Penta engines.

The VEPT plant in Pithampur is part of the VE Commercial Vehicles' joint venture between the Volvo Group and Eicher Motors. It is one of six manufacturing plants that the Volvo Group has invested in, in India, including several in Bangalore for the Trucks, Buses and Construction Equipment divisions.

"We see a great opportunity in infrastructure development in the country," says Jonas Nilsson, head of Volvo Penta in India. "As the demand from customers is increasing constantly, there is pressure on



contractors to complete the projects within the specified time with the cost levels they have calculated. So there is need for highly reliable and fuel efficient equipment to meet these demands.

Volvo Penta's range of 5- and 8-l engines are certified for Indian Bharat (CEV) Stage III emissions standards which are equivalent to EU stage IIIA/Tier 3 and are already in the field, powering a variety of applications including construction, material handling, raw material exploration and agriculture. The new production and assembly lines will enable versatile solutions tailored to the local market needs.

"One of Volvo Penta's global ambitions is to create a premium supply chain for our products with competitive lead-times at a competitive cost. Introducing production in India will help us to develop the foundation on which to build for the future," said Bjorn Ingemanson, president of Volvo Penta. ■

An 8-l diesel engine by Volvo Penta.

Sandvik appoints new distributor for breakers in India

Larsen & Toubro Construction & Mining Machinery Business (L&T CMB) Division has been appointed as Sandvik's new distributor for breakers throughout India. L&T CMB will not only be supplying a wide range of Rammer breakers, but also L&T branded breakers, as well as providing full aftermarket care, spare parts and customer service.

Headquartered in Mumbai, L&T CMB possesses business interests in hydrocarbon, heavy engineering, construction, power, information technology, electrical and automation, machinery and industrial

products, shipbuilding, railway projects, and other related industries. In order to support its large customer and equipment base, L&T CMB operates 22 local offices, five service centres, as well as one central and four regional training centres. These offices and facilities support the activities of 28 dealers and 783 personnel throughout India. In addition to its own local coverage, L&T CMB will be able to call on round the clock support from Sandvik Construction's regional Indian offices and from the breaker factory in Lahti, Finland. ■



L&T CMB is now Sandvik's new distributor for breakers throughout India.

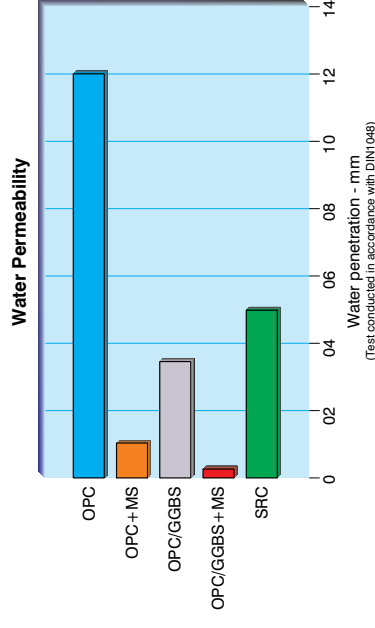
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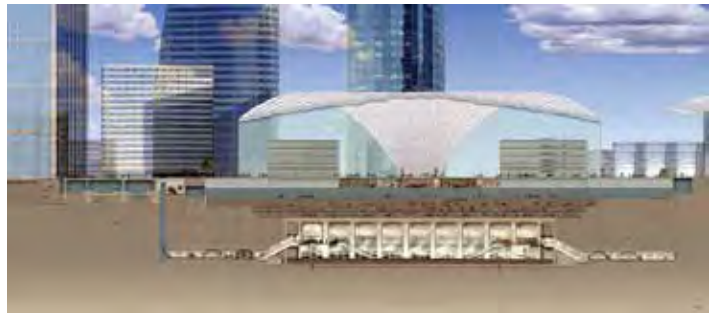
Vinci to build La Défense station and adjacent tunnels

SNCF Réseau has awarded Vinci Construction – through its subsidiaries Vinci Construction France (lead company), Vinci Construction Grands Projets, Dodin Campenon Bernard, Soletanche Bachy France and Botte Fondations, in a joint venture with Spie Batignolles TPCI and Spie Fondations – the contract to build the new La Défense station and the adjacent tunnels.

The works, amounting to €496 million, are part of the extension of RER line E towards the west of Paris (Eole). The works are planned to start in mid-2016 and will continue for 61 months. The operation will mobilise 700 construction workers at the peak of activity, and it requires four million hours of labour with more than 300,000 hours to be carried out under work-integration programmes, said Vinci.

The operation covers building the new La Défense station under the CNIT dome, a highly technical project that entails building an underground cathedral while supporting the existing structures and ensuring operational continuity of the site. All the CNIT offices, shops and hotel must continue to function normally throughout the duration of the works.

Apart from the underground structural work beneath the CNIT itself, the company will also be building 1 km of tunnels, a 40-m-deep and 15-m-diameter shaft and a large number of underground pedestrian corridors enabling connections between the RER E and A lines, the L and U lines of the Transilien and the T2 Tramway.



Vinci will build the new La Défense station under the CNIT dome, a highly technical project that involves constructing an underground cathedral while supporting the existing structures and ensuring operational continuity of the site.

The major challenge of the worksite is that it has to be executed in the dense and complex urban environment of La Défense, with works requiring the excavation of 350,000 cu m of rubble.

Extension of the RER E line will significantly reduce the travel time for thousands of Paris region residents and thereby improve their everyday lives. Extending the E line and building the new CNIT-La Défense station will provide commuters with better quality of service and connections with other RER lines and the future Grand Paris Express network. ■

Work on Wacker Neuson's new site starts

Work has begun on the expansion of Wacker Neuson's light equipment production site in Reichertshofen, Germany. The company will be investing around €10 million in a new R&D centre for light equipment between now and the start of 2017.

Back in 1998, Wacker Neuson already moved the production of vibratory plates from its previous site near the Olympic Park in Munich (now the location of its headquarters) to the factory in Reichertshofen (65 km away) to support strong growth and overcome capacity bottlenecks. Over the coming year, R&D, product management and materials management will also be relocated to Reichertshofen close to the production facility.

"Moving all technical operations for light equipment to the same site will improve processes, shorten workflows and boost productivity even further," said Helmut Bauer, managing director of Wacker Neuson Produktion GmbH & Co KG.

Wacker Neuson currently employs around 330 employees at the Reichertshofen site. The company is also constructing a new office building and test hall next to the existing production facilities on an area spanning more than 10 ha. This will include around 3,500 sq m of additional room for up to 120 employees, primarily in R&D. Adjacent to this will be a large, modern test hall providing almost 3,000 sq m of space for extensive testing of light equipment during the development phase.

"Expansion of the Wacker Neuson production site is currently the most important commercial development in our community," said Michael Franken, Mayor of Reichertshofen. "It is creating a lot of promising new jobs that will strengthen our region."



Wacker Neuson is expanding its site in Reichertshofen, Germany. The company will be investing around €10 million in a new R&D centre for light equipment over the coming year.

Vibratory plates, various rammers (e.g. battery-powered rammers), internal vibrators and inverters, angle grinders, floor saws and breakers will be developed and manufactured at the Reichertshofen site. The silver-spade ceremony was held on 22 April 2016, and the first employees are expected to be moving into the four-storey administration building and test hall by the end of the year. ■

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AECOM awarded transit contract from Metrolinx

AECOM has been selected to provide technical advisory services on the Hurontario Light Rail Transit (LRT) project in Mississauga and Brampton, Canada, and the Hamilton LRT project in Hamilton, Canada, for Metrolinx, an agency of the Government of Ontario.

The seven-year contract has a CA\$100-million aggregate maximum value. The Hurontario LRT and Hamilton LRT projects are part of a major infrastructure investment in Ontario, which are expected to have a significant impact on regional transit by providing crucial links between many of the existing lines, as well as on the local economy, by creating jobs and attracting more investments in the area.

AECOM will lead the development of the reference concept designs, project specific output specifications and related design and planning activities; provide assistance with the alternative financing and procurement request for quotation/request for proposal development and related in-market support; and support the construction and implementation phases providing technical

compliance oversight and acting in an associated advisory role.

The Hurontario LRT project will consist of 20 km of new light rail installation along Hurontario Street from Port Credit GO Station to Brampton Gateway Terminal. Twenty-two stops and a service loop in the downtown Mississauga City Centre/Square One area will be included, as well as a maintenance storage facility in the Highway 407 area. An estimated up to CA\$1.4 billion capital cost will be provincially funded.

The Hamilton LRT project will include approximately 13 km of new light rail that will connect McMaster University through downtown Hamilton to Queenston Circle as well as a connection to the West Harbour GO Station and potentially the waterfront. The project also includes a high-order pedestrian connection to the Hamilton GO Centre Station, and a maintenance and storage facility. The estimated up to CA\$1 billion capital cost for this project will also be provincially funded. ■

LafargeHolcim opens cement plant in Brazil

LafargeHolcim is strengthening its cement production network in Latin America with the opening of a new line at its cement plant in Barroso, Brazil. The construction of this new line at the existing Barroso site is part of the Group's strategy to reduce cost per tonne of cement produced, while improving quality and efficiency, in order to operate profitably in a low investment environment.

The new line in Barroso is expected to increase operational efficiency and cost competitiveness based on its technology. Equipment includes one of the world's largest vertical cement mills, with 450 t per hour production capacity; the horomill, in which the raw materials are refined and chemical corrections are made with low power consumption; and a fully automated quality control laboratory. The plant's total capacity is 3.6 mil t of cement per year. The new line will allow the reduction of total costs per tonne of cement by around 25 percent from 2014 to 2017, said LafargeHolcim.

"The opening of Barroso is key to our strategy in Brazil and will allow us to further improve our cost structure while we continue to supply our customers with our high-quality solutions. For example, we are providing solutions for various projects related to the Olympic Games in Rio de Janeiro including the Olympic Village, the Galeão International Airport as well as new metro and bus lines," said Eric Olsen, CEO of LafargeHolcim.

In 2015, LafargeHolcim delivered sustained performance in countries like Mexico, Colombia and Argentina. The Group believes that Brazil will remain a challenging market in 2016 and has taken a number of measures to adapt its presence to the changing landscape. However, the Barroso plant will make a difference to the Group's ability to serve customers in the southeastern region of Brazil.

Having entered the Brazilian market in 1951, LafargeHolcim now owns five cement plants, four grinding stations, and one blender with a capacity of around 12 mil t/year and is also present in aggregates and ready-mix concrete. The Group has operations in Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Mexico and Nicaragua with an extensive network of retail outlets across the continent.

LafargeHolcim has also been playing a key role in the construction of major infrastructure projects in Latin America. The Group is contributing to the upgrade of Bogota's El Dorado International Airport, the construction of the Coca Codo-Sinclair Dam in Ecuador, one of the country's biggest infrastructure projects and new highways and train lines in Mexico. ■

Astec's new manufacturing bay

Astec has started the construction of its new manufacturing bay in Chattanooga, Tennessee, USA. The new 24,780 sq ft facility, which is designed for manufacturing equipment used for Astec asphalt mixing plants and wood pellet plants, is expected to create 40-50 new jobs with approximately 30 of those jobs starting when the bay begins operating in September 2016. ■



Work on Astec's new facility has begun.

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Global construction industry 'regains strength'

The global construction industry is gradually regaining strength, having endured a prolonged period of sluggishness in the wake of the global financial crisis, according to a new study from Timetric's Construction Intelligence Centre (CIC). It is expected to have reached US\$8.5 trillion in 2015, up from US\$7.5 trillion in 2010. Over the forecast period (2016-2020) the pace of expansion will accelerate to an annual average of 3.4 percent, with the industry reaching a value of US\$10.0 trillion in 2020.

The emerging world will continue to outperform the advanced economies, but the pace of growth in the former will ease to an annual average of 4.2 percent over the forecast period from 5.2 percent during the review period (2011-2015). In 2010 emerging markets accounted for 43.9 percent of global output, a share that is anticipated to rise to 51.9 percent by 2020. However, it is the recovery in many of the major advanced economies that will push up the pace of global construction output over the next five years, with the annual rate of expansion in the advanced economies accelerating from an average of 0.1 percent during the review period to 2.5 percent over the forecast period.

Asia Pacific will continue to account for the largest share of the global construction industry, given it includes the large markets of China, Japan and India. However, the pace of growth will slow, given the relative sluggishness in China's construction industry, the expansion of which will be undermined by the glut of new residential property. The emerging markets of Southeast Asia will invest heavily

in new infrastructure projects, supported by private investment.

Construction industries in most Western European countries are recovering but, on the whole, output in real terms will remain below the pre-crisis highs. Ongoing troubles in the eurozone and the Russia-Ukraine crisis mean that investor confidence is still fragile. Germany's construction industry will remain slow moving, hampered by weak investor confidence and the government's focus on austerity.

Large-scale investment in infrastructure projects, mostly related to transport, will be a key driving force behind the rapid growth in construction in the Middle East and Africa. Qatar's industry will remain the fastest growing in the world over the forecast period, with a number of multi-billion infrastructure development projects either planned or underway. The fall in oil prices will put some energy projects at risk, and will weigh heavily on government finances in economies dependent on revenues from the oil and gas sector.

Latin America's construction industry is anticipated to expand at a slower pace than other emerging market regions, mainly as a result of contraction in Brazil. Economic uncertainty will continue to undermine investor confidence in Argentina, while Venezuela will remain troubled. Mexico's industry is recovering from a period of weakness, and will be supported by investments in infrastructure and residential projects. Weak copper prices are having an adverse effect on Chile and Peru, and a continuation of this situation could put new metal projects at risk. ■

Tomas Kuta named Volvo CE's senior VP for sales



Tomas Kuta (left) has been appointed as senior VP for sales at Volvo Construction Equipment (Volvo CE). In his new role, Mr Kuta will be responsible for leading the development and delivery of Volvo CE's global sales strategy. He will serve as part of the executive management team and report to Martin Weissburg, Volvo CE's president.

Since joining Volvo in 1997, Mr Kuta has held a number of senior management positions including VP Global Marketing for the company's articulated hauler business and VP in Region International. He has also been heavily involved with market and dealer development globally. In addition, he was head of Russian and Ukrainian dealerships during

2005-2008 and was responsible for the sub-region RUB (Russia, Ukraine, Belarus) during the same period.

Mr Kuta was also formerly president of the Global Customer Support function from 2008 to 2011. Most recently, he was president for the company's EMEA (Europe, Middle East and Africa) sales region where he successfully increased dealer engagement and customer satisfaction as well as overseeing the merger of the two sales regions (Europe and International) and driving strong general purpose machine market share growth in most markets.

Prior to joining Volvo, Mr Kuta was managing director of the Apple Computer Market Company in the Czech and Slovak Republics, headed Colliers International in their expansion to Eastern Europe and spend a number of years with Snowbird and Aspen Corporations in the area of marketing & sales in the US and in Chile, South America. ■

FLSmidth partners with Wirtgen

FLSmidth has signed a long-term cooperation agreement with Kleemann, part of Wirtgen Group, on supply of cone crushers for mobile applications in the construction industry. This partnership brings together FLSmidth's technology expertise within cone crushers with Kleemann's strong position in the mobile crushing in the construction and aggregate industry.

"This alliance is a result of FLSmidth's strategy to cooperate

and develop technology in partnership with leading peers. As FLSmidth is the main provider of productivity within minerals and cement and Kleemann has a strong foothold in the construction industry, it provides a unique opportunity for FLSmidth to expand into adjacent markets," said Manfred Schaffer, group executive vice president of the Minerals Division at FLSmidth. ■

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Date	Events in Asia	Organiser & Contact
24 to 26 Aug 2016	OS+H Asia 2016 Suntec Singapore Singapore	Messe Duesseldorf Asia Tel: +65 6332 9620, Fax: +65 6332 4633 Email: osha@mda.com.sg Website: www.osha-singapore.com
8 to 10 Sept 2016	Cambuild 2016 Diamond Island Exhibition & Convention Centre Phnom Penh Cambodia	AMB Events Group Tel: +60 3 4041 9889, Fax: +60 3 2770 5301 Email: richard@ambexpo.com Website: www.cambuildexpo.com
14 to 16 Sept 2016	Concrete Show South East Asia 2016 Jakarta International Expo Jakarta Indonesia	UBM Tel: +62 21 2930 5959, Fax: +62 21 2930 5960 Email: niekke.budiman@ubm.com Website: www.concreteshowseasia.com
21 to 23 Sept 2016	Concrete Asia 2016 IMPACT Exhibition and Convention Centre Bangkok Thailand	Impact Exhibition Management Co Ltd Tel: +65 6702 3005 Email: theresa.gan@giec.biz Website: www.concrete-asia.com
18 to 20 Oct 2016	BuildTech Asia 2016 Singapore Expo Singapore	Sphere Exhibits Pte Ltd Tel: +65 6319 4037, Fax: +65 6319 6140 Email: buildtechasia@sph.com.sg Website: www.buildtechasia.com
3 to 5 Nov 2016	OneBuild 2016 Kuala Lumpur Convention Centre Kuala Lumpur Malaysia	One International Exhibition Sdn Bhd Tel: +603 8943 7488, Fax: +603 8943 7599 Email: info@oneinternational.com.my Website: www.oneinternational.com.my
9 to 11 Nov 2016	Konstruksi Indonesia 2016 Jakarta Convention Centre Jakarta Indonesia	PT. Infrastructure Asia Tel: +62 21 391 3037, Fax: +62 21 391 3349 Email: dwi@infrastructureasia.com Website: www.constructionindonesia.com
10 to 13 Nov 2016	Philconstruct 2016 SMX Convention Centre & World Trade Centre 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
22 to 25 Nov 2016	Bauma China 2016 Shanghai New International Expo Centre Shanghai China	Messe München GmbH Tel: +49 89 949 20251, Fax: +49 89 949 20259 Email: info@bauma-china.com Website: www.bauma-china.com
1 to 3 Dec 2016	Myanbuild 2016 Myanmar Event Park Yangon Myanmar	AMB Tarsus Events Group Tel: +60 3 4041 9889 Email: darren@ambtarsus.com Website: www.myanbuild.net
12 to 15 Dec 2016	Bauma Conexpo India 2016 HUDA Ground, Gurgaon Delhi India	Messe München GmbH Tel: +49 89 949 20251, Fax: +49 89 949 20259 Email: info@bcindia.com Website: www.bcindia.com
Date	Events outside Asia	Organiser & Contact
17 to 20 Jan 2017	World of Concrete 2017 Las Vegas Convention Centre Las Vegas, Nevada USA	Informa Exhibitions Tel: +1 972 536 6379 Email: info@worldofconcrete.com Website: www.worldofconcrete.com
22 to 25 Feb 2017	Samoter 2017 Verona Exhibition Centre Verona Italy	Veronafiore Tel: +39 045 829 8111, Fax: +39 045 829 8288 Email: info@samoter.com Website: www.samoter.com
7 to 11 Mar 2017	Conexpo-Con/Agg 2017 Las Vegas Convention Centre Las Vegas, Nevada USA	Association of Equipment Manufacturers Tel: +1 414 298 4167, Fax: +1 414 272 2672 Email: international@conexpoconagg.com Website: www.conexpoconagg.com

Project Highlight: Sky Habitat



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IPAF Asia Conference returns to Singapore

The next IPAF Asia Conference & Showcase will be held on 20 and 21 July 2016 at the ITE College West, Bukit Batok, in Singapore. The event provides a regional perspective on safety and productivity in the use of mobile elevating work platforms (MEWPs) and mast climbing work platforms (MCWPs), as well as marketing and business opportunities in this growing sector. It will feature conferences in the morning and product showcases in the afternoon.

The conference keynote speaker is Alan B. Loux, vice president marketing of Access Segment at JLG, who will deliver a presentation on 'The future of MEWPs'. Other confirmed speakers include Jonathan Wan, managing director of Transvert Scaffold & Engineering, on the Singapore standard on the safe use of MEWPs and how it affects end-users; Shahid Qureshi, director of Product Safety & Reliability at Haulotte, on MEWP maintenance; Kimmo Koskensalo, chief technology officer of Scanclimber, on modern MCWP applications; and Jim Barr, vice president/general manager of Terex Aerial Work Platforms China, on how to run a successful MEWP business.

The Singapore Institution of Safety Officers is the co-organiser of the event. A networking night will also be held on 20 July at the Singapore Zoological Gardens and includes a complimentary ticket to the Night Safari.

Continuous Professional Development (CPD) points are available for IPAF instructors and senior instructors, as well as affiliates of



The product showcase at the IPAF Asia Conference will illustrate how MEWPs are a safe and productive way to work at height.

the Singapore Institution of Safety Officers, Professional Engineers Board, Institute of Occupational Safety and Health, and the Institution of Engineers Singapore. ■

Website: www.ipaf.org/asiaconference

APEX prepares for ninth edition

The global aerial platform exhibition, APEX, will return to the Amsterdam RAI exhibition centre from 2 to 4 May 2017 for its ninth edition. According to the organisers, as of May 2016 the show is already 85 percent sold out and they are expecting it to match the previous edition in June 2014 when more than 100 companies exhibited.

APEX 2017 will again be sponsored by Access International magazine and supported by the International Powered Access Federation (IPAF). The show will be co-located with the International Rental Exhibition (IRE) and the European Rental Association's annual convention, which will ensure the presence of Europe's largest equipment rental companies.

"APEX is dedicated to access equipment and remains the best place for equipment buyers to see all the latest products, conveniently, under one roof. There is also evidence that Europe's rental companies are entering a period of fleet re-investment, which makes the timing of the exhibition very good," said Tony Kenter, managing director of show organiser Industrial Promotions International (IPI).

Visitors to APEX 2017 will be able to find a wide variety of equipment, including self-propelled machines, vehicle mounted platforms, hoists and mast climbers, low-level platforms and access towers. In addition, there will be used equipment specialists, rental software companies and other suppliers of ancillary products and services.

APEX 2014 attracted more than 100 exhibitors and around 4,400 visitors, although that number rises to 5,500 when visitors to the neighbouring International Rental Exhibition (IRE) are included. Visitors to each show had free access to the other.

APEX was first held in 1996 at the Maastricht Exhibition and Congress Centre (MECC) in Maastricht, the Netherlands. The



Above and left: APEX will return to the Amsterdam RAI exhibition centre in May 2017.

subsequent six APEX shows were also held in Maastricht, before it moved to Amsterdam for the first time in 2014. ■

Website: www.apexshow.com



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*2 Based on the assumption of 1,500 hours of use a year.

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Conexpo-Con/Agg to present 'the future'

Conexpo-Con/Agg 2017 will feature the new Tech Experience Pavilion, where visitors can actually step into the future and experience what's new and next in the construction industry - this is in line with the show's theme, 'Imagine What's Next'. Located in Silver Lot 3, the new 75,000 sq ft area is dedicated entirely to presenting new construction innovations and emerging technologies that will drive change and process improvement across the industry.

Conexpo-Con/Agg 2017 will take place at the Las Vegas Convention Centre, USA, from 7 to 11 March 2017. It will be co-located with the IFPE exhibition for fluid power, power transmission and motion control. Both shows are produced by the Association of Equipment Manufacturers (AEM), which also is a show owner.

"The Tech Experience will not only present a vision for the future of our industry, but it will also raise awareness of technologies that enhance safety, productivity and profitability," said Sara Truesdale Mooney, show director and vice president exhibitions and business development for AEM. "Attendees will explore three key zones: the worksite of the future, the jobs of the future and the infrastructure of the future. We'll also feature additional engagement zones including a Maker Beta Lab that will feature a collaborative future factory environment and the world's first fully functional 3D-printed excavator."

The student engineering team from the University of Illinois at Urbana-Champaign (UIUC) has submitted the winning design for an aesthetic and functional excavator cab that will be 3-D printed and on display at the Tech Experience. Members of the UIUC team will receive a US\$2,000 cash prize, donated by the National Fluid Power Association (NFPA), and will have the opportunity to travel to Oak Ridge National Laboratory (ORNL) in Tennessee to observe the printing of their design.

Besides the pre-printed excavator, visitors will also get to see a demonstration of the 3D printing technology on the show floor. "Additive manufacturing will revolutionise the way things are designed



Conexpo-Con/Agg 2017 will feature the new Tech Experience Pavilion to showcase future innovations.

and produced in the not-so-distant future," said Mike Gust, industrial liaison officer at the Centre for Compact and Efficient Fluid Power (CCEFP). "This contest helped to raise awareness of advancements in technology to the next generation of engineers and we're excited that future engineers are bringing this newly designed machine to life."

CCEFP is working with research teams from Georgia Tech and the University of Minnesota to convert the current excavator design to one that is conducive to and takes full advantage of 3D manufacturing. Graduate engineering students at Georgia Tech will create a boom and bucket featuring integrated hydraulics with the goal of decreasing the weight, materials cost and maintenance, while students at the University of Minnesota are designing a hydraulic oil heat exchanger and cooling system that reduces the size and weight and increase the efficiency of the machine. ■

Website: www.conexpoconagg.com

Singapore to host ITA Tunnelling Awards 2016

The International Tunnelling and Underground Space Association (ITA) is organising the second edition of the ITA Tunnelling Awards, which will recognise and reward excellent achievements and innovations in underground infrastructures worldwide. The event will take place in Singapore at the Marina Bay Sands Hotel, on 10 and 11 November 2016.

The first day (10 November) will feature a technical conference focusing on innovation and productivity in the tunnelling industry through eight high-profile keynote lectures. This will be followed by the Awards Conference on the second day (11 November), during which stakeholders of the pre-selected entries will present the last updates of their underground infrastructure projects.

The projects are divided into nine categories, which include: Major Tunnelling Project of the Year; Tunnelling Project of the Year; Outstanding Tunnelling Project of the Year; Renovation/Upgrading Project of the Year; Technical Innovation of the Year; Environmental Initiative of the Year; Safety Initiative of the Year; Innovative Use of Underground Space; and Young Tunneller of the Year.

ITA is a non-profit and non-governmental international organisation, which aims at promoting the use of underground space

as a solution to sustainable development. It was founded in 1974 and operates out of Lausanne, Switzerland.

According to ITA, Singapore was chosen to be the host country this year as it provides an inspiration in its approach to the use of subterranean space. Furthermore, it is a part of a continent where the tunnelling and underground space market is becoming more and more important (Asia represents 60 percent of the global infrastructure spending by 2025).

Nowadays, beyond the parking, offices, shopping malls, restaurants and mixed-use infrastructure, Singapore mostly exploits tunnels and underground spaces as storage of arms and ammunitions, gas and hydrocarbons, for sewerage, power supply, and also as a way of connecting all areas of the country, notably with its underground expressways and an expanding underground rail transport network. The land scarcity of Singapore has made its government to think three-dimensionally, integrating underground space, both in the vertical and horizontal construction. The country has initiated a review of its urban development, in anticipation of its future needs and sustainability of its infrastructure. ■

Website: <https://awards.ita-aites.org>

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MEWP fatal injury rate remains constant: IPAF

The fatal injury rate for mobile elevating work platforms (MEWPs) has remained constant, even though the total MEWP rental fleet and the number of rental days worldwide have increased. IPAF's release of the 2015 MEWP-related accident data and its preliminary fatal injury rate calculations thus confirms that MEWPs are one of the safest ways to perform temporary work at height.

For 2015, the number of days a rented machine was operated per year was 192.2 million and the number of reported MEWP fatalities was 68, to give a fatal injury rate of 0.035. Of the 68 reported MEWP fatalities for 2015, the main causes were overturn, falls from height, electrocution and entrapment.

In 2014, the number of days a rented machine was operated per year was 182.4 million and the number of reported MEWP fatalities was 64, to give a fatal injury rate of 0.035.

In 2013, the number of days a rented machine was operated per year was 168.4 million and the number of reported MEWP fatalities was 68, to give a fatal injury rate of 0.040.

The accident data from 2013 to 2015 show that the main causes of MEWP-related fatalities include fall from height (31 percent), overturn (27 percent), electrocution (15 percent) and entrapment (15 percent).

The MEWP fatal injury rate as calculated by IPAF takes into account several factors: estimated rental fleet size, based on the IPAF Powered Access Rental Market Reports; estimated average utilisation rates per



The MEWP fatal injury rate in relation to the millions of MEWP rental days worldwide.

country and worldwide (utilisation rate is defined as the share of the fleet out on rent at any time over a year); average days worked per year (five days a week for 50 weeks a year); and the number of fatalities involving MEWPs in a given year, based on the IPAF accident reporting project.

Presenting the research at the IPAF Summit 2016 in Madrid, Spain, Chris Wraith, IPAF technical & safety executive, noted that international accident data is presented in different formats, which sometimes makes it difficult to draw useful comparisons. He said, "MEWPs are part of the solution in preventing falls from height, but we should recognise that MEWPs introduce hazards that need managing. Engineering control is but one option, and the industry is starting to work together on a global scale to ensure continual improvement." ■

IAPA 2016 winners



More than 400 industry professionals gathered on 17 March 2016 in Madrid, Spain, to recognise and honour the winners of the International Awards for Powered Access (IAPAs). Jointly organised by Access International and IPAF, the IAPAs celebrate best practice and excellence in the powered access industry. The winners include:

- **IAPA Innovative Technology Prize:** France Elevateur, France, for the 172 ATBI platform
- **IPAF/Access International Lifetime Achievement Award:** Art Moore, USA, founder of Snorkel
- **Access Rental Company of the Year:** Nationwide Platforms, UK
- **Powered Access Pioneer:** Genie, USA
- **Contribution to Safe Working at Height:** AFL, UK
- **Product of the Year – Mast climbing work platforms/hoists:** XL Group, France, for the XMH multimast platform
- **Product of the Year – Self-propelled above 20 ft / 6.1 m:** Almac, Italy, for the BIBI 850-BL
- **Product of the Year – Self-propelled below 20 ft / 6.1 m:** Haulotte, France, for the STAR 6
- **Product of the Year – Vehicle/trailer-mounted:** Time Versalift, Denmark, for the LAT-38-135-H
- **Project of the Year:** Hydro Mobile, Canada, for the new FAA Control Tower at Tucson Airport, Arizona, USA
- **IPAF Training Centre of the Year:** Maltech, Switzerland
- **IPAF Instructor of the Year:** José Ramón Etxebarria Urrutia, P&M 2000, Spain
- **Access Photograph of the Year (sponsored by Facelift):** Trevor Chapman, UK, for Castlecary Viaduct, Glasgow (submitted by Nationwide Platforms).

The next IPAF Summit and IAPAs will be held on 4 April 2017 at the Hilton Hotel, Wembley, London, UK. ■

Website: www.iapa-summit.info

IPAF Conference in Changsha



More than 50 people representing about 30 companies attended the IPAF Conference in Changsha, China, in early May 2016. Topics covered at the conference included the sustainable development of MEWPs, an introduction on MCWPs by Alimak Hek China, and new operational methods using MEWPs in tunnels. ■

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With a high resolution, illustrative touchscreen, high productivity is also ensured – with 2D grid views, an assisted workflow process and on-site post-processing of the measured data. Together with the included PC software, it allows an excellent statistical analysis of the data with efficient custom reporting. ■

Website: www.proceq.com



Right: Proceq's new Profometer Corrosion.

Wireless controlled Enerpac SHAS SyncHoist system

The SHAS Series Synchronous Hoist System – the latest in a growing range of SyncHoist systems developed by Enerpac – is a below-the-hook crane attachment operated by a single wireless controller to provide accurate, safe and cost-effective positioning of heavy and unbalanced loads without the need for multiple cranes.

SHAS comprises four, double acting, push-pull cylinders connected to lifting points above the load by cables or under an optional auxiliary frame, enabling accurate hoisting where space is limited. The lifting cylinders are available with 110 and 225 t lifting capacities each, plunger strokes of 1 and 1.5 m and capable of high precision lifting accuracy of +/- 1 mm over the full stroke. Each double-acting cylinder features integrated pump and controls, eliminating the need for an external power pack and removing the complexity of hydraulic hoses and connectors.

SHAS technology is applicable to all industries where tower, crawler, mobile and overhead cranes are used to lift odd-shaped loads with off-centres of gravity. Some suitable applications include positioning of roof sections, road and rail bridge sections, concrete elements and steel structures; positioning of turbines, transformers and fuel rods and electrical plant including wind turbine nacelles,



Left and below left: Enerpac autonomous wireless SyncHoist system is particularly useful for fine positioning of heavy and unbalanced loads. A single operator can control and oversee the entire hoisting job, using a portable wireless control unit for remote control of all cylinders.



rotor heads and blades; machinery loading, mill rod changes and bearing changes; positioning of pipelines and blow out valves; and positioning and aligning of ship segments prior to assembly.

A single operator can control and oversee the entire hoisting job, using a portable wireless control unit for remote control of all cylinders. In addition to synchronous lifting and lowering, the operator is able to lift and lower each cylinder independently for balancing, tilting and positioning loads. For repetitive hoisting tasks, the controller can also be pre-programmed for positioning, tilting and aligning of loads. The wireless controller allows the operator to work at a safe distance.

The SHAS system is fully compliant with global standards, so it can be used on projects all over Southeast Asia and globally. ■

Website: www.enerpac.com

Terex unveils various new cranes

The new Terex CTT 332-16 flat-top tower crane is designed for heavy lifting and placement duties on challenging jobsites. The crane features a jib length of 75 m, a jib tip capacity of 3 t and a maximum lifting capacity of 16 t. It can be erected with three different tower systems and has a maximum freestanding height with standard configuration of 98.35 m. Crane parts dimensions, weights and modularity provide an excellent choice for erection and transport.

The new 80-t capacity, Terex RT 90 rough terrain crane, features an enhanced control system with integrated diagnostics, a redesigned cab with an 18-degree tilt and an easy access flat deck for improved visibility. The five-section, full hydraulic boom stretches 47 m for long reach applications, and the multi-stage outriggers are designed for a variety of outrigger positions. Transporting and operating costs are reduced due to the crane's narrow width of 3 m and central lubrication system.

Designed for roadability and versatility, the Terex AC 40/2L all-terrain mobile crane delivers a reach of up to 37.4 m, for a maximum tip height of 47 m. Combining the advantages of short telescoping times and high load telescoping capacity in all configurations, this highly mobile, two-axle all-terrain crane is capable of lifting up to 40 t at 2.6 m radius. Equipped with independent rear steering and an easy-to-operate counterweight unloading system - to make it simple for users to spread the load equally across each axle - the AC 40/2L all-terrain crane offers driving speeds of up to 80 km/hr.

The Terex Challenger 3180 all-terrain mobile crane incorporates several enhancements to increase productivity and reduce operating costs. The crane is in the 60 t capacity class, with a 50 m single cylinder telescoping system. Designed for one-person operation, the crane has an automated counterweight rigging system for easy and fast setup. Its main boom can be tilted up to 5 degrees under floor to avoid working at heights as well as to make rigging easier and safe. ■

Website: www.terex.com/cranes



Above: Terex CTT 332-16 flat-top tower crane features a maximum lifting capacity of 16 t and a jib length of 75 m.

Right: Terex RT 90 rough terrain crane has a five-section, full hydraulic boom that stretches 47 m for long reach applications.



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Compact Commando DC130Ri surface drilling rig

The new Commando DC130Ri is the latest addition to Sandvik Construction's surface drilling product offering. Modular design and practical layout of components, new efficient rock drill and a new intelligent control system with large on-board touch screen, are the core features of this new machine. The fully remote-controlled, hydraulic and self-propelled compact size drilling unit, with four-wheel carrier, is designed for drilling 22-45 mm holes.

A completely new RD106 rock drill providing a high 5.5 kW output power, and a new intelligent drilling control system, form the basis for Commando DC130Ri's high penetration rates. Performance is further enhanced with the machine's large drilling coverage area, and a new forward pointing feed that allows it to drill closer to structures than before.

The machine also possesses the functionality to have roll-over for the feed, change drill steels on the rock drill, and to adjust the drill rig to challenging environmental conditions with additional appliances such as the fuel powered engine heater. All this ensures that the Commando DC130Ri is a versatile drill rig that is easily adaptable to changing job sites, and different drilling applications. These include road construction, demolition works, secondary breaking, foundation drilling, trenching, shaft sinking as well as dimensional stone quarrying.

The new intelligent control system of the Commando DC130Ri provides modern machine control features that until now have been found only on larger drill rigs, said Sandvik. Intelligent engine control provides operating cost savings through lower fuel consumption by optimising the engine power based on actual requirements. The advanced drilling control ensures smooth drilling, and is gentle to drill steels. High performance is further enhanced by being able to increase percussion pressure while drilling without sacrificing rock tool life.

The 175 mm on-board touch screen enables effective monitoring allowing changes to machine functions. It provides different views for adjustment, aligning and drilling, as well as diagnostics for trouble shooting purposes. The Commando DC130Ri may also be equipped with several optional control system features, such as the torque control and automatic feed-percussion-follow-up, which enables automatically adjusted drilling in varying conditions. Additionally,



The new Commando DC130Ri is compact in size, featuring a new rock drill and a new intelligent control system. The machine is designed for drilling 22-45 mm holes.

the new control system enables the use of the TIMi aligning and inclination system as well as the SanRemo remote monitoring service.

The Commando DC130Ri is equipped with four high-torque tramming motors, and skid steering that makes the unit extremely mobile. The machine is well balanced, with an optimised centre of gravity, which means it is able to reach steep slopes without any problems. In case of higher inclinations, a hydraulic winch with automatic rope tension control is available as an option.

For added drilling stability, the Commando DC130Ri comes with extendable front ground legs as a standard. The machine has a completely new modular design and component layout that allows easy reach to all service points and components. The whole carrier is divided into four main modules, which can be dismantled when making major overhauls.

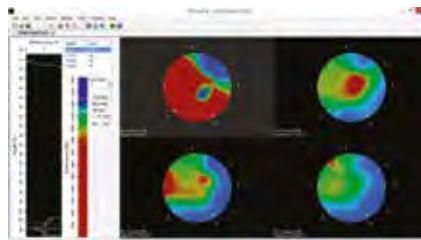
The Commando DC130Ri is powered by a fuel-efficient and low-emission Cat C2.2 Tier 3 engine. ■

Website: www.construction.sandvik.com

New Tomography software for CSL data

Pile Dynamics has released the new PDI-Tomo software for analysis of Crosshole Sonic Logging (CSL) data. The programme replaces an older tomography programme, with significant advantages.

Crosshole Sonic Logging evaluates the integrity of the concrete of drilled shafts and other bored or cast-in-place deep foundations. Ultrasonic transmitters and receivers are inserted in the foundation and an instrument such as the Pile Dynamics' brand CHAMP-XV collects the data. Its software CHA-W analyses the propagation of the waves emitted by the transmitters, indicating potential concrete problems.



Pile Dynamics has introduced the new PDI-Tomo software for analysis of CSL data.

Tomography analysis with PDI-Tomo takes the examination many steps further, allowing a better estimate of the extent of irregularities or defects. It combines arrival

time data from the scans of all pairs of tubes, analyses the data and displays it in various views.

Once CSL testing is complete and data is processed, the transition from CHA-W to PDI-Tomo is done in a seamless step. PDI-Tomo has been designed for fast data processing, improving the productivity of CHAMP-XV users. Programme functions are intuitive and many features are automatic (for example, PDI-Tomo find the depths where data suggests that a detailed investigation of integrity may be warranted). The PDI-Tomo output is highly customisable to fit the needs of each user. ■

Website: www.pile.com/CHAMP

Auger Torque sweeper broom for various applications

Auger Torque's new sweeper broom has a low profile design for enhanced operator visibility. It features easy adjustment, simple brush replacement and low maintenance design. Available in a number of variations and sizes for skid steer loaders, front end loaders and telehandlers, the broom is suitable for various applications. It can be fitted with an optional high capacity water spray system for keeping airborne dust to a minimum.



Auger Torque's new sweeper broom has a lightweight aluminium brush, with a sweep width of 1,800 mm.

The broom is made of high grade steel, with a lightweight aluminium brush, a 1,800 mm sweep width and a lockable bucket cover for convenient brush access. Its modular motor fits to left or right side to match hydraulic connections. Other features include a forward and reverse motion, reversible bolt-on cutting edge, easy-to-change rubber dust suppression skirts and steel guide wheels. ■

Website: www.augertorque.com.au



The broom can be fitted with an optional water spray system.

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Allen's high performance HP105 riding trowel

The HP105 from Allen Engineering is a high performance, twin engine ride-on power trowel delivering a total of 53 hp. It uses the torque converter clutch, resulting in excellent low speed torque for low speed oat panning and superior high rotor speed for finishing concrete.

The HP105 is the latest addition to Allen's riding trowel lineup, with standard features including twin EFI Kohler engines for more durability and power; two 6-gallon fuel tanks providing extended and equal run time for each engine; two 46-in diameter, five-blade non-overlapping rotors, with rotor speeds of up to 180 rpm; electric powered spray system for application of retardant; and six gallon fuel/retardant capacities. ■

Website: www.alleneng.com



Right: Allen's new HP105 riding trowel.

Quiet and environment-friendly light towers

Pramac's LSW8T light tower has a whisper, quiet noise level of just 65 dBA at 7 m and a long-run fuel tank. Transporting this unit is cost effective, as up to 10 sets can be delivered on a standard 12 m vehicle. According to Pramac, the LSW8T is a popular model around the world, including in Europe, Australasia, South Africa and the Middle East. It is suitable for various applications, ranging from outdoor events to construction and highway projects, as well as for mines, carparks, industrial sites, airports, warehouses and pedestrian areas at public events.

For 'green' lighting solution, the Pramac LSW5Y may be the answer. This light tower features a very low diesel fuel consumption, with fuel savings of up to 75 percent compared to a traditional light tower, thanks to the combination of a high luminous efficiency with a low energy consumption engine, said Pramac. The LSW5Y is ideal for building sites, rental companies and road works.

In addition, the Pramac LQW5K light tower has a compact design and its base configuration ensures that during operation, the unit cannot be moved or towed. Its new internal locking system also ensures safe and secure locking of stabilisers.

The LQW5K features good internal accessibility, having five doors for a wider access - four of which are wide enough to provide a complete access to the technical area. The fifth door is a compass-top door

for safe and convenient maintenance access of the engine. Transportation is also cost effective, as it is possible to load up to 20 units on a single truck.

Pramac's LSW-series light towers are suitable for outdoor use such as road and bridge projects, general construction works, oil and gas applications, as well as emergency and disaster relief efforts. Provided with manual or hydraulic lifting, they are equipped with a site or road trailer for quick deployment and manoeuvrability. Thanks to the 4 -1,000 W metal halide lights, these integrated towable light towers can cover more than 4,000 sq m.

Furthermore, Pramac offers Light Globes to those who are looking for fast, high-powered lights with nylon balloons that automatically inflate with air in a few minutes, which are also easy to use, install and transport. ■

Website: www.pramac.com



Top right: The LSW5Y light tower features a very low diesel fuel consumption, with fuel savings of up to 75 percent compared to a traditional light tower, said Pramac.

Right: The LQW5K light tower has a compact design and its base configuration ensures that during operation, the unit cannot be moved or towed.

Tsurumi Tandem Kit enhances operation

Tsurumi's new Tandem Kit is designed for use in applications where draining with high head is required, such as those at mining, construction and tunnel work sites. The kit is attached to the casing of the LH and LH-W series pumps that feature high head and a slim design.

With the Tandem Kit, two pumps of the same model can be easily connected in series. The tandem operation can provide twice the total head of a single pump at a fixed flow rate, according to Tsurumi. The operating principle of this method is the same as that of a multi-stage pump.

Tsurumi has six 3-30 kW pumps that are applicable with the Tandem Kit, most of which have a dual impeller design. The kit can be easily attached to the pumps at the work site. With this kit, an ultra-high head of a maximum 254 m can be achieved; a head of 400 m is also possible with optional features. In many cases of tandem operation, pump models equipped with pressure relief ports are selected, said Tsurumi, in order to prevent discharge pressure from being directly applied to mechanical seals.

Tsurumi further explained that most of the cylindrical pumps used for tandem operation have a centre flange structure that allows discharge piping to be aligned with the centre axis of the pump. However, with general pumps whose discharge port is not aligned with the centre axis of the pump, it is difficult to balance the connection

between the two pumps, as well as to install the pumps. The centre flange structure, on the other hand, enables the pumps to be well balanced in the direction of the pump axis. Therefore, when two pumps with this structure are connected in series via the tandem connector, they can be installed in a hole of an 8- to 16-in bore owing to their slim design.

In applications at construction and mining sites, pumps often need increasingly higher head as work progresses. In such a case, Tsurumi said that higher head can be obtained with the addition of a second pump for tandem operation, instead of installing a new pump that meets the requirement. ■

Website: www.tsurumi-global.com



Right: The Tsurumi Tandem Kit is used by attaching it to the casing of the LH and LH-W series pumps.



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JCB Loadall telehandler marks another milestone

JCB recently celebrated the production of its 200,000th Loadall telehandler, reaching another milestone in the product's history. The Loadall range has been providing material handling and lifting solutions for construction, agricultural and industrial markets for almost four decades.

Launched in 1977 as the JCB 520, the first model was a two-wheel drive machine with a 6.4 m lift height and a maximum lift capacity of 2.25 t. Over the years the Loadall range has expanded significantly, incorporating machines with working heights of up to 20 m and maximum lift capacities exceeding 6 t.

Among other updates were introducing four-wheel drive, placing the engine to the side of the chassis to allow a lower boom mounting position, and offering multi-mode steering with equal sized wheels, to improve manoeuvrability. In addition, JCB is currently introducing low-emission Tier 4 Final engines to improve efficiency and cycle times when placing a load at height.

The models in the Loadall range have also grown rapidly, with the addition of the heavier lift 525 in 1980 and the lighter second generation 520-2 and 520-4 in 1981, the latter introducing four-wheel drive and larger rear wheels for improved traction on construction



A JCB Loadall telehandler on a jobsite.

sites. These models were also notable for the introduction of JCB's Q-fit implement carriage, which allowed operators to work with a range of bucket and attachments, as well as pallet forks. ■

Website: www.jcb-singapore.sg

New Dynaset HPTO

Dynaset has introduced its HPTO hydraulic power take-off at the bauma show in April. This new HPTO takes power out from a crankshaft to a hydraulic pump with the bolt-on belt drive. The structure of the bolt-on belt drive does not cause any traction to a vehicle's crankshaft, providing safe usage and longer lifetime for an engine.

The compact structure and the bolt-on assembly significantly reduce installation workload and save time compared to traditional PTO solutions, according to Dynaset. When engine compartment allows, the HPTO can be fitted on any vehicle with a transverse mounted engine. The output power of the HPTO is 30 kW while pressure is 210 bar and hydraulic flow 85 l/min.

The new HPTO with variable hydraulic pump enables the use of powerful hydraulic equipment also while driving. For example, hydraulic generator can be producing electricity for refrigerated transport equipment and electric tools. With the help of Dynaset technology, any vehicle can be equipped with hydraulic equipment to utilise its own engine power to produce electricity, welding current, high-pressure water, compressed air and so forth. The vehicle's fuel consumption remains the same when the hydraulic equipment is not running, said Dynaset. ■

Website: www.dynaset.com



The new Dynaset HPTO takes power out from a crankshaft to a hydraulic pump with the bolt-on belt drive.

Wick drain installation mast



Foundation Associates Engineering (FAE) manufactures wick drain installation masts (pictured). They are available in different sizes and configurations to meet various job requirements.

Paper drains are now being widely used in lieu of sand drains, according to FAE. A paper drain is a geotextile consisting of a grooved plastic or paper core covered by plastic or paper membranes to produce a 'wick' ranging from about 100 to 300 mm wide and 4 to 6 mm thick of the necessary length. The membrane cover provides a permeable soil barrier to reduce core clogging. The core provides a ready conduit to the surface into a sand or textile filter or into horizontal trench drains.

Paper drains are more cost-efficient, since per meter installation costs are typically one-quarter that of sand drains, said FAE. This can be installed to depths of up to 30 m using a conventional vibratory hammer and a special paper drain. ■

Website: www.fnapl.com

More powerful Brokk demolition robots

The updated Brokk 60 II remote-controlled demolition robot is now with 10 percent more power than the original Brokk 60. This new model has an upgraded hydraulic system, which increases the machine's power.

The Brokk 60 II has also been designed to be more manoeuvrable in tight spaces. Its movements are smoother and more precise than before. The machine weighs 1,102 lbs, and its overall dimensions remain the same as the original Brokk 60 - only 23.2-in wide and 34.3-in tall.

While mainly used in the construction industry, the Brokk 60 II is also ideal for other applications where limited space is common, such as mining, nuclear and process industries. The machine's three-part arm system works with a variety of attachments including hydraulic hammers, grapples, crushers and buckets to achieve flexibility and versatility.

In addition, the recently launched Brokk 120 Diesel is believed to be the world's smallest diesel-powered demolition robot, weighing less than one-fourth of the Brokk 400 Diesel. The six-gallon fuel tank and efficient operation allow run times longer than eight hours before refuelling.

The Brokk 120 Diesel's compact size - 31-in wide, 80-in long and 49-in high - enables it to pass through any standard door opening as well as manoeuvre in tight spaces. Meanwhile, its light weight - about 2,700 lbs - allows it to drive over weight-restricted floors and helps make it easy to transport to and from sites.

Powered by a compact and efficient diesel engine, the Brokk 120 Diesel can run a full shift independent from any power source. This flexibility comes without sacrificing any of the power and performance of its similar-sized electric-powered sibling, the Brokk 100. Plus, the Brokk 120 Diesel uses the same attachments and generates the same hydraulic power as the Brokk 100, increasing its versatility.

The construction industry can benefit from Brokk 120 Diesel for its easy transport, diversity of attachments and light weight, which make it ideal for a wide range of jobs including demolition and cutting. The machine also fits well in the process and underground industries, where use of a power cable can be inconvenient or inadvisable. ■

Website: www.brokk.com



Above:
The Brokk 60 II remote-controlled demolition robot has an upgraded hydraulic system, which increases the machine's power.



Left:
The Brokk 120 Diesel is believed to be the world's smallest diesel-powered demolition robot.



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Robbins TBM overcomes Chennai Metro challenges

On 27 January 2016, a Robbins mixed ground EPB broke through at Chennai Metro, India, finishing up a challenging second drive that saw the full gamut of difficult conditions. The 1,027 m long second drive for the machine was part of Lot UAA-01 on Line 1 of the city's metro, consisting of two parallel 1-km tunnels running from the Washermanpet area towards Chennai International Airport. The contractor on the project is Afcons Infrastructure Ltd.

The 6.65 m diameter Robbins EPB was designed to excavate granite, sand, silt, and clay with boulders up to 300 mm in diameter. The specialised design utilised a combination of 17-in diameter disc cutters as well as soft ground tools. Small grippers located around the circumference of the machine's shield allowed for cutterhead stabilisation in harder ground, while additionally reacting the forces needed to pull the cutterhead back from the face in difficult conditions.

The TBM was launched on its initial drive in January 2012 from a 28 m deep starting pit. Challenges began nearly from the outset, said Robbins. The TBM bored into mixed face conditions that contained varying strengths of granite, from weathered to hard granite of 150 MPa UCS. The unexpectedly hard rock caused high cutter consumption rates and slowed advance.

Robbins provided a geologist who carried out face mapping for the whole of the first drive, in both hyperbaric and open mode conditions on a daily basis. The data not only assisted in operating the TBM, but also provided a comprehensive geological record for the second drive. With the data gleaned from the geological investigation, Robbins was able to advise Afcons on the optimal operating parameters to get through the difficult conditions, including cutterhead RPM, thrust pressure, penetration rate and cutterhead torque. The parameters also resulted in a reduced cutter consumption rate.

The TBM was launched on its second tunnel in February 2015. Afcons explained that the team experienced very high water pressure in this alignment, as the water table in Chennai is just 1.5 m underground and the strata above the crown included silty sand, clay and weathered rock. It was very important to maintain the earth pressure to reduce the inflow of water, and to avoid any settlement on the surface with proper grouting. Despite the challenges the TBM was able to complete a section below the Koovam River without any water flowing into the tunnel. The machine achieved up to 12.6 m in one day and 62 m in one week.

The TBM broke through into a receiving shaft, utilising a setup for the second time that had the machine emerging under water. According to Afcons, these were the first breakthroughs in India under wet conditions in the retrieval shaft, which is 30 m below the ground level. The retrieval shaft was filled with Bentonite slurry 10 m from the base slab in order to arrest water entry from outside the diaphragm wall.

The completed sections of tunnel will now be commissioned as part of Line 1, a 32.1 km long route in total with 14.3 km underground and a total of 17 stations. ■

Website: www.robbinstbm.com

Right: The Robbins TBM was launched on its initial drive in January 2012. The 6.65 m diameter EPB was designed to excavate granite, sand, silt, and clay with boulders up to 300 mm in diameter.



Left: The Robbins EPB bored through unexpectedly hard granite rock in two parallel 1-km drives.

Below: Launched from a 28 m deep starting pit, the EPB experienced challenging ground nearly from the outset.



Providing quality asphalt hot mix for Sepang race track

The Sepang International Circuit (SIC) in Sepang, Malaysia, holds both local and international motor races, including the annual MotoGP Grand Prix as well as the Formula 1 (F1) Grand Prix. The venue was recently closed for track resurfacing works - from mid of February to early May 2016 - to ensure that the track continues to be homologated as Grade 1 circuit by the Fédération Internationale de l'Automobile (FIA), the organisation in charge of F1 races, and as Grade A circuit by the Fédération Internationale de Motocyclisme (FIM), the organisation in charge of MotoGP races.

The project involved resurfacing the entire 5.54-km race track, along with additional works to upgrade its drainage system, kerbs, run-off area tarmac at several Turns, and the shortcuts. Drivability at several Turns was also improved and the gravel beds at Turns 1 and 15 were rebuilt. Main contractor on the project was Nippon Road (M) Sdn Bhd.

Kajang Rocks Premix Sdn Bhd was appointed as the asphalt hot mix provider. To help complete its job, the company used a Lintec CSD3000 containerised asphalt plant, which features a capacity of 220 to 240 t/hr at 5-pct moisture content. For resurfacing the track to 40-mm thickness, the total asphalt hot mix produced was 20,000 t with bitumen mixture of Shell PG76. Shell PG76 is a polymer modified bitumen (PMB) specifically designed for heavy-duty application of asphalt mixture to increase fuel resistance and resistance to permanent deformation and cracking.

Lintec containerised asphalt plant is believed to be the first asphalt plant in the world that is built into 100 percent-ISO sea containers. With all parts built in containers, the setting-up and dismantling procedures are easy and quick as all parts have been preassembled and tested in the factory. The plant has also been designed to save on fuel consumption and require less maintenance with the dual-purpose screen drum technology that combines the drying and screening processes in one drum.

Lintec containerised asphalt plant is one of the product ranges offered by Linnhoff Technologies Pte Ltd, in addition to mobile asphalt plant, modular asphalt plant (CompactMix and TransitMix series), recycling asphalt plant (Hot Recycling and Cold Recycling series), and base stabilisation plant. ■

Website: www.linnhoff.com.sg



Above: A Lintec CSD3000 containerised asphalt plant was used on the track resurfacing project at the Sepang International Circuit.

Bottom and inset: The project involved resurfacing the entire 5.54-km race track, along with additional works to upgrade its drainage system, kerbs, run-off area tarmac at several Turns, and the shortcuts.



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Haulotte aerial platforms work round the clock

Haulotte aerial platforms have been working at the construction of Abu Dhabi Midfield Terminal Complex– Expansion Project (MTC) in the UAE. The machines were supplied through the company’s dealer, M/s United Gulf Equipment (UGER). There are currently 70 units on site, said UGER, and the project is expected to be completed by the end of 2017.

The construction of MTC and the expansion of Abu Dhabi International Airport are both important, as they enable the diversification of the Emirate’s economy by continued growth support to other industries through increased connectivity. Abu Dhabi Airports Company (ADAC) with joint venture of TAV, CCC and Arabtec signed an AED 10.8 billion contract in June 2012 for the construction of the Midfield Terminal Building (MTB) at Abu Dhabi International Airport, with opening planned in 2017. UGER joined the project in 2014, providing a significant number of Haulotte aerial platforms, which mainly comprises big booms.

Haulotte machines are designed to reach difficult areas, thanks to their excellent working envelope that was used to build the complex shape of the building and modern high tech elevation finishing. Most of Haulotte models working in MTC are the 32- and 41-m articulated booms, plus the 43-m telescopic booms. The 41-m articulated boom has a maximum outreach of 19.80 m and a lifting speed of less than 40 seconds, whereas the 32-m articulated boom and 43-m telescopic boom are known for their rough terrain capabilities. ■

Website: www.haulotte.sg



Top and above: Haulotte aerial platforms work on the Abu Dhabi Midfield Terminal Complex– Expansion Project.

Peri systems ‘form’ new warehouse facility

A new four-storey ramp up warehouse in the Tampines Logistics Park, Singapore, which was completed last year, has increased Keppel Logistic’s operating warehouse capacity by 20 percent to beyond 2 mil sq ft. This new air logistic hub features automated storage, tracking and handling systems, as well as incorporate environment-friendly building features for enhanced efficiency, productivity and sustainability.

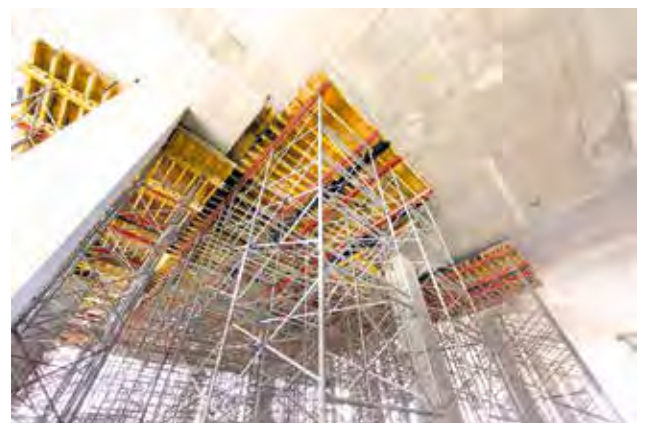
Peri was commissioned to supply its formwork systems for the new warehouse, which has a floor height of 9.50 m. One of the company’s solutions was the PD 8 slab table, which ensures stability at all times. The Vario GT 24 wall formwork was used with the CB 240/160 climbing system for the building liftcore casting. The Vario GT 24 is capable of assembling in any size, height and shape. It is designed to withstand concrete pressure of up to 50 kN / sq m.

In addition, the Vario GT 24 column formwork was chosen for the column casting due to the L-shape column panel. It comes with concreting platform for safe access and push pull prop for vertical alignment. ■

Website: www.periasia.com



Peri has supplied its formwork systems to build a new warehouse facility in Singapore. Here is a view of Peri PD 8 slab table and Vario GT 24 column formwork from outside the building.



The PD 8 slab table being used for heights of up to 9.50 m.

Potain crane helps build India residential project

Crane rental company Everest Construction Equipment debuted the first Potain MCT 85 crane in Karnataka, India, where it was leased for the construction of a 27-storey residential project called Mangalore Bhandary Heights. The crane was erected onsite in January 2015 and will be used until January 2017, working up to 22 hours a day to lift concrete, shuttering materials, blocks and structural steel.

The MCT 85 was manufactured in Manitowoc's Potain factory in Pune, India, with its proximity enabling shorter delivery times to India-based customers. This flat top crane is equipped with a 5 t maximum capacity and an ability to lift 1.1 t at its jib end of 52 m. The MCT 85 can be operated as an internal climbing crane, positioned inside the building it is constructing. Mounted on its 1.2 m mast sections, the crane can offer a maximum freestanding height of 33.2 m when operating internally.

With accessibility cited as one of the key issues faced at India's construction sites, the MCT 85 is also easy to transport. The crane's entire top portion transports on just two trucks. Thanks to pre-assembly work performed at the factory, on-site assembly is simplified too. For example, the counterjib and towerhead are fitted together as a single unit and can be lifted as such. Connecting the jib is simplified through the use of rapid pin connectors. This enables the tower crane's entire upperworks to be connected in just two sections. ■

Website: www.manitowoccranes.com



The Potain MCT 85 crane works up to 22 hours a day on the Mangalore Bhandary Heights residential project, lifting concrete, shuttering materials, blocks and structural steel.

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Sandvik crushers revolutionise production

One of Korean aggregates producers that recently invested in Sandvik crushing equipment is Wooryung, which is now using the CH430 cone crusher to produce a 30 mm product from a -150 mm feed material. The equipment is located at the company's site in Yeongwol, Gangwon province, with the crushed limestone being supplied to a steel company after desulfurisation.

Sandvik cone crushers, such as the CH430, combine high capacity operation with high reduction efficiency. With hydraulically adjusted CSS and automatic wear compensation, a choice of different crushing chambers and eccentric throws, plus many other high performance features, helps to ensure each model is versatile, user friendly and highly productive. All Sandvik cone crushers are optimised by 3D CAD and Finite Element Analysis (FEA). Each model is tested 'virtually' for stress, strain, shock, deformation, thermal loading, vibration and noise under a wide range of load conditions, with the end result being excellent reliability.



Left and right: Korean companies are investing in Sandvik crushing equipment.

Another Korean company, Bokwang, is using a Sandvik CV229 VSI crusher to produce sand from aggregate at its site in Gwangju, Gyeonggi province. The -35 mm aggregate is fed into the CV229 to produce a finished product of -5 mm, which is then used as sand.

Sandvik VSI crushers have been developed for tertiary and quaternary crushing of abrasive rocks. These crushers have been designed in such a way that they allow material to break along natural cleavage planes, thus producing stress free, cubical shaped products. This means that the VSIs' development ensures that product shape and size are consistent, but the innovative nature of the design also produces reduced power consumption, increased capacities and reduced maintenance costs.

Introduced in 2002, Sandvik's line of autogenous crushers, of which the CV229 is among the latest developments, utilises a rock lined rotor to accelerate material. This is then impacted in a highly energised rock lined crushing chamber and it impacts with material falling through the biflow system. The crushers incorporate the Sandvik Hurricane rotor, which became a major breakthrough in VSI autogenous rotor design due to its decreased vibration levels and wear part design, resulting in increased crusher bearing life combined with reduced maintenance. Standard Sandvik VSI crushers are fitted with a timed trapped two key system, which ensures the safety of maintenance personnel combined with electrical isolation.



Above: National Quarries in the UAE is also using a Sandvik CH660 crusher.



Furthermore, in the UAE, Sandvik crushers are also helping National Quarries LLC. The company has an annual production of 3.5-4 mil t of high quality aggregate, which is produced in a variety of sizes. The products are supplied to construction and readymix companies in the UAE and the surrounding area.

National Quarries uses a three stage crushing process to produce the large amount of accurately sized aggregates. This includes a 42x48 in jaw crusher as a primary; a cone working as the secondary crusher; and two impact crushers operating in a tertiary capacity. In 2013, the company replaced its existing cone crusher with a Sandvik CH660.

Since then, National Quarries said the total capacity of the plant has increased by 25 percent. And while the output from the old cone crusher was around 0-75 mm, with the CH660 the company can reduce the output to 0-63 mm, leading to a reduction of the close circuit on the tertiary impactors, and in turn increased lifetime of the wear parts in the impactors by 65 percent.

According to National Quarries, the company is also using 20 percent less fuel in its generators due to less power consumption. On top of that the 0-5 mm production, which is a less valuable product, has decreased by about 5 percent. In May 2015, National Quarries placed another order with Sandvik for one CJ615 jaw crusher, two CI532 impact crushers, one primary feeder and three product screens for its new crushing plant. ■

Website: www.construction.sandvik.com

Terex trucks boost fuel efficiency at Welsh quarry

Hogan Aggregates has added two TA300 articulated haulers to its existing Terex Trucks fleet, helping to increase fuel efficiency and productivity at the company's Coedana granite quarry, Caer Glaw, in Anglesey, Wales.

With nearly half a century of experience in the construction industry, Hogan Aggregates handles the production and supply of premium quality primary, secondary and recycled aggregates from four quarries in Anglesey, Wales. The recent purchase of 28 t capacity TA300s has been supplied by Terex Trucks dealer, TDL Equipment Ltd, which is based in Tankersley near Sheffield.

The existing Terex trucks currently operating in the quarry include TA27 and TA30RS articulated haulers. Hogan Aggregates said that both haulers have together accumulated over 21,000 hours since they were purchased.

The new TA300s, powered by fuel-efficient Scania engines, will be working tirelessly 10 hour days, five days a week, hauling blasted rock from the quarry face and transporting finished product to stockpiles around the site.

Built in Terex Trucks' Motherwell factory in Scotland, the TA300 articulated hauler is well suited for the quarry's applications, delivering reliable performance and cost-efficient hauling methods. ■

Website: www.terextrucks.com



Hogan Aggregates recently acquired two Terex TA300 articulated haulers to help increase fuel efficiency and productivity at the company's granite quarry in Wales.

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OITAGAWA DAM

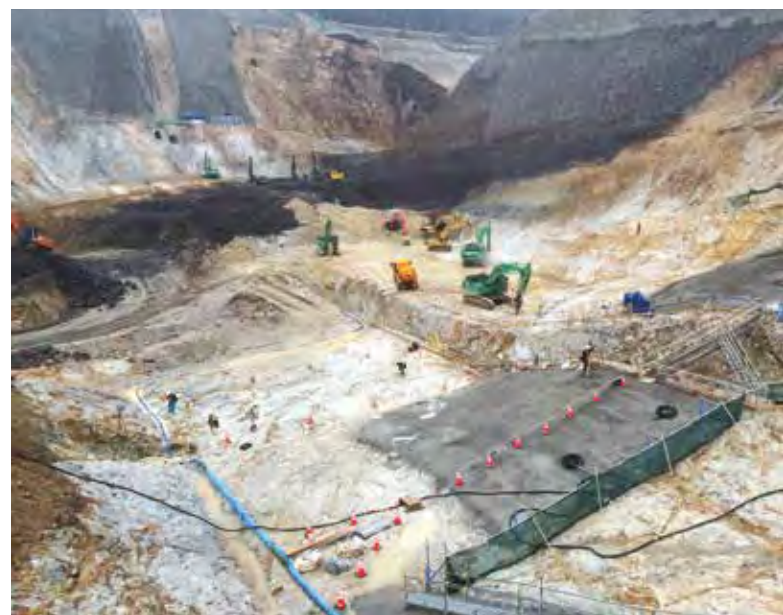
The construction of Oitagawa Dam is an important infrastructure project on Kyushu island, Japan. When completed, it will hold a total of 24,000,000 cu m of water. Kajima Corporation has been appointed as the main contractor for the project, and Tomijima Construction as the main earthworks subcontractor.

Started in 2013, the first phase of the dam includes breaking rock, removing rock and prepping the site area. In total, the team has moved 1.39 mil cu m of earth, before the next phase which will involve building up the rock dam wall. Once constructed, the dam wall itself will be 100 m high by 500 m wide and will include 3.7 mil cu m of rock and material.

Because of the slope and vertical elevations required for meeting the dam design, Kajima and Tomijima were looking to use Intelligent Construction Technology (ICT). Both companies then consulted with Nikon-Trimble Joint Venture (NTJV) to talk about project management and machine control options.

Improving excavation productivity

With support from NTJV, Tomijima equipped five excavators and five dozers with the Trimble GCS900 Grade Control System. The company has also utilised four Site Positioning Systems Essentials Kits and deployed Trimble SPS620 total stations to conduct high accuracy



structural works and checks. The Trimble Essentials Kits include the Trimble Site Mobile Controller, Trimble SCS900 Site Controller Software and Trimble SPS985L GNSS Smart Antenna. Tomijima selected the mobile controllers and connected communication system, so that it could send information from the field to the office – including design updates, GNSS corrections, telematics and production information.

Operators used the hydraulic excavators with 3D GCS900 machine control systems to excavate for the dam according to the design. Trimble said that traditionally, building a rock dam of this size would require the initial survey plus ongoing subsequent grade checking as dirt was being moved. That would involve checking and re-setting stakes close to where the excavator and rock crusher are working. Instead, with the Site Positioning Systems Essentials Kits and machine control, crews were kept out of harm's way and there was 90 percent less staking required compared to traditional methods.

Top and above: The Oitagawa rock dam on the southern island of Kyushu, Japan, is currently under construction and when completed, it will hold a total of 24,000,000 cu m of water.



Above, left and below: Tomijima equipped five excavators and five dozers with the Trimble GCS900 Grade Control System. The company has also utilised four Site Positioning Systems Essentials Kits and deployed Trimble SPS620 total stations to conduct high accuracy structural works and checks. Plus, it adopted VisionLink site productivity technology from Trimble for a holistic view of the project site and to track site productivity and materials movement.

With Trimble grade control, after an initial grade check, machine-mounted sensors calculate necessary bucket position to achieve the desired design. They also measure how much material must be moved. For about nine months, the GCS900 system was also used to guide the team's rock breaker attachment for the excavator. Traditionally, this step is needed to prepare the dam's foundation, breaking down the earth until the ground is solid enough to add fill for the dam material, explained Trimble.

Following the design profile on the in-cab control box, the rock breaker removed rock and overburden across the dam site by breaking rock to two to three centimeter pieces. With the GCS900 systems, the team reportedly achieved a 150 percent increase in productivity in managing and completing earthworks, moving 1.39 mil cu m of earth.

The team used the breaker and twin-header attachments with Trimble guidance to cut excess material. This was believed to be critical to saving time and money, not only because of the extra work in over excavating but because additional material that would have to be used for backfill.

Tomijima also adopted VisionLink site productivity technology from Trimble for a holistic view of the project site and to track site productivity and materials movement. The system monitors and records 3D earthmoving operations across



the project. Managers can also create real-time 3D surface models, elevation and cut and fill maps. With machine control and VisionLink, instead of taking an average of 2.5 hours to prepare and manage data, it now takes engineers on average of 30 minutes each day – an 80 percent time saving in managing the earthmoving process, according to Trimble.

By September 2015, the team has finished breaking down and moving rock totalling 1.39 mil cu m of material. Next, Kajima and Tomijima are bringing in fill material to build the rock dam walls. This provides even more opportunity to utilise VisionLink to track loads of material and associated productivity and efficiency in the next phase of the project. ■

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The power plant's coal dome is designed to minimise the surface area in which dust can settle as well as for the safe storage of the plant's fuel supply.

UNDER THE DOME

Black & Veatch has completed its prime EPC (engineering, procurement and construction) role at Therma South Units 1 & 2 near Davao City, in the Philippines. The additional 300 MW of power added to the grid is expected to help alleviate the daily power cuts faced by millions of Filipinos and complement the seasonally affected hydropower facilities in the region.

Therma South Units 1 & 2 are a circulating fluidised bed, coal-fired power plant owned by Therma South Inc, a wholly owned subsidiary of Aboitiz Power Corporation. Black & Veatch was appointed as the overall project and commissioning manager for the plant. The company provided balance-of-plant engineering and procurement services, and was also responsible for providing the EPC solution for material handling, plant-wide fire protection and offshore piping for cooling water, in addition to site management and commissioning services.

“The successful completion of the plant is coming at the right time as the coming dry season is expected to affect the power output from surrounding hydro power plants, which provide much of the region’s electricity today,” said Todd Edsall, project manager at Black & Veatch.

Coal dome

The plant features a coal dome - it is believed to be the first coal dome in Southeast Asia - designed in accordance with the environmental requirements set by the Department of Environment and Natural Resources of the Philippines. Its primary function is to minimise the surface area in which dust can settle as well as for the safe storage of the plant’s fuel supply.

Over 1,200 foundation piles were installed for the coal dome. The piles support a 120 m radius concrete ring wall that is nearly 20 m in height. The aluminium dome that reaches an overall height of 62.5 m sits on top of the concrete ring wall. There is also an underground tunnel that extends the entire diameter of the dome.

The outer diameter of the dome roof is 126 m and consists of 26 vertical ring sections with an approximate total weight of 280 t. The first 22 rings were built on the ground, which is a much safer option than building it in the air, said Black & Veatch. After each ring was built, the dome would be pneumatically jacked high enough so that the next ring could be built. Due to the concrete wall, the dome was jacked to its final position for the last four rings

to be installed in the air. After the dome was completed, a 1500T/HR circular stacker with a 36 m boom and 400T/HR circular reclaimer was installed.

According to Black & Veatch, it took approximately three months to complete the piling, eight months for the concrete civil works, four months to install the roof, and then three months to install the stacker and reclaimer inside the dome.

The piling work was carried out round the clock, and the use of concrete formworks was scheduled in hourly blocks. There was also a schedule that was monitored daily for the construction of the dome roof and circular stacker and reclaimer.

Difficult soil conditions

The plant is located next to the sea, at the confluence of two rivers and in a seismic Zone 4. The soil is silty and vulnerable to erosion and other extreme environmental conditions.

“The more we investigated the soil, the more we learned. Discrepancies in the data using different tests just highlighted the complexity of the overall soil conditions,” said Mr Edsall.

A constructability programme was devised in the proposal stage to enhance the plant’s design, tighten the delivery schedule and ensure everything was done with the construction process at top of mind.

“Such advanced project management was needed. The artesian groundwater conditions made it very difficult to collect reliable soil information during subsurface investigation and geophysical testing. Electronic piezometers, seismic cone penetration tests, continuous flight auguring and multichannel analysis of surface waves were some of the techniques used to help



The plant is located next to the sea, at the confluence of two rivers and in a seismic Zone 4. The soil is silty and vulnerable to erosion and other extreme environmental conditions.

“ EVERY TIME WE BORED INTO THE GROUND TO INSTALL A FOUNDATION OR PILE, WE RECEIVED NEW INFORMATION AND USED THIS TO CONTINUALLY EVOLVE OUR DESIGN. IT WAS A VERY DYNAMIC SCENARIO THAT REQUIRED CONSTANT DILIGENCE AND RE-EVALUATION. ”

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Therma Souths Unit 1 & 2 are now fully operational. The circulating fluidised bed, coal-fired power plant is designed to help alleviate the daily power cuts faced by millions of people in the Philippines and complement the seasonally affected hydropower facilities in the region.

gather valuable information. However, until the construction work actually began, the true extent of the groundwater was not fully understood,” explained Mr Edsall.

“Think of the site as a block of Swiss cheese. Every time we bored into the ground to install a foundation or pile, we received new information and used this to continually evolve our design. It was a very dynamic scenario that required constant diligence and re-evaluation. Then we encountered the limestone shelves.

“Unexpected limestone layers were discovered at the site at various locations and depths. The weak soils beneath the limestone shelves meant that it was not possible to terminate the piling in the limestone itself. This new technical challenge threatened to increase the amount of time required to drive the piles and increased the risk of pile damage.”

To avoid the risk of delay and increasing costs, the team decided that the piles in the limestone layers would be pre-drilled through the limestone shelf to reach solid bedrock. The civil, structural and geotechnical engineering team also had to design the power plant for the highest possible earthquake loads. The combination of silty soil in an earthquake zone created a further challenge - liquefaction, added Mr Edsall.

“Modelling earthquake events in the prevailing site conditions showed that the soil could develop properties of a liquid and become

unstable and unable to support the load of the structures. Such understanding only heightened the importance of piling activity as structures not supported by piles would be subject to massive settlements in such seismic incidents,” he explained.

“Additional preventative measures were taken to counteract the liquefaction potential. This included the installation of stone columns as well as vibro compaction and soil densification through pile driving. Studies were also performed to understand the expected movements of flexible offshore water pipes, and design tolerances were adjusted to allow movement without damage.”

Mr Edsall further mentioned that when earthquakes did strike the area during and after construction, the design coped, thereby preventing damage or structural failures.

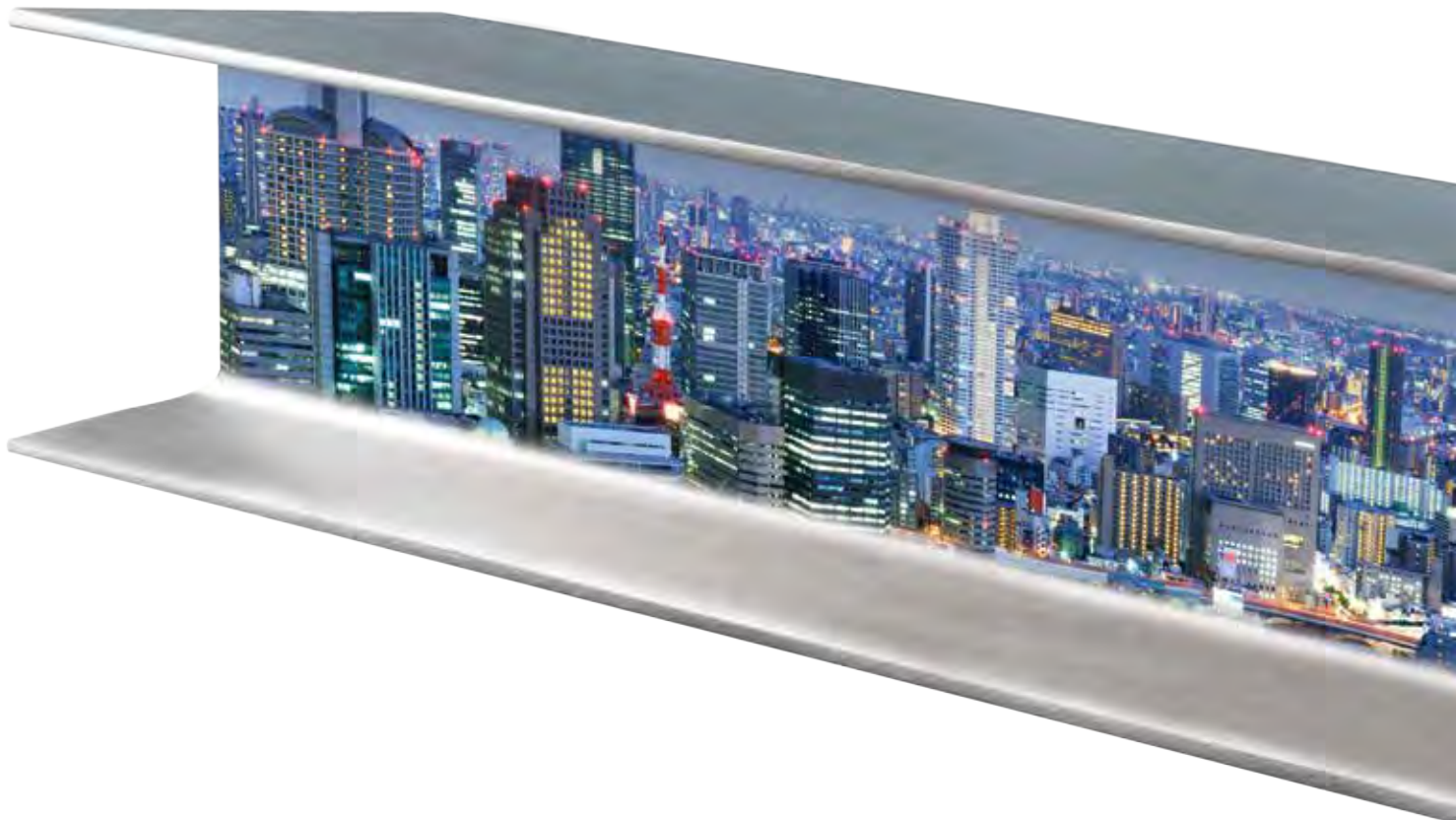
In the end, the project was completed on schedule. “Our pre-construction planning, before we had even submitted our EPC bid to plant owner AboitizPower, was key to construction remaining on schedule, and it’s what is often missing from other contractors when building power plants in Asia,” said Mr Edsall.

The Therma South Units 1 and 2 are now fully operational. Officially opened by the country’s president in January 2016, it is said to be the first major power plant to come online in nearly 10 years in Mindanao, serving an expanding economy and population in the region. ■

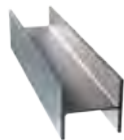
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PRESERVING THE CAPITOL



The Capitol Singapore is a mixed-use development comprising a four-storey upmarket retail mall, a six-star hotel, a residential building and a cinema cum theatre, located in the heart of the country's downtown civic district. Designed by Richard Meier & Partners Architects, the 50,353 sq m complex has recently undergone an extensive makeover.

The origin of the building, Capitol Theatre, was completed in 1929. Four years later, Capitol Building was added adjacent to the theatre, featuring the same neo-classical style. In 1946, after the Japanese Occupation, the building was purchased by Shaw and was rebuilt. It became the organisation's flagship cinema and was renamed as Shaw Building. In 1983, the building was listed for preservation by the Urban Redevelopment Authority (URA), and was acquired in 1984 so that it would be preserved as part of a future development. Shaw's tenant lease was ceased in 1987 and the building was fully returned to the URA.

In November 2011, main contractor Shimizu Corporation was awarded the redevelopment project to turn it into a large-scale complex called 'Capitol Development'. The Capitol Building was redeveloped together with a stretch of adjoining buildings including the Stamford House and Capitol Centre. These three buildings were gazetted for conservation, meaning that the buildings' facades and other architectural features must be maintained to ensure the buildings' integrity.



The Capitol Building (top) and Capitol Theatre after renovation.

Dual-purpose theatre

The Capitol Theatre is one of the highlights of the development due to its longstanding history. To preserve the style of the theatre, the developers kept and restored three distinctive neo-classical architectural decorations: the Pegasus panels flanking the stage, the Zodiac decoration on the dome ceiling, and the art deco detailing of the Capitol Theatre sign.

The 21,000 sq m theatre has a capacity of 977 people. With both cinematic and theatrical capabilities, it is believed to be Singapore's first dual-purpose theatre. The rotational floor system enables the sitting space to be transformed into a flat floor within minutes, so the venue can also hold other events such as conventions or gala dinners. The theatre was reopened in 2015.

Theatre restoration

Previously, existing bricks in certain areas were found to be loose and with cracks, making the entire structure unstable. Mapei solutions were used to reinforce the structural strength of masonry substrates.

The existing plaster was removed from the brick surface. A layer of Planitop HDM Restauro fibre-reinforced, hydraulic lime and eco-pozzolan-based mortar was applied up to 15 mm thick to fill up the cracks and level the surface. Subsequently, Mapegrid G220 was placed on top of the applied layer at areas with bigger cracks, while Mapegrid G120 was used at areas with smaller cracks. Thereafter, 15 mm thick of Planitop HDM Restauro was applied to cover the grid.

After several observations and tests, the site revealed that there was no moisture and salt in the substrate. The next step was to restore the old existing structures.

Cracks and small gaps in the existing substrate were sealed with Mape-Antique F21 super-fluid, salt-resistant hydraulic binder with fillers made from lime and eco-pozzolan through the injectors for consolidating masonry and render. Substrates with gaps in between the bricks were removed. Mape-Antique Allettamento



Above and left: The Capitol Theatre under renovation. Its structural strength was reinforced, and its distinctive neo-classical architectural features were restored.

Continued overleaf...

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salt-resistant masonry mortar was applied to fill up the surrounding perimeter of the gap and onto the new brick. Afterwards, the new brick was inserted in place and Mape-Antique Allettamento was applied to fill up the gaps. The Mape-Antique Allettamento system was also used to patch brick tiles on the floors.

Mape-Antique Intonaco NHL transpirant base render was used for rendering decorative columns of up to 25 mm thick. The existing faded carvings were then restored with new carvings using Mape-Antique Intonaco NHL.

Mape-Antique FC and Mape-Antique FC Ultrafine possess fine grain properties that would make for smooth finishing. Mape-Antique FC Ultrafine salt-resistant, ultra-fine-grained lime and eco-pozzolan transpirant skimming mortar was used for the decorative motifs on the columns and panes. Mape-Antique FC cement-free lime and eco-pozzolan-based fine mortar was applied as skim coat on flat substrates.

The minor cracks were sealed with Mape-Antique F21 by injection, and then Mape-Antique FC/Mape-Antique FC Ultrafine were applied as final finishing over the existing renders.

Concrete beams and columns

Spalling concrete was also detected on the concrete beams and columns of the Capitol Theatre, Capitol Building and the hotel. This suggested that the presence of water in the substrate would likely result in the corrosion of the reinforcement rods. The spalling concrete was hacked off to reveal the reinforcement rods, and these corroded rods were then treated with two coats of Mapefer anti-corrosion cementitious mortar.

To seal off the fine cracks in the concrete, a 2.5 mm V-groove was sawed and patched with Adesilex PG2 SP thixotropic epoxy adhesive.

For smaller areas of spalling concrete,



Above (left and right): Mapei provided its solutions during the refurbishment of the Capitol Theatre.

Left: Mapei system was also applied on the facades of the Capitol Building.

Below: The new retail mall.



The article courtesy of Redita Mapei International no. 56

Planicrete SP latex additive was mixed with one part cement and applied onto damp substrate. This would act as a bonding agent to receive Planitop G40 SP polymer modified cementitious repair mortar, which was then plastered to the required thickness.

For areas with bigger spalling concrete, the surface of columns was removed. A

formwork was installed and filled with aggregates. Mapefill GP was used to fill up the columns by pressure grouting.

In the new mall and the hotel, Keracolor Maxi S1 was used to install stone floors and Keracolor GG and Keracolor SF to grout the joints. ■

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GOING GREENER

MANY BUILDING OWNERS AND DEVELOPERS IN SINGAPORE ARE NOW PLAYING A BIGGER ROLE IN THE GREEN BUILDING MOVEMENT. THE FOLLOWING PAGES (FROM 66 TO 69) ARE TWO INITIATIVES THAT HAVE RECENTLY TAKEN PLACE.

3FOR2@UWCSEA ADMINISTRATIVE OFFICE

The new 550 sq m 3for2@UWCSEA administrative office at the Dover campus of the United World College South East Asia (UWCSEA) stands as a living laboratory of the '3for2' applied research project led by ETH Zurich - the Swiss Federal Institute of Technology, in partnership with Siemens Building Technologies and UWCSEA. The project is the pilot implementation of the 3for2 building design concept developed by architectural and engineering researchers at the Singapore-ETH Centre, a research centre established by ETH Zurich and Singapore's National Research Foundation (NRF), as part of NRF's CREATE campus.

The 3for2 concept, which integrates design and construction, offers a paradigm shift in the way sustainable high-rise buildings can be realised. It proposes that new lean and energy-efficient technologies for air-conditioning and related services can be successfully integrated into building structures, thereby saving not only energy, but also considerable space and materials.

The technologies driving the 3for2 building system, such as chilled ceilings and decentralised ventilation units, were first conceptualised and experimented on through four years of research at the Future Cities Laboratory of the Singapore-ETH Centre. That the 3for2 concept focuses largely on air-conditioning technologies is not surprising - it is believed that air-conditioning accounts for approximately 60 percent of energy consumption across the Singapore building stock.

"Despite decades of technology development, widespread deployment of highly energy-efficient air-conditioning technologies in the commercial building sector has not yet occurred outside of a few European countries. There are a number of reasons for this, one of them being the nature of the construction market and building design practices. Air-conditioning technologies are typically selected during the building design stage by developers and their consultants, who will not bear the cost of a building's future energy consumption. It's difficult to convince developers to invest in these highly efficient air-conditioning systems if they don't benefit from the long-term rewards of lower energy bills," explained Prof Arno Schlueter, leader of the 3for2 project and professor of Architecture and Building Systems at ETH Zurich. "The 3for2 concept attempts to address these split

Right (top, middle and bottom): The 3for2@UWCSEA administrative office at the Dover campus of the United World College South East Asia (UWCSEA) stands as a living laboratory of the '3for2' applied research project.



incentives by proposing a holistic design concept that saves materials, space and energy. These more sustainable buildings help developers to lower construction costs and increase tenable floor areas, while enabling tenants to benefit from significantly lower utility bills.”

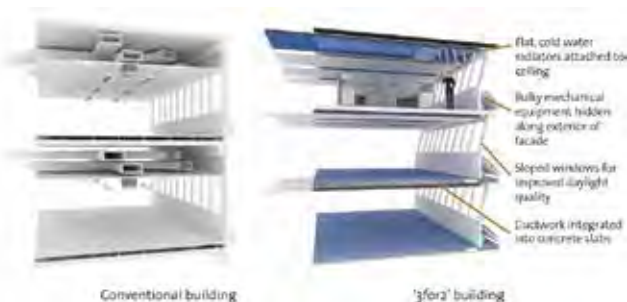
The UWCSEA has also been selected as the first recipient of the Green Buildings Innovation Cluster (GBIC) Demonstration Scheme. GBIC is a research, development and deployment (RD&D) programme spearheaded by the Building and Construction Authority (BCA) to support and encourage the building owners, researchers and industry to work together in trialling and demonstrating novel energy-efficient building technologies with the potential for wider commercial deployment in Singapore.

“The GBIC will co-fund the implementation of UWCSEA’s 3for2 project, including its measurement and verification. We will also collect data from the project to ensure that the knowledge and best practices will be consolidated for dissemination to the industry,” said Tan Tian Chong, group director of research at BCA. “Sharing of best practices and technologies tested with the rest of the industry will be critical in accelerating the adoption of these energy efficient technologies. Building owners and developers can also harness the potential of energy savings and improved indoor environmental quality substantially. We strongly encourage more applicants to come on board this scheme.”

The 3for2@UWCSEA office space, which occupies part of a single floor in UWCSEA’s new 20,000 sq m multi-purpose educational building, is home to the administrative and management staff of the UWCSEA. It was in 2014 that UWCSEA invited researchers from the Singapore-ETH Centre to consider a pilot of the 3for2 concept in its new building.

Siemens Building Technologies has also been directly supporting the 3for2@UWCSEA project since 2014. The company has implemented its pioneering building management system Desigo CC, with over 1,000 sensor and control points feeding data into a web-accessible server at one-minute intervals. The project’s researchers have already begun combing through this data since the 3for2@UWCSEA space started operating at full capacity in December 2015. According to the data, across three weeks of operation in December, the energy efficiency of the 3for2@UWCSEA office space is already among the top 10 percent of large office buildings in Singapore.

“These are very early days,” said Dr Adam Rysanek, senior researcher at ETH Zurich and project manager of the 3for2@UWCSEA. “While we are pleased to see that our system is already performing among the most energy-efficient office buildings in Singapore, a number of our key performance objectives will only be realised towards the end of the project in two years’ time. Based on these initial performance indicators, we should be able to lower our energy footprint by a further 40 percent upon fine tuning the systems we’ve already installed – and installing some new ones by 2018.”



Images on pages 66 and 67 © 3for2@UWCSEA, Future Cities Laboratory, Singapore-ETH Centre, 2016.



Above: An overview of the systems installed in the 550 sq m 3for2@UWCSEA pilot project.

Bottom: Compared to the conventional building design, the ‘3for2’ building concept allows building developers to construct three floors within the standard space of two floors without any impact on perceived floor-to-ceiling heights.

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NUS-CDL RESEARCH LABORATORIES

The National University of Singapore (NUS) School of Design and Environment and City Developments Limited (CDL) have formed a partnership to promote innovations in smart, green building technologies. CDL made a gift of S\$2.25 million to the school to establish two new research laboratories dedicated to the study of smart building technologies for indoor and outdoor environments, and to provide funding for research projects. These initiatives, which are also supported by the Economic Development Board (EDB), will further entrench Singapore's position as a leading international Smart City and improve the quality of life in the country's highly urbanised environment.

"Urban Solutions and Sustainability has recently been announced as a key technological domain to receive dedicated public research funding in the next five years. This research partnership between CDL and NUS is a prime example of how companies can work alongside government partners and institutes of higher learning to capture business opportunities in this exciting growth sector," said Goh Chee Kiong, executive director of Cities, Infrastructure & Industrial Solutions at EDB. "We look forward to CDL and NUS co-developing, testing and exporting innovative sustainable urban solutions that are tailored for a rapidly urbanising tropical region."

NUS-CDL Smart Green Home

This indoor test-bed environment will serve as a platform for researchers to undertake holistic and innovative experimental studies on smart features, green building technologies and design for sustainable living. The NUS-CDL Smart Green Home will be designed as a world-class venue for testing, analysing, evaluating and piloting rapidly evolving smart home innovations in a 'plug-and-play' and in a real-life environment. It will also allow researchers to experiment with the technology-human interface.

The facility, expected to be completed by December 2017, will be located within a new building at the NUS School of Design and Environment and it will be managed by the School's Department of Building. The NUS-CDL Smart Green Home is designed as a 100 sq m full-size home. At least one



The NUS-CDL Smart Green Home is an indoor test-bed environment, which will serve as a platform for researchers to undertake holistic and innovative experimental studies on smart features, green building technologies and design for sustainable living. The facility is expected to be completed by December 2017.



The NUS-CDL T² Lab is conceived as an adaptable indoor-outdoor research space that can be configured to test lifestyle scenarios, space-use configurations, features as well as cutting-edge or emerging technologies. The facility is expected to be completed by December 2016.

facade will be designed for plug-and-play experimentation of new smart materials, systems and finishes.

The NUS-CDL Smart Green Home will be devoted to investigating human centred smart materials, technologies and knowledge platforms that lead to enhanced health and

comfort, quality of life, and a sustainable and connected future.

One research project that will be carried out at this facility is to design and develop an intelligent system that is capable of improving indoor aural comfort by picking an ideal sound profile that is able to mask

undesirable ambient noise. A library of desirable sounds will be selected to manage and reduce the undesired elements of different types of ambient noise. For example, well-blended and dosed insects' sound and breeze may be used to mask road-tyre interaction noise and air turbulence noise created by fast travelling vehicles along expressway.

In another project, NUS researchers will design and develop novel facades and building envelopes that integrate smart nanomaterials and systems, sensor-based controls and analytics to continuously create an optimally balanced and comfortable indoor environment that is appropriate for the occupants, and at the same time be energy efficient.

NUS-CDL T² Lab

The 107 sq m NUS-CDL T² Lab is conceived as an adaptable indoor-outdoor research space that can be configured to test lifestyle scenarios, space-use configurations, features as well as cutting-edge or emerging technologies. Managed by the School's Department of Architecture, the laboratory will be used to study new ideas relating to research themes such as 'healthy, green living' which explores the integration of passive and active building systems to achieve substantial reductions of carbon emissions, as well as 'future lifestyles' which examines the adaptability of the Singapore home to ageing, safety and security, work-life balance, and social and cultural expectations.

The new laboratory, expected to be completed by December 2016, will be located at the NUS Kent Ridge campus. The lab will be constructed on an existing structure, and designed with flexibility to adapt to the new functions while testing high-performance materials and environmental systems.

One of the projects that will take place at this facility will be an experimental study on integrating building facade design, construction and operation that suit Singapore's climatic conditions. NUS researchers will study the integration of solar panels with building facades such as roof and vertical wall surfaces. For instance, they will evaluate the feasibility and efficiency of incorporating sun-shading shutters with solar membranes and panels. ■

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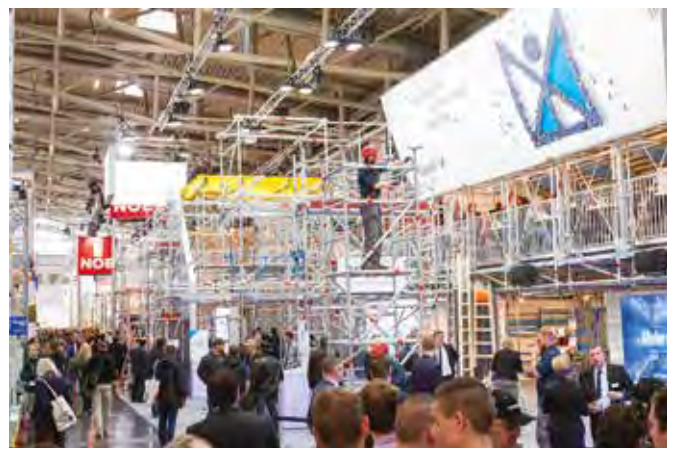


bauma 2016, which took place in Munich, Germany, from 11 to 17 April, attracted approximately 580,000 visitors from 200 countries. After Germany, the top 10 countries of origin among the visitors were Austria, Switzerland, Italy, France, the Netherlands, the UK, Sweden, the Russian Federation, Poland and the Czech Republic. There were a total of 3,423 exhibitors - 1,263 from Germany and 2,160 from abroad - from 58 countries. The show occupied 605,000 sq m of exhibition space. Exhibitors from outside Germany accounted for 63 percent of the total - higher than ever before.

bauma Innovation Award

Six companies and research institutions were honoured with the bauma Innovation Award on 10 April. They included: Kramer Werke GmbH (machinery); IMKO GmbH (components); Leonhard Weiss GmbH & Co KG (construction process/construction work); the Technical University of Dresden, Department of Construction Machinery Technology (research); and Groupe Mecalac SA and the Technical University of Dresden (design).

Johann Sailer, chairman of the German manufacturers of



construction and building material machines included in the German Engineering Federation, noted that interest in the competition was growing among international companies. Almost half of all applications for the award came from international companies, he said.

The winner in the machinery category is Kramer-Werke GmbH, which was honoured for its 5055e vehicle, a fully electric wheel loader with all-wheel steering. The emission-free machine is optimally suited for jobs in buildings and tunnels.

The award in the components category went to IMKO GmbH. The company was recognised for its Sono-WZ device, a handheld analyser that can quickly, accurately and easily measure the moisture content of fresh concrete.

The award in the category of construction process/construction work was presented to Leonhard Weiss GmbH & Co KG for a pilot project in which the deteriorating driving surface of a steel bridge was rehabilitated at relatively low cost.

The award in the research category went to the Department of Construction Machinery Technology at the Technical University of Dresden for its on-going research into 3D printing for concrete.

The award in the design category was presented to two winners. Mecalac was honoured for its new generation of mobile excavators, and the Technical University of Dresden and several companies cooperating under the so-called Concept Cluster were awarded for their jointly developed driver's cab, called Genius Cab.

Partnership with InnoCentive

Following the partnership between Messe München and InnoCentive, which was announced on the Innovation Day during the bauma Forum, companies wanting to use the Open Innovation service can now take advantage of not only the Messe München network, including its world-leading trade fairs, but also the InnoCentive global community with over 400,000 experts to solve innovation problems.

"InnoCentive is a pioneer when it comes to open innovation and has a well-versed community of experts that have already solved highly complex problems for companies such as NASA. We are delighted to have them as a partner for our Open Innovation service.

Continued on page 74...

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Continued from page 72...



All images: Scenes from bauma 2016.

Exhibitors at capital goods trade fairs in particular will benefit from the technical knowledge of our experts,” said Stefan Rummel, managing director of Messe München GmbH.

“Technology and connected individuals and organisations are the great enablers of open innovation. Bringing together the extensive networks of InnoCentive and Messe München, and the wealth of expertise and industry familiarity these networks hold, creates a hugely exciting opportunity for driving innovation in the areas of industrial goods and beyond. Partnering with Messe München on this initiative carries a special significance for us and we’re looking forward to the new innovation challenges and solutions that will come out of it,” said Craig Jones, chairman of the board and CEO of InnoCentive.

Through this partnership, Messe München is catering for the needs of its customers in the construction machinery sector with specific requirements when it comes to innovation management. In many cases, the innovation work of these companies involves highly complex challenges, the solutions to which are not permitted to be made public. This is where Messe München’s Open Innovation

service comes in, backed up by InnoCentive. The InnoCentive community comprises over 400,000 people who specialise in a wide range of areas, are experts in their respective fields and have experience in solving complex innovation problems.

Messe München’s Open Innovation service includes translating a company’s innovation problems into ‘challenges’, which can then be addressed and solved by the expert community. The experts’ work when coming up with a solution is totally anonymous and results are returned straight to the provider of a challenge, in other words, the original company or exhibitor. The company can then select the best solution and award prize money. Community members are spread across the world, are highly trained and specialise in an extremely wide range of areas - they even include research institutions and universities. As a result, they are the ideal complement to the existing Messe München network which already combines heterogeneous sector knowledge.

The next bauma is scheduled to take place from 8 to 14 April 2019. ■

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ELEMATIC

Elematic's casting machine Comcaster is now equipped with a 3D machine vision, making quality control management of wall production easier. This new automatic casting system also detects possible errors early and thus minimises excess costs.

The system scans the casting table by using the 3D machine vision, ensuring all of the details - shuttering, reinforcement, lifting hooks, spots for different electric wall sockets or other inserts - are placed correctly. Machine vision obtains information about the surrounding environment for further analytical processing; it uses image capture and analysis to automate tasks such as inspection, gauging and counting.

The new automatic casting system is ideal for diversified, high capacity wall production with the Elematic EDGE Wall production line. EDGE Wall consists of a manufacturing execution system, automatic machinery and a table circulation system. The line is particularly suited to producing sandwich panels, cladding panels, solid panels and solid slabs.

Quality control is also a useful function for smaller-scale production. The scanning system can be detached and turned into a separate quality control unit for any type of production line. Collecting and saving production data also offers new possibilities for other parties, such as regulatory authorities. ■



Elematic automated casting machine.

MOVAX

Movax's new DH-20 and DH-30 piling hammers are excavator-mounted, hydraulic impact-type hammers for driving load-bearing piles or assisting in sheet pile driving in difficult soil conditions. They can be mounted directly onto the excavator or when greater depths are required onto an excavator mounted leader mast.

The piling hammers can be used in various site conditions and are suitable for a wide range of piles including sheet piles, H-piles and tubular steel piles, among others. They are fitted with Movax Control System (MCS) for accurate control, safe, flexible and easy operation.

Movax EML-12 is a leader mast for piling applications with 12.3 m of effective leader length. It is designed for various types of driven piles, preaugering or different techniques of cast-in situ piles. Movax's own attachment selection currently includes the DH-20 and DH-30 piling hammers.

The EML-12 can be mounted onto multiple different crawler excavator bases as piling specific hydraulics and winches are integrated to the Movax leader mast itself. The mast can be folded and thus easily transported between sites. ■



Movax DH-20 piling hammer.

JASO

Jaso's J118HPA hydraulic jib crane has an elevation mechanism situated in the upper part of the jib, achieving a maximum load of 6 t and the maximum reach at 45 m is 1.6 t. The steep out-of-service parking radius is just 7 m, making the crane ideal for use in confined inner city areas. According to Jaso, the freestanding crane can be transported with three lorries only.

Jaso's J265PA luffing jib crane has a maximum load of 18 t. The minimum reach at 30 m is 11.5 t and its maximum at 60 m is 2.2 t. Other features include 336 m/min for the elevation mechanism; a 73.1 m maximum freestanding height with 2.16 m sections; and emergency brakes situated on the frame where the elevation mechanism sits.

In addition, Jaso's GTC25 tower crane elevator can provide capacity for two people for a total weight of 250 kg and an elevation speed of 22 m/min. The unit can guarantee efficiency and security, thanks to the optimal equipment for the crane operator as well as the maintenance personnel. The GTC25 is also compatible with cranes from various manufacturers.

Jaso said that the above tower cranes meet the requirements of Asian market, and last year the company sold several units to Shinwoo - a rental company in Korea - through its distributor Towerland. ■



Jaso tower cranes.

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HERRENKNECHT

Herrenknecht's Slant Directional Drilling (SDD) combines the advantages of HDD (Horizontal Directional Drilling) and vertical drilling. The HK150C SDD rig enables drilling at entry angles of 8 to 90 degrees to the earth's surface. Herrenknecht also offers a regular multi-tool, which is suitable for tapping near-surface energy reserves such as oil sands or geothermics. The crawler features high mobility, low spatial requirements and short dismantling times, facilitating swift and easy drilling relocations for operators.

Herrenknecht has also developed three new drilling tools for laying pipelines faster, more safely and cost effectively. Weeper Subs in the drill rod ensure a balanced pressure level in the flush circuit during pilot bores, and significantly reduce the risk of frack-outs typical during this process. The Full Face Hole Opener permits extension of the pilot bores to target size in a single work step. Using replaceable disc cutters, it can be used in various subsoils and can be refurbished or converted as quickly and cost effectively as required. The Down Hole Jet Pump can be installed directly behind the Full Face Hole Opener. It cleans the borehole and removes the excavated material within the drill rod. Drilling with the Hole Opener in



Herrenknecht HK150C SDD rig.

combination with the Jet Pump can also achieve a round and clean borehole as well as reduced bentonite consumption. ■

JUNTTAN

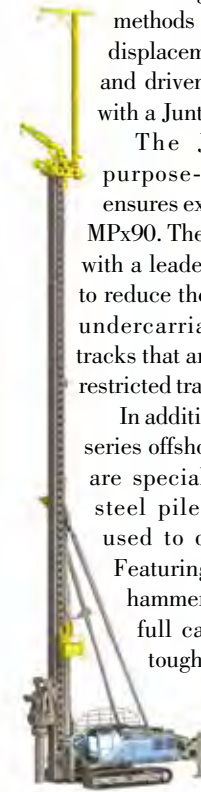
The first model in Junttan's new MPx-series multipurpose piling rig is the MPx90.

It is designed for different work methods including Kelly, CFA, displacement, driven cast-in situ, and driven pile work carried out with a Junttan hydraulic hammer.

The Junttan-designed, purpose-built undercarriage ensures excellent stability for the MPx90. The rig can be transported with a leader, which can be folded to reduce the transport length. The undercarriage also comes with tracks that are easy to dismantle for restricted transportation conditions.

In addition, Junttan's new HHx-series offshore hydraulic hammers are specially designed to drive steel piles. They can also be used to drive concrete piles.

Featuring a robust design, the hammers can be operated with full capacity at all times in tough conditions. ■



Junttan MPx90 piling rig.

BOBCAT

Bobcat showcased a fully functional prototype of its new E10 Electric model - a new zero-emission, electric powertrain version of the 1-t E10 micro-excavator, one of the most popular models in the Bobcat compact excavator range.

The new E10 Electric model has been developed with the option of an alternative all-electric powertrain, allowing the machine to be used in areas requiring zero emissions such as interiors and basement construction work. It also offers very low noise levels on site with an LpA of only 64 dBA.

The alternative powertrain option comprises an electric motor that can be powered both by a pack of rechargeable Li-Ion batteries or a 400-V mains electric supply via a plug-in power cable. The batteries can be quickly recharged (less than an hour to reach full capacity) and when fully recharged, the machine can work independently of the mains power for 2-3 hours. The machine is also capable of carrying out work while charging via the mains power cable.

The new E10 Electric model has the same zero tailswing (ZTS) profile and identical external dimensions as the standard E10 machine. It offers the same or better performance, said Bobcat. As the new machine is designed to be used in demanding indoor demolition



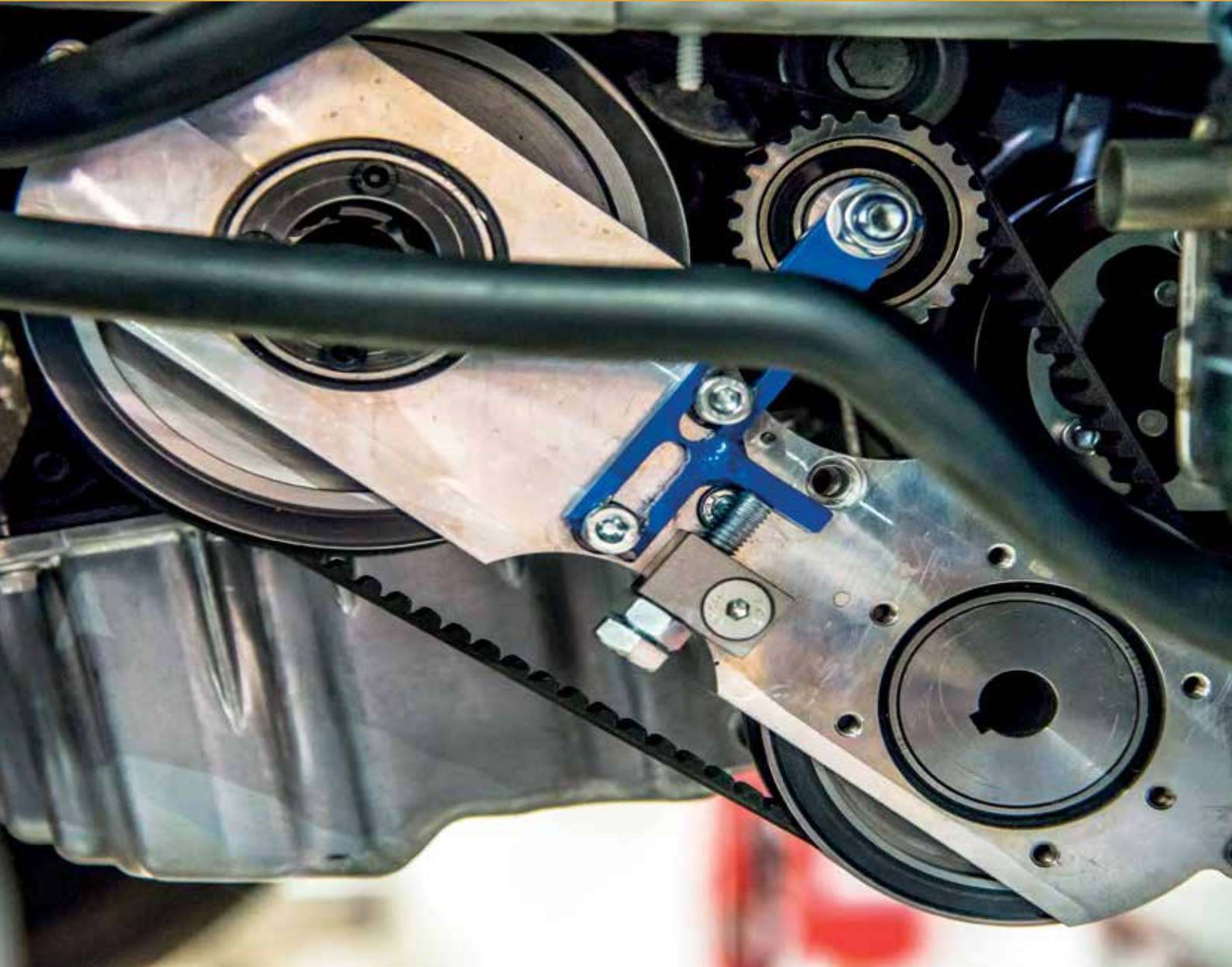
Bobcat E10 Electric micro-excavator.

applications, it is equipped with auxiliary lines and an efficient oil cooler system for continuous hydraulic breaker operation. ■



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CARMIX

The new Carmix 3500 TC concrete mixer from Metalgalante has an output capacity of 3.5 cu m, a double mixing blade, a mixing and jet speed, regardless of the number of turns of the diesel motor, and a concrete jet in reverse; plus, a 600-l loader - controllable with the Joymix - with a hydraulic command opening to load the sand or gravel directly into the barrel. The machine can also handle slopes up to 30 percent, even when fully loaded, said Metalgalante. With Concrete-Mate, the mix can be weighed directly inside the barrel.

The 3500 TC is fitted with Promix, a measuring instrument composed of a stainless steel probe that is housed inside the mixer and supplied by a solar panel. A display in the cab receives information in real time. The sensor provides details on the slump, temperature, moisture and rotational speed of the concrete mixer; it also informs the operator when the mixture is ready. All the data is constantly updated and sent to the receiver. Thus, the operator always knows the parameters of the concrete that is being prepared. Such information can be stored in an external computer or sent to other mobile devices via the GPS network. ■



Carmix 3500 TC concrete mixer.

REXROTH

The new Rexroth A4VGT series 34 axial piston variable pump is designed for drum drives of concrete mixers, featuring special function elements such as sequence valves and neutral position switches. Rexroth has determined and documented the required reliability parameters for functional safety for these elements and the proportional electric control (EP). Therefore, designers can configure safe drum drives according to the correct standards and with little effort.

The variable pump with axial piston rotary group in swashplate design is intended for a maximum pressure of 420 bar in closed circuits. In addition to the previous frame sizes 71 and 90, Rexroth has also developed a version with 115 ccm displacement. With it, machine manufacturers can lower the rotational speed of the diesel engine in stationary operation, without reducing the speed of the drum drive. This lowers the average noise emissions and the diesel consumption during waiting times on building sites.

Furthermore, Rexroth said it has reduced the weight of the frame size 90 by more than an eighth in comparison to conventional products on the market, while the frame size 115 weighs 8 kg less than comparable products. Depending on the size, the installation length ranges from only 301 to 317 mm. ■



The A4VGT axial piston variable pump for drum drives of concrete mixers.

WACKER NEUSON

Wacker Neuson has developed the AS30e and AS50e battery-powered rammers, which are completely free of emissions, said the company. The smaller AS30e is designed for compacting pipe spandrels, and the AS50e can be used for all traditional rammer work.

Because of the zero emissions, both rammers are suitable for use in urban construction areas or working in trenches. The battery is independent of the model and can be replaced in a few quick steps without any additional tools, said Wacker Neuson.

The cable-free rammers also feature low total operating costs, since typical maintenance work on conventional rammers - such as on the carburetor - are not applicable. And according to Wacker Neuson, around 55 percent in energy costs can be saved by operation with electricity. The company has chosen lithium iron phosphate batteries due to their long service life; even after 1,500 charging cycles, at least 80 percent of the original battery capacity is still available, it claimed. Another advantage is the high temperature stability at operating temperatures between -10 and +50 degrees, making it ideal for global applications in various climate zones. A special safety concept also prevents the battery from self-igniting or catching on fire if damaged. ■



Wacker Neuson AS50e battery-powered rammer.

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SENNEBOGEN

HÜNNEBECK

The modular ST 60 system from Hünnebeck has six lightweight basic parts, each weighing less than 15 kg. These can be mixed and matched to form high-capacity shoring towers in three system dimensions. It takes only two different frame sizes to build towers measuring 113 cm x 113 cm, 150 cm x 150 cm, and 113 cm x 150 cm. A load capacity of up to 240 kN per tower and system compatibility with aluminium and steel beams as well as H 20 and R 24 timber beam formwork ensure good loadability and effective load discharge at the typical working heights of between 3 and 15 m.

Among the important features of the ST 60 tower, which conforms to both DIN EN 12810 and DIN EN 12811, are that assembly and dismantling are carried out with surrounding side guards as well as the system of board transfer to the next level. The Load Class 4 boards are transferred simply and easily from one level to the next using the special lifting handle.

Thanks to its flexible footprint, the assembly height variable in increments of 1 m, and the jack height of 62 cm at the base and head, each ST 60 can be closely adapted to suit site conditions. Combined, this results in an efficient space scaffold thanks to the load-bearing junctions separated by 50 cm increments and permitting positive connections in eight directions. ■



Hünnebeck ST 60 shoring system.

KOBELCO

The Kobelco CKE2500G crawler crane has a maximum lifting capacity of 250 metric tons at 4.6 m. Its nested boom length spans from 15.2 to 91.4 m. Its fixed jib offers a maximum lifting capacity of 27 metric tons, and the maximum combination of boom with fixed jib is 76.2 m + 30.5 m and reaches to 96.6 m working radius. Its luffing jib offers a maximum lifting capacity of 80 metric tons and the maximum combination of luffing boom with luffing jib is 61 m + 61 m, and reaches to 82 m working radius.

The CKE2500G is powered by a 271 kW 1,850-rpm Hino engine. Its main and auxiliary winches have a maximum line speed of 110 m/min and a rated single-line line pull of 132 kN. It travels at 1 km/hr, has an operating weight of 220 t, transport weight of 44,570 kg and 90,400 kg of counterweight.

In addition, the CKE900G-2 crawler crane has a maximum lifting capacity of 100 metric tons at 3.6 m (theoretic result) and 90 metric tons at 3.9 m. Its boom length spans from 12.2 to 61 m. Its fixed jib offers a maximum lifting capacity of 10.9 metric tons and the maximum combination of boom with fixed jib boom is 51.8 m + 18.3 m, and reaches

to 68 m working radius. The crane is powered by a 213 kW 2,100-rpm Hino engine. Its main and auxiliary winches have a maximum line speed of 120 m/min, and a rated single-line line pull of 112 kN. It travels at 1.7 km/hr, has an operating weight of 90 t, transport weight of 41,350 kg and 31,900 kg of counterweight. ■



Kobelco CKE2500G crawler crane.

SDLG

The Tier III-compliant SDLG L968F wheel loader is designed for construction, mining and aggregates applications. The 6t-rated machine comes with a low-revs, high torque engine that is low on emissions and high on fuel economy. With an SDLG-designed VRT200

rigid-axle transmission converter and synchronised four-speed transmission, the L968F offers improved stability on rough terrain and better traction in dangerous conditions. The machine's hydraulic core is centrally arranged for easy maintenance and service, while the enlarged cab improves visibility and operator comfort.

Another SDLG wheel loader is the L959F, which is an update to the LG958L model. The L959F offers a maximum breakout force of 152 kN and can be fitted with a 3.1 cu m bucket for optimum material handling. It is suitable for various applications, including general construction, quarrying, agriculture and utility work.

In addition, the SDLG L948 wheel loader has a 4 t-rating and is powered by a SD60B Tier III engine, which drives a ZF fixed shaft electro-hydraulic control transmission. It has full hydraulic brakes and load-sensing capabilities, plus a large and comfortable cab that features a reversing camera for safer and more efficient site movements. Maximum breakout force is 140 kN and it has a standard bucket capacity of 2.3 cu m. ■



SDLG L968F wheel loader.



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Results base on a satisfaction study realized in Asia in 2015. More information available upon request.

KLEIN

The Klein KBZ 37-4 concrete pump has an overall weight of less than 25 t with a 37 m boom. This low weight is a result of the modified linkage of the front and rear outriggers. The new machine also features a common pivot point, which absorbs the load torque of the support legs. Due to the significant weight reduction in steel construction, the axle loads of the machine are also reduced - this is often considered an important requirement in many countries. In addition, the stability of the machine is guaranteed under all operating conditions, said Klein.

Furthermore, Klein's two-cylinder piston pumps are now used not only for concrete delivery. For pumping of incurred soil during tunnelling, Klein has introduced the S-tube valve-controlled KIP 9015 dual piston pump. The equipment exhibited at bauma belongs to a Japanese customer, who will use it with 160 kW drive power to pump



Klein KBZ 37-4 concrete pump.

tunnel overburden to the surface. The pump system is designed for flow rates of up to 150 cu m/hr at 28 bar resp. 75 cu m/hr at 50 bar. ■

RUBBLE MASTER

The new RM 120GO! from Rubble Master features an output of up to 350 t/hr and is capable of crushing a wide range of materials. The crusher is designed based on the RM GO! principle, making it a reliable and user-friendly machine, said the company.

Rubble Master has added the Remote Performance Optimisation System to the RM GO! principle. This provides important information and advice during operation and ensures efficient maintenance, servicing and monitoring procedures. Mobile devices like smartphones and tablets are used to visualise and process the information.

The GO! SMART concept focuses on the benefits and various points of contact between the machine operator, owner and service specialist. It combines the simplicity and intuitiveness of the RM GO! control concept with smart future-safe technology. By optimising performance, supporting the user and ensuring maximum uptime it contributes to increasing the cost effectiveness of the machine. In addition to detailed descriptions of troubleshooting routines that assist in implementing rapid remedial action on-site, documentation like instruction manuals, spare parts lists and service reports can also be downloaded at any time to offer greater support. ■



RM 120GO! crusher made its appearance at bauma.

MENZI MUCK

The latest model in Menzi Muck's M2-series excavator, the M220, has a weight of 7 t and a turning radius of 6,800 mm. Its new, electronically controlled drive system ensures precise and regular propulsion up to 7 km/hr. Depending on the steering angle, distribution of wheel speeds and driving forces are equally and continuously adapted to the driving situation.

With the APM (Anticipating Power Management) controller, overloading can be reduced significantly. The machine's boom cylinder is mounted horizontally in the centre part, thus preventing collisions at the boom cylinder. All cylinders on the boom are equipped with cushioning, and all cylinders on the chassis are equipped with check valves for safety.

An axial piston motor with automatic multi-disc stop brake acts via a planetary gear on the internal gearing of the large-dimensioned, double-row slewing ring. The maximum slewing force is available over the entire speed range. Powering the machine is a 55 kW Stage IIIB/Tier IV Deutz engine.

According to Menzi Muck, in just a few steps the M220 can be disassembled quickly for transport by helicopter, funicular or crane to the desired individual sizes. ■



Menzi Muck M220 excavator.

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SKYJACK

The new SJ30 ARJE is Skyjack's first electric boom, featuring a rotating jib and a direct electric AC drive. The machine is 1.19 m wide with a working height of 11 m, an up-and-over clearance of 4 m, a 1.55 m turning radius and a maximum weight capacity of 227 kg. Skyjack has optimised the drive on the SJ30 ARJE to offer 35 percent gradeability in order to make navigating jobsites, as well as loading and unloading from a trailer, a lot easier.

In addition, Skyjack's tallest DC electric scissor - the SJIII 4740 - features a working height of 13.8 m. This machine was designed in response to an increasing demand for larger electric scissors in industrial operations. It has an overall capacity of 350 kg and is Skyjack's widest DC electric scissor at 1.19 m. The steering system in the SJIII 4740 has also been redesigned, offering operators an improved 0.54 m turning radius. The machine is equipped with a variable speed front wheel hydraulic drive for 25 percent

gradeability, as well as a 0.9 m roll out extension deck.

The bolted cross braces make the Skyjack SJIII 4740 scissor lift rigid and reliable, even when working at full height. Emergency lowering has been designed to be user friendly with a simple, single location push-and-pull system that is fast and efficient. Battery life has also been upgraded with a motor controller, ensuring increased controllability and reduced recharging time. ■



Skyjack SJ30 ARJE articulating boom.

LIUGONG

One of LiuGong's popular wheel loaders is the 856H model, which comes equipped with a Cummins QSB 6.7 engine. The new ZF powertrain of 4WG200 (F4/R3) gearbox and wet axles are ideally matched to ensure optimised performance, and LiuGong's Intelligent load-sensing hydraulics supply power to the machine working functions based on demand. The ride control system provides fast, stable travel, whilst also achieving better material retention. Safe cab is compliant with certified FOPS/ROPS.

The 856H is fitted with a review camera, a large storage area, heated mirrors and a large, glass-curved front offering good visibility. Other features include an electrical actuated, wide-opening engine hood and all-round passage, which allows quick and easy service. The machine also has a coupler that is compatible with a wide range of attachments for multiple working conditions. ■



LiuGong 856H wheel loader.

CATERPILLAR

Caterpillar's new 9.3 l engine is designed for use in heavy-duty off-highway machines. Delivering 250-340 kW and 2,081 Nm torque, the new Cat C9.3B industrial engine will meet Stage V, Tier 4 Final and below emissions standards.

The C9.3B delivers 18 percent more power and torque, and has a simplified and 30 percent smaller aftertreatment compared to the previous Stage/Tier. A six-cylinder turbocharged engine, system mass has been reduced by 95 kg while a simplified air system allows for smaller radiator packaging.

Ease of installation has been supported through engine mounted aftertreatment (EMAT), while uptime is maximised due to the compact and lightweight diesel oxidation catalyst, diesel particulate filter, and high efficiency selective catalytic reduction aftertreatment system. The engine's flexible design reduces both installation cost and time, while ensuring quick and easy servicing and a lifetime of low cost for the end user. ■



Cat C9.3B industrial engine.

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AIRSTAR

Airstar's new battery-powered Sirocco 2S 12x10W and 24x10W LED 48-V lighting balloons can be easily transported and deployed on site, thanks to their all-in-one cases: the lighting balloon, the battery and the stand are all packaged in one rolling case. The standard version of the Sirocco 2S 12x10W LED, which comprises the lighting balloon and a 48-V battery, is packaged in a heavy-duty transport case with integrated handles and casters for ultimate portability, making it ideal for fast lighting, rescue operations and small industrial maintenance.

The Sirocco 2S 24x10W LED version, which offers two 48-V batteries for longer operating time, offers an excellent size-to-performance ratio (240-W, 24,000 lumens for 3.7 kg lighting balloon), and is suitable for industrial maintenance, emergency lighting, logistical lighting or small construction works. Both the 12x10W and 24x10W versions also have an optional pole and sand bags for ballast.

In addition, the new Sirocco 2S 2x150HI is excellent for small construction sites, roadworks and building sites. This model is well adapted for emerging markets. ■



Airstar's Sirocco 2S 2x150HI lighting balloon on a jobsite.

ALSINA

Alsina offers a wide range of formwork solutions for different applications. The company has been involved in various projects around the world including highways, viaducts, splits, piers, abutments and tunnels, among others.

Alsina's slab formwork systems are suitable for all types of solid slabs, lightened slabs and hanging beams. The company also offers shoring elements for slab formwork systems. The variety of props covers a height range from 1.5 to 6 m.

Alsina's climbing systems include one-sided wall, interior climbing platform and two-sided climbing platform with or without movement of the annexed formwork. The systems are compatible with the company's range of wall formworks.

Alsina's Multiform system for civil works consists of double UPN steel beams and wooden beams. The company can make slabs, formwork tables, columns and pillars of all geometries, straight walls, curved walls, one-sided walls, bridge decks and climbing elements. In addition, Alsina's column formwork systems are designed for all kinds of pillars: light, with crane and metallic. ■



Alsina formwork system being used on a bridge project.

XCMG

XCMG launched its new XCA100_E all-terrain crane, LW1100KN wheel loader and XE35U excavator. The company also showcased its other signature products including the RT55E rough terrain crane, LW800K and LW180K loaders, XR220DII rotary drilling rig, XE210C excavator and SQZ200K lorry crane. According to XCMG, all of them have CE certification and meet EU standards.

The XCA100_E all-terrain crane satisfies the WVTA certification requirements. With XCMG's duo-telescopic boom pin bolt technology, the crane's 60-m main boom has a maximum lifting height of 88 m. The XE35U excavator is powered by a Stage IV engine with high torque and low rpm, ensuring low noise and low fuel consumption with improved efficiency. The LW180K loader features a more spacious cab than that of the original model, greatly improving operator comfort. ■

XCMG XCA100_E crane on display at bauma.



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INDECO

Indeco has upgraded the hydraulic system on its breakers, making the HP-series to be fuel efficient. Compared to other manufacturers' models of equivalent weight and performance, Indeco claimed its breakers require less oil per minute and lower operating pressure. And as using lower hydraulic power means reducing the rpm on the carrier, this leads to fuel savings of up to 20 percent, while ensuring optimum performance and maximum productivity, said Indeco. The company added that this advantage is even more clear-cut if the breakers are compared with gas- or gas/oil-powered products of similar sizes manufactured by its competitors.

All of the new breakers in the Indeco HP range will be displaying the FS (Fuel Saving) badge. Indeco's silent demolitions and material handling products have also been given the same rotation mechanism, which will now be used on all rotating products.

In addition, the Indeco IMP multiprocessor has been redesigned, featuring a more robust body and increased maximum jaw opening; while its demolition, pulverizing and cutting geometries on the various jaws have been improved. The jaws have been updated to make it easier to dismantle and replace, and also offer better grip. Its pulverizer version now has interchangeable teeth, and the shear version has all of the features of the ISS-series Indeco shear (reversible and interchangeable cutters, and a dual-profile piercing system). The range has also been modified and extended. ■



Indeco HP-series breaker.

DYNASET

Dynaset HGV Power Box produces high-quality electricity for jobsites by utilising mobile machine's engine power with improved efficiency. The Power Box includes HG hydraulic generator with control valves, oil tank, cooler, Dynaset high-speed hydraulic pump and electric central. The all-in-one-box system is easy to install on any truck chassis, vehicles, boats, ships due to its modular structure and compact size.

The Dynaset HVD90 hydraulic directional vibra provides one direction powerful vibration force for loader's buckets, truck's beds, etc. The vibration will help emptying the buckets and removing blockage material such as mud or wet snow. The HVD90 can also be used for compacting work. It has a maximum hydraulic flow of 100 l/min, maximum hydraulic pressure of 201 bar, maximum vibration force of 40 kN and maximum vibration frequency of 35 Hz. The HVD is powered by hydraulics.

Dynaset also introduced its new HMAG pro hydraulic magnet, which is now available with claws. The hydraulic magnet is plug and play type of attachment for scrap handling, recycling, demolition and railroad, etc. In addition, Dynaset's new compact power booster



Dynaset HGV Power Box.

is designed for powering tools, pressure testing and momentarily increasing power of tools. ■

SANY

A total of 15 Sany machines were on display at bauma, including 11 new excavators, two road construction machines, a rough terrain crane and a loader. Sany said the excavators represented the highlight of its products, which included six small excavators, three medium excavators, a large excavator and a wheeled excavator.

According to Sany, the debut of its full range of excavators tailored to the European market signifies that the company would enter the high-end market in Europe. Sany also showcased its 55-t rough terrain crane - built for the European market and sold in the region by Palfinger Sany - as well as a wide range of Putzmeister equipment. ■

Sany excavators were the highlight of the company's products.





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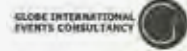
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GOMACO

Gomaco's new GP3 slipform paver is ideal for widths up to 9.14 m. It has a roller frame with dual telescoping capabilities of up to 2.13 m on each side of the paver, for a total of 4.26 m of automatic frame widening. Double parallel, hydraulic telescoping frame members in the front and rear of the mainframe allow the dual telescoping capability. Smart cylinders in the roller frame allow Smart Telescoping with accurate frame widening and automatic width reference for steering setup. The T-beam mounting rail is incorporated into the telescoping frame.

The GP3's Smart Leg Positioning includes sensed, hydraulic rotational drives on the pivot arms of each of the paver's four legs. The Smart Pivots on the legs provide the G+ control system with information on the angle of rotation and work together with the track rotation sensors to maintain the tracks in the straight-head steering line. The Smart Track Rotation provides the G+ control system with exact track location and position. The GP3 easily turns radii with Smart Leg Positioning and Smart Track Rotation. They work with the G+ control system to automatically control the direction and speed of the track travel through a radius.

The GP3 can be put into the Transport Mode by simply driving the legs around to the transport position with its full-steer tracks and hydraulic rotational sensed pivot arms. The paver has a minimum transport width of only 2.59 m and a minimum transport length of 10.15 m.

In addition, the new Gomaco 3300 multi-application slipform paver has been specifically designed for right side and left side pour capabilities. It features a symmetrical design that makes it easy to pave from either side. Its U-shaped operator's platform provides a complete view of the entire paving operation from anywhere on the platform.

The 3300's design includes a 6.1 m long conveyor with four-way hydraulic positioning, which allows perfect placement of the concrete into the hopper on either side of the paver. The four-way



Gomaco GP3 slipform paver.

positioning includes pivoting tilt, pivoting swing, longitudinal slide and sideshifting. The conveyor hydraulically folds to reduce the overall transport length of the paver.

The 3300's Extreme Steering is accomplished with hydraulic rotational drives on the tracks and G+ controls. The paver's two front legs are mounted on parallelogram-style pivot arms and the rear leg has power slide for positioning. Their smart leg positioning is accomplished with smart cylinders and the G+ digital control system along with Smart Track Rotation to provide the G+ control system with the exact location and position of the tracks and reference to their straight ahead line.

Another feature on the 3300 is the Smart Telescoping Mould mounting system for reference to G+ for repeatable mould offset. It has the Gomaco Hook-and-Go mould mounting system to quickly and efficiently change from one mould profile to the next. ■

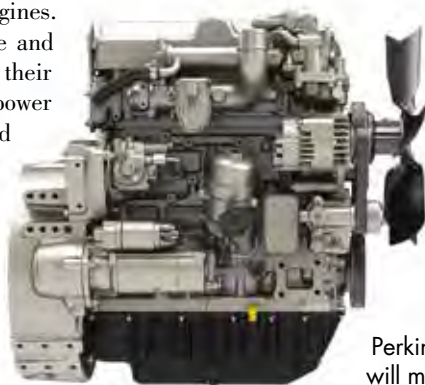
PERKINS

Perkins has launched a new family of four-cylinder, 2.8- and 3.6-l diesel engines delivering 45-100 kW. The Perkins Syncro range of common rail engines will meet multiple global emissions standards including EU Stage V and US EPA Tier 4 Final.

The high power and torque density will give OEMs the opportunity to move to smaller, more compact engines. The excellent fuel consumption, fast response and electronic integration they need to differentiate their machines is achieved through an increase in power density of 22 percent when downsizing, said Perkins.

With up to an 8 percent improvement in fuel economy during machine use, the 3.6 l offers powers up to 100 kW with up to 500 Nm of torque, while the 2.8 l turbo aftercooled variant delivers a maximum of 55 kW with torque of up to 325 Nm.

The Perkins Syncro range offers a suite



of technologies including a common rail fuel system, electronic control, advanced air systems and aftertreatment configurations. A 90 percent commonality in the customer interfaces between the 2.8 and 3.6 l engines gives OEMs the freedom to determine machine platform strategies that suit their businesses and markets.

In addition, the engines feature a modular design to ensure their ease of integration into existing – and future – generations of machine.

Manufacturing will start on a production line in Peterborough, the UK, and Perkins also plans to develop the capacity to manufacture the Perkins Syncro range in facilities in the Americas and Asia. ■

Perkins' new Syncro range of common rail engines will meet multiple global emissions standards.

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AMMANN

The new Ammann AFW 150-2 mini paver features a hydraulically extendible screed and several significant material flow enhancements. With a weight of 1,150 kg and paving width capabilities of 250 to 1,650 mm, the machine utilises a screed similar to those on large road pavers. The system enables quick and effortless hydraulic extension of the screed while the machine is operating.

Auger diameter has been increased from 100 to 120 mm to ensure consistent material distribution along the length of the screed. Also enhancing material flow is a new mechanical sensor that monitors the screed in its entirety to ensure asphalt is distributed evenly. The AFW 150-2 is powered by a Hatz diesel engine.

The new conveyor concept with a completely redesigned material flow divider is another material flow advancement that has been made. The mechanical material flow divider, conveniently located and operated by easy-to-engage hand levers, allows the operator to select whether asphalt is distributed on both sides of the paver, on one side, or stopped entirely.

The possibility to easily load the machine with a skidsteer from the side is one of the advantages of this machine. An optional insert is wider and longer than the standard hopper and makes it even easier to load the machine from any side. Machine control and precise steering is granted with the operator platform that features a steering wheel for optimal control. An updated display and a secure location for LPG gas bottles round up the operator platform.

Improved machine design is also a highlight of the new AFW 150-2. Air inlets are located on the side of the cooler to help prevent



Ammann AFW 150-2 mini paver.

asphalt and aggregate from reaching the engine compartment. The service hood opens widely for easy access, which is important when it comes to service and maintenance work. ■

SENNEBOGEN

The Sennebogen 5500 crawler crane has been used in many projects around the world for a variety of tasks, from lifting work to assembly of large building elements, as well as for logistics tasks. This 180 t crane has now been optimised to meet Tier 4f emission standards.

The 5500 is powered by a 261 kW diesel engine that drives the two 160 kN winches. Thanks to its robust Star Lifter crawler undercarriage, the machine is not only stable, but also can be conveniently driven under load. A modular boom design allows for numerous equipment variants with lengths of up to 104 m, including luffing jib.

The crawler tracks can be easily removed for transport, after which the base machine, at just 3 m wide, can be easily transported. All further components can be stowed in containers or tarpaulin-covered trucks in a space-saving way. Thanks to the Sennebogen self-assembly system, the crane can be assembled quickly.

As part of the E-series, the 5500 with green efficiency technology also boasts high energy efficiency thanks to EcoMode, temperature-controlled fan drives and a Sencon control and diagnostics system. The modern Maxcab comfort cab provides a comfortable operating environment and an optimal overview. The cab can also be tilted by 20 degrees and elevated up to 2.7 m. ■



Sennebogen 5500 crawler crane.



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DEMAG

Terex Cranes has brought back the Demag brand, which will include 11 all-terrain cranes ranging from 100 to 1,200 t capacity, and seven crawler cranes ranging from 400 to 3,200 t capacity.

The Demag AC 130-5 all-terrain crane is a 130 t, five-axle capacity class machine with a total length of 14.3 m and a carrier width of 2.75 m. The crane comes with a standard 60-m long main boom, but can reach a system length of more than 86.5 m with additional main boom extensions. When travelling, the crane is designed to stay under 12 t axle limit while still carrying a payload of up to 450 kg.

The Demag AC 220-5 all-terrain crane has a main boom length of 78 m, which can be extended to a full 99 m with boom extensions. This 220 t capacity class machine features a compact frame of 14.5 m long and 3 m wide for navigating in confined areas. The crane also stays under the 12 t axle transportation limit while carrying up to 600 kg.

The 250 t Demag AC 250-5 all-terrain crane features a total length of 14.5 m and a carrier width of 3 m. Its clean axle loads allow the crane to stay under a 12-t-per-axle road limit while still transporting up to 550 kg of payload.

All of the cranes use a single engine concept with an intelligent motor management system to reduce operational and maintenance costs. They can also be outfitted with the optional IC-1 Plus control system, which calculates lifting capacities for every position of the boom subject to the slewing angle of the superstructure. This



Demag AC 220-5 all-terrain crane.

enables users to use their maximum lifting capacity especially when lifting over the outriggers. In addition, the cranes have excellent manoeuvrability with all-axle steering, independent rear axle steering and dynamic launch control. ■

TRIMBLE

Trimble introduced its Loadrite H2250 haul truck monitor for rigid body haul trucks used in the aggregates extraction and process industry. The H2250 is an in-cab display and sensor system with InsightHQ cloud reporting and data analysis. InsightHQ is a Web-based management portal accessible via any browser, including mobile devices. It consolidates live, operational information from Trimble Loadrite devices across the site, to provide near real-time productivity and performance reports for extraction, processing and load-out operations in quarries.

The H2250 provides a near real-time reporting of haul truck production and process monitoring, driving increased production and limiting costs. The system helps quarry managers, supervisors and operators by presenting information to monitor and improve the processes and handling of the quarry haul fleet.

The H2250 provides automatic haul truck load counting and payload measurement typically within +/- 3 percent accuracy. It also features near real time production reporting, truck speed monitoring, cycle time analysis and location-based material tracking.

Using data from the H2250, fleet managers are able to empower operators to make informed decisions for haul truck process improvements.



Benefits include lowering transport costs by optimising payload, reducing cycle times and supporting safe operation of haul trucks.

The H2250 productivity reports show accurate production figures removing the need for tally sheets and production estimates. The reports highlight material movement issues e.g. poor haul road construction and inefficient product movements. Cycles time

reports include graphical reports of haul truck activity, loading time, haul time, queuing time that show machinery availability and allow fleet managers to make improvements that affect production during the shift. Speeding reports overlay speeding events over quarry maps to identify operator skill gaps or haul road design issues to improve machine operation, fuel consumption and reduce machine wear.

For a quick understanding of haul fleet productivity, the dashboard shows each truck's cycle count and daily tonnage to enable managers to check their haul fleet is meeting plant demand, adjusting to changes in cycle time, product ratios etc. On screen alerts provide speeding, rollover, tray-up and overloading alerts. ■

Trimble Loadrite H2250 haul truck monitor.



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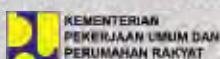
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HAMM

Hamm unveiled its new HD+ 90i tandem roller with hybrid drive. The prototype of the machine was displayed at bauma. With this model, Hamm combines an internal combustion engine with a hydraulic system.

Up to now, the roller has operated with an 85 kW diesel engine complying with the EU level IIIB/EPA Tier 4i exhaust emission standards. According to Hamm, a detailed examination of the actual engine load during compaction showed that the peak loads were only needed occasionally and even then for just a few seconds. This is the case when the roller starts up for example, or the vibration/oscillation is activated. In the new hybrid power roller, these brief peak loads are handled by a hydraulic system, enabling the roller to be equipped with a smaller diesel engine for the same performance. The load on the diesel engine is also reduced in that the radiator fans are electrically operated for optimum efficiency.

Hamm explained that the hydraulic system works rather like a pumped storage power station. As soon as the power demand falls below the maximum load of the internal combustion engine, a pump fills the hydraulic accumulator. If a great deal of power is called for, such as when starting the vibration drive, the hydraulic system functions as an auxiliary drive, able to supply a maximum short-term load of up to 20 kW. Following this, the cycle begins afresh with the refilling of the accumulator. The principle functions well because for normal applications, the maximum load is only called up for a matter of seconds. Afterwards, there is sufficient time to replenish the accumulator.

This leads to numerous benefits. For instance, the 9 t roller can be powered by a 55.4 kW engine instead of an 85 kW unit – and with the same compaction power. The smaller engine does not require an SCR catalytic converter or AdBlue, which results in advantages in terms of handling and maintenance. What's more, the power train is quieter. And last but not least, the hybrid power train in combination with the electric fan drives and a start-stop system enables significant savings of up to 15 percent in fuel consumption, substantially reducing CO₂ emissions.

The hybrid system is expected to enter field trials in selected markets during 2016, and is scheduled to be available in the models with double vibration (VV) and oscillation (VO) as well as in the combi rollers (VT) as standard from 2017. ■



Hamm HD+ 90i roller with hydraulically assisted hybrid power train.

MANITOU

The new Manitou MRT 2145 telehandler has a lifting capacity of 21 m and a load capacity of 4.5 t. It is part of the MRT Easy range, which also includes the MRT 1440, MRT 1640 and MRT 1840.

The MRT 2145 Easy is light (14 t) and compact (6.59 m at the heel of the forks), making it ideal for confined work sites. Its compact design, combined with a small turning circle, ensures great manoeuvrability. The hydrostatic transmission gives precision and flexibility in approach to handling in confined environments.

The MRT 2145 Easy is equipped with new stabilisers of the spider type (Manitou system), providing excellent stability and a large working area. The machine has a new boom with hydraulic hoses routed inside for better protection. The 75 kW Perkins Stage 3B engine delivers power adapted to all-terrain ground. The basic cab includes a dashboard identical to all of the MRT, which makes it easy to get started for operators who are used to using this range of machines.

The MRT 2145 Easy also comes with several accessories, forks, access platform, crane jib, winch, etc, providing its user with a three-in-one solution: telescopic, mobile crane and access platform.

In addition, the MT 420 New Buggy adds to the Manitou compact telescopic segment, in which the MT 625 (6 m / 2.5 t) is already present. This new ultra-compact truck is particularly suitable for renovation and urban works, where sites are increasingly confined, as well as for industrial maintenance.

The MT 420 is 1.49 m wide, 3.67 m long (at the carriage) and 1.90 m high. Its maximum lifting height is 4.28 m for a load capacity of 2 t. The machine is equipped with four-wheel drive and all wheel steer for all-terrain capability and greater manoeuvrability. It also includes a hydrostatic transmission, which enables excellent flexibility in approach and precision of movements that is particularly useful on confined work sites.

The MT 420 uses the same cab as the MT 625. The dashboard is intuitive and movements are carried out via the JSM control. The machine is offered with the standard Manitou carriage or the skid steer carriage as an option, with a wide range of accessories, which makes it highly versatile in various applications, such as loading/unloading lorries, placing loads, distributing materials, etc.

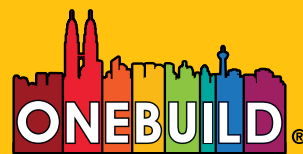
The MT 420 New Buggy will be marketed from the first quarter of 2017, according to Manitou. ■



Manitou MRT 2145 Easy telehandler.



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GENIE

The new Genie Z-60/37 FE articulating boom lift from Terex AWP provides the choice of two modes of operation, either 'full-electric' which means full-day emission-free performance on a single charge, or 'hybrid' mode which provides more than a week of run time with a single tank of diesel.

In hybrid mode, the machine uses its environment-friendly 24-hp Tier 4 Final/Stage IIIB engine-powered generator to maintain the battery state of charge or to supplement the battery power to get a boost in machine performance. To keep productivity high and maintenance costs low, its engine-powered generator constantly monitors the battery state, keeping them topped off for maximum run time, then automatically shutting off to minimise fuel consumption.

For extreme usage conditions or after heavy full-electric operation, the high power hybrid power system can provide a bulk charge within approximately four hours. The hybrid system can also provide power directly to the four-wheel AC drive motors, allowing the system to combine the power of the diesel driven generator and the 48-V DC battery pack, maximising performance when climbing hills and taking on the most rugged terrain.

The Genie Z-60/37 FE offers 45 percent gradeability, ground clearance of 33 cm and is capable of travelling 25 percent faster than other typical diesel-powered units, said Terex AWP. Operators will also appreciate its full-time active oscillating axles that increase wheel contact on irregular terrain, as well as its fully sealed AC motors, which support drive performance even while submerged under 91 cm of water.

Providing a 20.16 m working height, an 11.4 m of horizontal outreach and a 7.4 m up-and-over clearance, the Genie Z-60/37 FE lift is equipped with a 1.5 m jib offering 70° up and 65° down range of motion and a 160° platform rotation. It also boasts a narrow footprint and a low 58 cm tail swing. The platform comes in 1.8 m or 2.4 m with a capacity of 227 kg to take on board two people across



Genie Z-60/37 FE articulating boom lift.

the entire working envelope. Both platforms offer a side entry swing gate and front sliding mid rail as standard. The 2.4 m platform comes with an additional side sliding mid rail, opposite the gate, for a total of three entry points.

In addition, the Z-60/37 FE features the Genie FastMast system that enables the boom to be moved from full height to below grade and back, shortening ground-to-top lifting time with the use of just one boom control. Among other features common to all Genie booms, the Z-60/37 FE lift combines the time-saving benefits of full height drive ability and a dual parallelogram linkage design to enable operators to vertically track walls by simply raising or lowering the secondary boom without needing to reposition the machine. With a low machine weight of 7,530 kg and a stowed length of 8 m, the Genie Z-60/37 FE is also easy to transport on a standard truck. ■

MB CRUSHER

MB Crusher launched its third generation of crusher buckets, which feature a more compact design. The crusher's mouth has been expanded, thus increasing the crushing surface. With a dust suppression system, an iron separator and low noise impact, the buckets can be used at various construction sites, including residential areas.

According to MB Crusher, the buckets do not need drainage and their crushing power exceeds 110 cu m/hr, allowing them to crush hard materials such as basalt and granite. The buckets are also designed to be eco-friendly in demolitions, recycling, excavations, road works, quarries, mines and environmental remediation made for crushing, screening, divide and reuse inert material directly on site.

In addition, MB Crusher's new MB-LS220 screening bucket is ideal for loaders and backhoes with an operating weight from 12 to 35 t. It has a basket with interchangeable modular panels, available with easy-to-fit different sized meshes according to screening requirements. The conical basket shape has been specifically designed to increase the performance of production per hour and to screen all collected material without residue. ■



An MB-S18 crusher bucket mounted on an excavator.

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HAULOTTE

Haulotte's Optimum 8 electric scissor lift can move with great precision in difficult areas, thanks to its asynchronous motor. The machine is flexible both in elevation and while driving, with its narrow turning radius of 1.50 m. And with a forward speed of 5 km/hr, it can move quickly for maximum productivity.

The Optimum 8 is able to navigate indoor and outdoor jobsites in winds up to 45 km/hr while maintaining its load capacity of 230 kg. Equipped with an automatic pothole protection system, the machine can easily surmount obstacles and has no trouble making it up truck ramps during the transport phase.

The counterweight is positioned at the back of the chassis, increasing the machine's robustness. It acts as a shock-absorber, thus preventing any damage to the platform access; is able to withstand repeated hits and knocks; becomes a skid-resistant step plate integrated to the design of the machine to enhance the operator safety; and includes a veritable storage area for charger cables and plugs and offers electrical plugs in the tray.

The Optimum 8 is also compatible with the Haulotte Diag universal tool and integrates the Haulotte Activ'screen on-board diagnostics. In addition, the machine is fitted with two easy-open swing-out trays for easy maintenance (one for batteries and the other for hydraulic and electrical systems). ■



Optimum 8 electric scissor lift.

KOMATSU

One of the highlights at Komatsu stand was the HB365LC-3, a new 36 t hybrid excavator, which is designed to provide 20 percent fuel savings compared to a standard PC360LC-11 excavator. The HB365LC-3 has the same SAA6D114E-6 engine (202 kW) as the PC360LC-11, with up to 53 kW extra electric power supplied by the Komatsu hybrid system.

The kinetic energy generated during the swing-braking phase is converted to electricity, which is sent through an inverter and captured by the Komatsu Ultra Capacitor. When accelerating under workload conditions, the captured energy is discharged quickly for upper structure rotation and to assist the engine as commanded by the hybrid controller. The reserve power stored by the hybrid technology represents additional horsepower that is available to maximise machine performance by supporting the engine, or is used for swing power.

The new HB365LC-3 hybrid excavator is powered by an EU Stage IV engine and has ultra-low noise levels. All machine components and the engine are optimally controlled to match the work at hand and are coordinated through Komatsu's total vehicle control system to deliver excellent fuel savings and a reduced carbon footprint. The engine control and fun-clutch system allows the HB365LC-3 to achieve ultra-low noise levels of 100 dB (external) and 68dB (internal).

The ROPS certified cab, specifically designed for hydraulic excavators, gains strength from a reinforced box structure framework. The cab is mounted on viscous isolation dampers for low vibration levels. A heated high back air-suspension seat comes with newly designed fully adjustable armrests for improved comfort. Operators can select up to six working modes to match machine performance to the application. The new monitor panel provides information



Komatsu HB365LC-3 hybrid excavator.

on AdBlue fluid level, Eco guidance, operational records, fuel consumption history and utilisation information. For improved safety, a rear-view camera gives the operator a wide landscape view of the area directly behind the machine and is now incorporated, along with the gauges, as the operating default screen.

In addition, the HB365LC-3 has guardrails on both sides of the upper structure for easy accessibility. The machine is also equipped with the Komatsu EMMS (Equipment Management Monitoring System), which has enhanced diagnostic features that give the operator and technicians greater monitoring and troubleshooting capabilities. ■

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CASE

The new Case CX290D material handling crawler excavator is specifically designed for material handling applications. The elevating cab structure provides the operator with a commanding view of the working area from a height of 5.06 m. The reversible fan cleans the radiators more effectively, keeping high performance in the dusty conditions typical of many material handling applications.

The cab can be lowered from the cab or with an external control switch, for greater operator safety, and its descent speed is limited in case of a burst hose. The emergency cab lowering device is now operated hydraulically, further enhancing safety.

A new device prevents interference between the machine and its attachments through sensors placed on the bucket cylinder. Improvements to the pilot circuit reduce front attachment shock at full stroke. This results in a much less shaky cab, better comfort and greater safety around the machine. The front guard increases the operator's safety in the cab.

The CX290D MH is powered by a Tier 4 Final/Stage IV engine with Selective Catalytic Reduction after-treatment system and Diesel Oxidation Catalyst. Other features of the machine include a new LED working light package and a third camera to further enhance all round visibility. ■



Case CX290D material handling crawler excavator.

GROVE

Designed for the global market, the new five-axle Grove GMK5150 and GMK5150L all-terrain cranes feature a compact design to improve manoeuvrability. The GMK5150L, which was displayed at bauma, is fitted with a 60 m boom while the GMK5150 has a 51 m boom. The GMK5150L replaces the GMK5130-2 and the GMK5150 replaces GMK5110-1 in the company's product line.

Maximum counterweight for both the GMK5150 and GMK5150L is 45 t, which helps the cranes achieve an overall load chart increase of 20 percent over the GMK5130-2. Up to 10.2 t of counterweight can be carried by the GMK5150 in its taxi set-up (when configured with a Gross Vehicle Weight of less than 12 t per axle - a common axle load limit in many countries), while the GMK5150L can accommodate up to 7.9 t of counterweight in its taxi configuration.

Featuring a capacity of 11.6 t with its boom fully extended to 60 m, the GMK5150L is ideal for tower crane assembly or other applications where strength at height is required. Boosting both cranes' overall reach is an 18 m bi-fold swing-away jib, which can be extended with an 8 m boom extension and an 8 m jib extension for a total jib length of 34 m. The jib also offers an improved offset of 50°.

The new cranes are powered by a single engine, reducing their overall weight and allowing them to carry more counterweight. This in turn delivers excellent lifting ability. The engine is a Tier IV Final/Euromot 4 Mercedes-Benz OM471LA six-cylinder diesel engine with a 390 kW rating at 1,700 rpm and a maximum torque rating of 2,460 Nm at 1,300 rpm. With 16-in tyres and an overall width of 2.75 m, the 150 t capacity cranes can be easily manoeuvred on congested job sites.

Grove GMK5150L all-terrain mobile crane.



Operator efficiency is maximised through the inclusion of Manitowoc's Crane Control System (CCS). It includes the highly intuitive Boom Configurator Mode, which makes it quick and easy to select the optimum boom position for a specific lift. The operator simply inputs lift parameters such as radius, load or required distance the boom should be moved, and the system calculates the best configuration. Once the operator selects the preferred option, the boom automatically extends to the required length.

Other features include a new ergonomic Mercedes carrier cab, the Twin-Lock boom pinning system, Megaform boom shaping and Megatrak independent active suspension. Deliveries of the new GMK5150 and GMK5150L are expected to start in the fourth quarter of 2016. ■

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The MTU Emission Flex Package enables customers to operate engines in countries where widely differing emission requirements apply and fuels have higher sulphur content. Engine systems that to date have been developed solely for markets with stringent emission regulations with exhaust gas aftertreatment, can now be operated outside these highly regulated markets by using engine management software designed specifically for the purpose, thus eliminating the need for complex exhaust gas after treatment systems, with the result that no hardware changes are required.

In the initial phase, the Emission Flex Package will be offered as a retrofit solution for Series 900, 460 and 500 engines (75 – 480 kW) based on Mercedes-Benz classic engine series designed to meet EU Stage IIIB and Tier 4 interim. These engines can be modified to operate in non-emission regulated countries. With the Emission Flex Package, the new Series 1000 to 1500 engines (EU Stage IV and EPA Tier 4) can also be modified to meet EU Stage IIIA.

MTU's Series 1000 to 1500 engines (100 – 480 kW) are currently being further developed jointly by MTU and Daimler based on Daimler commercial vehicle engines to meet EU Stage V



MTU's engine portfolio for construction equipment and industrial applications includes engines of Series 1000 to 1500 as well as Series 1600.

regulations. They are expected to be available in time for the planned introduction of the new emission standards in 2019. In addition, MTU's 10-cylinder Series 1600 (567 to 736 kW) and 12-cylinder Series 2000 (560 to 1,000 kW) engines for the power range beyond 500 kW are also designed to meet the EU Stage V regulations. ■

JCB

JCB unveiled its new, innovative tool-carrying solution - the Hydradig, a compact wheeled excavator that is set to change the way in which modern construction projects are undertaken, particularly in congested urban environments and on busy road networks.

The Hydradig has a low centre of gravity, boosting stability and mobility. The machine's driveline and hydraulic pump were packaged in the base chassis, rather than high up in the upper structure. The complete driveline was packaged within the machine's wheelbase. According to JCB, the machine is as much as 150 mm lower in overall height than leading competitors, so it can be transported in a standard curtain side trailer. Its twin articulation boom offers a lift capacity of 1,000 kg through 360° off dual tyres.

With stepless hydrostatic drive to all four wheels, and an extended all-wheel steer chassis, the Hydradig has the ability to travel rapidly between jobsites. Its maximum travel speed is 40 km/hr. JCB will also offer a purpose-built trailer with the Hydradig, allowing a single operator to carry a variety of attachments and buckets along with materials for a range of jobs on site.

The operator's cab has 360° visibility, as there are no engine covers or fluid tanks to obstruct the view. And as the engine is no longer mounted in the upper bodywork, there is no requirement for additional handrails, mirrors or a rear-view camera, further enhancing visibility for the operator.

The Hydradig is equipped with three steering modes as standard, including two-wheel steer, four-wheel steer and crab steering. There is also an optional reverse steer function, which changes the direction of the steering wheels when rotated at 180 degrees. A front axle with +/-8° of oscillation and constant four-wheel drive with a stepless hydrostatic transmission ensures maximum traction and manoeuvrability on tough terrains.



The JCB Hydradig.

The side-mounted engine has a wide-opening steel canopy that provides complete ground-level access to the engine and cooling pack. All daily checks and regular maintenance can be safely carried out from the ground, reducing downtime and boosting on-site safety as there is no working at height requirement.

The Hydradig uses JCB components and technologies, including the JCB Ecomax engine, axles, hydraulic rams, cab and all of the major fabrications. The machine also comes with JCB's LiveLink telematic system, allowing fleet managers to geo-fence operation and to monitor fuel use and operating data remotely. ■



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BOMAG

Bomag's new RS 500 stabiliser/recycler features a sideways adjustable milling rotor that extends beyond the wheel edge, so it can reach even marginal areas while the machine remains safely manoeuvrable, without the tyres having to work on unsuitable subsurface or the wheels colliding into existing road surfaces. The rotor can be moved left or right over the wheel rim, making it possible to mill both edges of the road without missing any areas.

The machine concept is complemented by Flexmix technology developed by Bomag, with which the material pulverisation can be adjusted. The RS 500 also has an adjustable flap in the rotor cover. The milling material can be shredded if required by the variable crushing bar to any desired target size. Compared to other methods, this does not increase fuel consumption and the rotor wear remains very low, said Bomag.

Thanks to its height-adjustable cab and compact dimensions, the RS 500 is easy to transport. With a transport height of 3.1 m, a total width of 2.55 m and a length of 9.5 m, the machine can be placed on a low loader



stabilisers and recyclers, its function remains effective even under difficult conditions. ■

Bomag RS 500 stabiliser/recycler.

JLG

JLG's new articulating boom lift, the 1500AJP, has a working envelope of more than 74,000 cu m of reachable space. The lift features a standard 2.4-m jib that raises and lowers 135 degrees to provide additional reach, up-and-over capability, and the ability to position the platform independent of the main boom. In addition, the jib pivots horizontally 125 degrees to provide extra manoeuvrability at elevated work sites.

The 1500AJP allows operators to reach more workspace - 60 percent more than the next closest articulated boom on the market - and take more materials with them than any other articulating boom lift, said JLG. It has an up-and-over height of 18.3 m, a working outreach of 23.5 m, and platform capacity of 270 kg unrestricted and 450 kg restricted.

The Quick Stick feature enables the lift to move from the ground to maximum platform height in 2 minutes 15 seconds and return to the ground at the same speed, according to JLG. Operators can also be assured of a smooth, comfortable transition from full function speed to full stop, thanks to end of stroke cylinder dampening.

The 1500AJP offers improved serviceability, thanks to a swing-out engine tray that provides easy access to key service components, and a hydraulic system that simplifies hose routings and reduces leak points. In addition, an LCD panel located at the ground control panel uses text and fault codes to improve troubleshooting and reduce the number and duration of service calls.

The 1500AJP is easy to transport, as it fits on a standard flatbed trailer. Its balanced weight distribution on the axles also contributes

from one construction site to the next.

Due to the central, high working position and the extensive all-round glazing of the ROPS/FOPS cabin, the driver has excellent 360° visibility even without camera systems. This cabin concept, as well as its intuitive operation, enhances both safety and comfort for the driver.

The new RS 500 also features Bomag's rotor drive concept. In this case, two planetary gears are driven by two hydraulic motors. This allows for easy adjustment to every construction site situation. If required, the hydraulics always work with the maximum engine power. The rotor is completed by the BRS 05 quick-change tool holder system. Designed specifically for



JLG 1500AJP articulating boom lift.

to transportability, as the lift is easier to load, as well as great terrainability on the job site.

Other time-saving features when positioning the lift include 40 percent gradeability; 360-degree continuous turntable rotation; four-wheel drive; and hydraulically powered pivoting axles that expand quickly for fast setup time.

The 1500AJP is expected to be available for shipment to customers in early 2017. ■

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KEESTRACK

The Keestrack R8 crusher is a highly mobile solution in the output range of up to 450 t/hr. The machine has a 1,250 mm wide rotor and four impact bars (diameter: 1,267 mm, weight: about 6,100 kg), plus a specifically larger crushing chamber for high crushing capacities at a very smooth operation and a long service life of the tools. The standard active double-deck pre-screening with crusher bypass optimises the crushing result and minimises wear and tear.

The R8 also features a double-deck add-on screening unit and an oversize-grain recirculating conveyor. The optional equipment permits the production of three final grains via conventional removable screening media. Large-scale screening surfaces (each of which is 4,500 x 1,500 mm) and widely projecting stockpile conveyors help avoid frequently occurring bottlenecks of bolted-on screeners that are too small, leading to markedly declining production rates.

Keestrack is offering the approximately 60 t R8 with its hinged four-axle dolly for transporting the similarly compact large machine by trailer (transport width: 3 to 3.20 m; length: 16.70 to 17.80 m;



Keestrack R8 crusher.

height: 3.67 m (including dolly: 4 m)) in the 49.5 t basic version – with all the add-on options, including an overbelt magnet. ■

LIEBHERR

One of the highlights at Liebherr stand was the new eight-axle LTM 1450-8.1 mobile crane. The machine is capable of travelling on public roads with a 12-t axle load, including its complete telescopic boom and all supports. For worldwide economic mobility, a variety of transport weights and axle load versions have been included in the design. The VarioBallast enables the ballast radius to be reduced with infinite adjustment from 7 to 5 m using a simple hydraulic system - this feature is practically useful on constricted sites.

When the boom is fully extended to 85 m, it can hoist a massive 20 t, making it ideal for erecting large tower cranes. This long telescopic boom is also suitable for use in refineries and chemical plants. The new 450-t crane delivers excellent load capacities both with large radii and also for heavyweight hoists with a small radius, which enables it to carry out 500-t class work in many cases.

A range of lattice jibs enables the crane to work efficiently in various applications. It has a folding jib from 7 to 35 m in length, which is attached below a 0°, 10°, 20° or 40° angle. In this configuration, the crane is ideal for wind turbine maintenance work. Greater hoist heights and load capacities can be achieved using the fixed lattice jib. It can be erected from 7 to 56 m and can also be attached at an angle of 0°, 10°, 20° or 40°. The luffing lattice jib with a length of 14 to 84 m delivers maximum height, radius and performance.

The LTM 1450-8.1 operates with a maximum ballast of 135 t. The ballast plates are compatible with the plates from the LTM 1350-6.1, LTM 1400-7.1 and Liebherr nine-axle mobile cranes. Winch 2 with its pulley block for luffing jib operation can be installed quickly since it is secured direct to the ballast frame.

Powering the crane is an eight-cylinder Liebherr diesel engine in the undercarriage, which develops 505 kW and torque of 3,160 Nm. The engine meets the emissions regulations for Stage IV/Tier 4f, and is also available in a Stage III version for threshold countries.

The power is transferred to the crane axles via the 12-speed ZF-



Liebherr LTM 1450-8.1 mobile crane.

TC Tronic gearbox. The intarder, a zero wear hydrodynamic brake integrated in the gearbox, acts as a retarder. A Telma eddy current brake is also available. All the rear axles on the crane have active electro-hydraulic steering depending on the vehicle speed. This increases the manoeuvrability of the vehicle and drastically reduces tyre wear. Five steering programmes can be selected conveniently at the touch of a button. There is no need to raise the centre axles in crab speed, said Liebherr.

The LTM 1450-8.1 is the fourth mobile crane to feature the new Liebherr single-engine concept. An add-on programme is available for the crane drive concept with just one engine and a mechanical shaft to allow the machine to be run with particularly low fuel consumption. In ECOmode, the complete pump drive can be disconnected automatically when the engine is idling and then reconnected by the intelligent controller in a matter of seconds when it is required. ■

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HYUNDAI

Hyundai's new HL980 wheel loader has an operating weight of 31,000 kg and is powered by a Stage IV Scania DC13 engine without DPF (Diesel Particle Filter), which makes it up to 10 percent more fuel-efficient in truck loading, and able to achieve up to 8 percent more productivity in comparison to its predecessor, the 9A-series.

The 10 percent larger, new ROPS/FOG/FOPS cabin with fully adjustable seat provides an ergonomic working environment. It is fully sound-proofed and features maximum silence (68 dB) when working in noisy environments, such as quarries or waste handling depots – the new HL980 benefits from a 4 dB reduction in cabin noise over the 9A-series, said Hyundai.

The new air conditioning system maximises heating and cooling performance by optimising air flow through the cabin. The electro-hydraulic integrated control lever allows operators to operate attachments with ease. The automatic shutdown of engine prevents unnecessary fuel consumption and emissions. The HL-series turns off the engine when it enters into an 'idling' state. Operators can select an operating mode and 'idling' time depending on the work environments. The 5 Speed transmission with Lock-up Clutch on this machine also aids fuel consumption depending on the working conditions.

The ECO Gauge feature enables consistent economical operation through frequent checks of the machine's operating state. And when operators use the accelerator pedal (ECO pedal), they can distinguish between economical operation and power operation.

With the 'travel speed limit control' function, the operator can limit the maximum travelling speed within a range of 20 to 40 km/hr to suit diverse working conditions. The HL980 can also be fitted with HD-axles (front and rear).

Touchscreen monitor and EH controls allow several (new) features like 'Soft End Stop', bucket priority and boom bucket detent



Hyundai HL980 wheel loader.

mode, to be controlled through the touchscreen. The 'Soft End Stop' delivers - when an attachment reaches the end of a stroke - a 'shock free' operation by reducing the speed of the attachment near the end stroke.

The HL-series improves work precision with additional weight calibration. The automatic/manual cumulative weighing function greatly improves operating efficiency. In addition, Hyundai has redesigned the wheel loader buckets on the HL series and they now have a better fill factor, an additional spill guard to minimise spillage of loaded materials and changeable heel plates.

The new HL980 wheel loader is also available in XTD version (larger dumping height). ■

PALFINGER

The Palfinger PK 165.002 TEC 7 is designed for carrier vehicles with a maximum permitted total weight of 32 t. The crane shows its strengths with heavy loads, for example, which have to be lifted across large distances. It has a lifting capacity of 125 meter tons, and its maximum lifting capacity with the fly jib is 8.2 t. With the PJ 240, the PK 165.002 TEC 7 reaches a maximum lifting height of 35 m and even 40 m with the PJ 300L.

The Power Link Plus function allows the PK 165.002 TEC 7 to be used in difficult application areas. The knuckle boom system enables an overextension of 15 degrees. This point can be decisive, for example when one has to lift heavy loads through a low gate opening into a building – and this is the type of application where the PK 165.002 TEC 7 with Power Link Plus can excel, said Palfinger.

In addition, the boom system with the P-Profile increases the stiffness of the crane boom and contributes substantially to the lightweight construction. The completely redesigned slew mechanism and extension system are made in a maintenance-optimised style. The sensors, hydraulics and electronics of the crane are installed in such a way that all components have excellent protection against mechanical and weather-related influences. ■



Palfinger PK 165.002 TEC 7 crane can be mounted on a 32 t chassis.

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VOLVO

The new, 55 t capacity A60H is Volvo Construction Equipment's largest articulated hauler to date, designed for heavy hauling in severe off-road operations, including quarries, opencast mines and large earth-moving operations.

The A60H is engineered to increase uptime, thanks to its heavy-duty front and rear frames, hitch and wet disc brakes. It is powered by a 16 l Volvo engine, delivering not only maximum power of 382 kW and 495 Nm of torque, but also excellent fuel efficiency. The front grill swings down, acting as a service platform with anti-slip steps. The electric hood opens to 90 degrees, combined with electric belly plate, allowing full and safe access to the engine compartment.

With intelligent systems from Volvo, such as MATRIS, CareTrack and the On Board Weighing system, customers can optimise production and minimise operational costs. The On Board Weighing System guarantees the optimal load every cycle; this maximises production, boosts fuel efficiency and reduces machine wear in all site conditions and operations.

According to Volvo, the A60H has a bigger payload for heavy-duty applications, delivering up to 40 percent more productivity than its previous largest hauler. It has matched drivetrain,



Volvo A60H articulated hauler.

automatic drive combinations, including 100 percent differential locks, all terrain bogie, hydro mechanical steering and active suspension. Fitted with an active hydraulic front suspension for higher hauling speeds in tough conditions, the A60H optimises operator comfort and stability during travel, allowing more material to be moved in a shorter time for unmatched productivity.

The centrally positioned seat, superior steering, excellent suspension, low noise levels, climate control, space and visibility all help reduce operator fatigue for more effective operations. Its excellent levels of comfort, control, ease of operation and safety also appeal to operators, helping maintain productivity all day, every day.

The A60H's dump support system, Hill Assist and load and dump brake, all help the operator to stay in control at all times, for extra productivity and safety. A number of safety features such as superior visibility and efficient lighting help to keep the operator and people working around the machine safe in the most demanding working environments. ■

SNORKEL

Among Snorkel's new global products is an electric drive version of its popular TM12 self-propelled telescopic mast lift. Branded the TM12E, it can lift up to 227 kg to a platform height of up to 3.6 m and weighs in at 840 kg.

The electric drive system delivers longer duty cycles, thanks to drawing up to 50 percent less amps than the hydraulic drive version. It also brings the additional benefit of a zero inside turning radius, making the lift ideal for working in confined spaces.

The new TM12E features a new upper control box with a power to platform outlet as standard, consistent with Snorkel's new electric scissor lift family. The lift also features saloon-door style entry gates as standard, along with a built-in step in the chassis to ease access in and out of the stowed platform.

There are swing-out service trays on both sides of the lift, providing easy access to the batteries and hydraulic components. All electronic components are housed in a separate compartment, at the rear of the



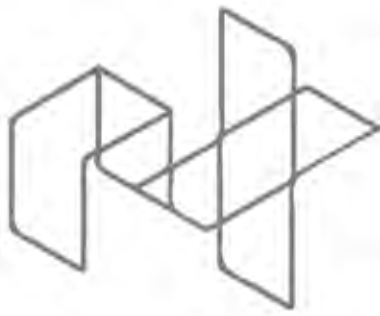
Snorkel TM12E telescopic mast lift.

chassis underneath the new step. This all-steel compartment is designed to provide additional protection to the electronics, while still providing quick and easy access, using just two bolts.

Lower controls are positioned in the rear of the chassis, making them easy to access, even when machines are parked side-by-side. The control panel is recessed to minimise damage, and the battery charger and power to platform plugs are fitted flush into the rear chassis. This helps to prevent damage, but also eliminates the need for a 'pigtail' style charging lead, which can be lost or damaged on jobsites.

In addition, the TM12E features Snorkel's on-board diagnostic system with a visual display to ease the troubleshooting process. This system is fully integrated into the machine and does not require the use of any additional external diagnostic devices.

The TM12E is expected to enter full production in the third quarter 2016, and will be sold globally, alongside the current hydraulic drive Snorkel TM12. ■



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POWERSCREEN

Powerscreen's new Warrior 1400XE electrically driven screen has been designed to meet the needs of customers for whom electricity is a preferred power source and opens up the possibility to run the machine indoors. It can be powered by electricity generated by other Powerscreen models, such as the Premiertrak 600.

The Warrior 1400XE builds on the success of the standard Warrior 1400X model with its single shaft, high amplitude 3.6 m x 1.25 m screenbox and the chassis riser option giving excellent stockpiling capacity. It also has several important service and maintenance features, including the Powerscreen 'stay-clean' system under the feeder and a jack-up screen system allowing easy access for screen media changes. Depending on feed material the output capacity for this machine is up to 500 tph.

The main benefit of the Warrior 1400XE is the variety of power options available. It can be self-powered with its own 72 kVA generator, or be connected to a mains electricity supply for even further reductions in cost of ownership. The machine can also be powered from an electric drive crusher with a barely noticeable effect on the crusher fuel consumption, said Powerscreen. This has the added benefit of eliminating the engine maintenance on the Warrior. To operate in high altitude or in high ambient temperatures, the Warrior 1400XE can be powered as part of a machine train from a single gen-set which can be oversized to handle any de-rating caused by the operating environment.

In addition, the new Powerscreen Premiertrak 600 is a high performance primary jaw crushing plant which is easy to set up, versatile and ideal for quarrying, demolition and mining applications that require high production capabilities. At the heart of the Premiertrak 600 is a 1,200 mm x 820 mm modern jaw chamber incorporating a robust construction with many user-friendly features, such as a fully



Powerscreen Premiertrak 600 jaw crusher and Warrior 1400XE screen.

hydraulic CSS range of 75 - 200 mm, and a reversing system to clear blockages quickly for increased uptime. The aggressive stroke and high inertia flywheels ensure high production rates and excellent reduction ratios. The machine can produce up to 600 tph.

The diesel-hydraulic and diesel-electric variants of the Premiertrak 600 have been designed and constructed to deliver maximum production and performance with increased uptime and low running costs. The high capacity jaw is fed by a vibrating grizzly feeder with variable speed control and a large grizzly area to maximise removal of fine material, enabling maximum wear life of jaw plates within the crusher chamber. The bypass chute is also fitted with wear-resistant liners as standard, and incorporates an adjustable five-position deflector plate to divert material to either the product or side conveyors. ■

DRESSTA

The SB-85M Extra is currently Dressta's largest pipelayer and the first to meet Tier 3 emission standards. It is powered by a Cummins QSX15 engine that delivers 410hp. The machine is ideal for the construction of gas, petroleum and water lines, as well as the repair works and maintenance of pipelines.

The efficient cooling system with Charge Air Cooler (CAC) provides cooling for the engine, charge air, powertrain, hydraulic system and fan drive. A hydraulic motor-driven engine cooling fan is used. The two-speed steering system offers excellent traction in all conditions; coupled to three-speed transmission which provides six speeds forward and six reverse.

The sound-suppressed, comfortable cab is demountable, six-sided and two-door with a roof window and emergency hatch. It also features an adjustable air suspension seat



with arm rests, and optional A/C or heater. The left hand side joystick controls the driving system of the machine. Four right hand side levers control all movements of the pipe laying equipment (boom, hook, front and rear counterweights).

Non-oscillating, all-welded, heavy box section track frame provides good stability and easy operation. With a lifting capacity of 100,000 kg, the machine can operate on large bore pipeline constructions with a tube diameter up to 1,420 mm.

Safety is ensured through the use of an emergency hook lowering system, automatic boom kick-out, hook block limit switch and load indicator devices. Working attachments include two types of boom with lengths of 7.3 m and 9 m. ■

Dressta SB-85M Extra pipelayer.

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Residential Non-Landed Buildings Category < 25,000 sq m

76 SHENTON



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76 Shenton is located within the central business district in downtown Singapore. The 39-storey development, which comprises a single-storey commercial block, 34-storey residential flats (202 units), sky terraces, a four-deck multi-storey carpark, a swimming pool and communal facilities, puts itself as one of the tallest residential buildings in the district.

Key features:

- Standardisation of precast elements that were delivered to the site for just-in-time (JIT) installation reduced inventory costs and cycle time greatly.
- Adoption of double-tier precast columns and walls doubled the crane efficiency.
- Use of unitised window-wall facade, which is lighter than a full curtain wall system, improved the constructability.
- Installation of jet fan system for the carpark ventilation was a cost and time effective alternative compared to the conventional complex ducted mechanical system. Overall building load was reduced, alleviating structural stress and in turn achieving a better total building performance.
- RCS CB 240 self-climbing system with Vario GT 24 girders used for the core walls greatly reduced lead time, which conventional system would need for dismantling and erection for use in the next construction level. This helped to achieve productivity improvement.
- Concrete placing boom was used for the project. This equipment had a small space requirement and moved upwards together with the structure, improving constructability and hastening construction work;
- Adoption of Peri SRC circular formwork eased the assembly of the rigid circular formwork at high-void area, which saved time and manpower compared to the conventional system.
- Assembly of the Peri Gridflex aluminium formwork was easy and fast.
- Gridflex's early striking beam feature had allowed for early dismantling unlike traditional system. This allowed for subsequent architectural and M&E works to commence early.
- RCS climbing protection panels were used at the perimeter to provide gap-free enclosure and safety barriers against falling from height. Being crane-independent, the tower crane could be maximised for other lifting activities and this helped to improve productivity.
- Building Information Modelling (BIM) adopted reduced uncertainties like clashes and conflicts before construction.

Project Team

Developer: Hong Leong House Pte Ltd
 Architectural Consultant: DP Architects Pte Ltd
 Structural Consultant: T.Y. Lin International Pte Ltd
 M&E Consultant: Belmacs Pte Ltd
 Design and Build Contractor: Kimly Construction Pte Ltd
 Construction Cost: S\$58,351,949.00
 Gross Floor Area: 16,873.85 sq m



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Commercial Buildings Category

CAPITAGREEN



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CapitaGreen is a Grade A high-rise office building located within Singapore's central business district and in close proximity to the extended Marina Bay Financial Centre. The building provides 34 levels of office space with a total net lettable area of approximately 700,000 sq ft, with features such as sky terraces on level 5, 14 and 26; a gymnasium and swimming pool on level 38; and a sky forest and restaurant on level 40.

Key features:

- Extensive use of precast elements such as columns and beams helped the project to achieve high construction productivity.
- Structural steel system was adopted, which improved the speed of construction.
- Application of dry fire proofing system to the steel beams allowed other trades to be done concurrently to reduce construction time.
- Extensive use of off-site prefabrication and preassembly such as curtain wall, glass partition and balustrade helped to achieve optimum site efficiency.
- For the construction of the basement, a top-down method was adopted to overcome limited construction space and allowed basement and superstructural works to be carried out concurrently. Large diameter bored piles of 3.5 m were also used to reduce a total number of piles needed, thus increasing efficiency in the installation work.
- Use of Peri formwork system allowed crane independent climbing as and when necessary to save costs on expensive crane operations.
- Efficient methods were adopted such as lotus joint for precast component installation, Tatekata Ace for steel column installation and Pitakai for faster installation of precast columns and beams to enhance productivity on site.
- Adoption of G100 and G80 high strength concrete helped to shorten the construction cycle time.
- Huge and high speed temporary lift from Japan to transport big machineries and equipment instead of relying on tower cranes saved time and improved productivity.

Project Team

Developer: CapitaLand, CapitaLand Commercial Trust and Mitsubishi Estate Asia

Architectural Consultant: RSP Architects Planners & Engineers (Pte) Ltd

Structural Consultant: RSP Architects Planners & Engineers (Pte) Ltd

M&E Consultant: Squire Mech Pte Ltd

Design and Build Contractor: Takenaka Corporation

Construction Cost: S\$420,283,655.46

Gross Floor Area: 82,953.07 sq m



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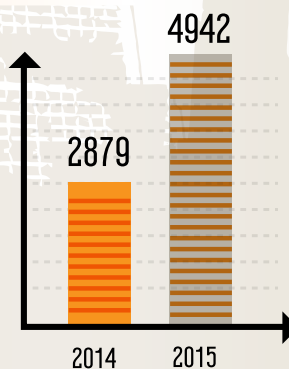
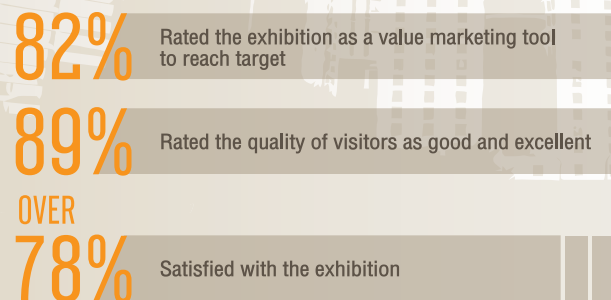


Fast Facts

- FDI projection was US\$ 5 Billion for 2014-2015 but was easily surpassed to US\$8.1 Billion.
- Estimated population of around 60 million offers huge potential market for import.
- Yangon, 7.3 million estimated population, ranked as one of Asia's top 5 emerging investment spots by Asia Property Report.
- Myanmar's construction forecasted to reach US\$6.6 Billion by 2018, with over 8% annual growth rate for the next 5 years.

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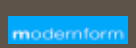
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Residential Non-Landed Buildings Category $\geq 25,000$ sq m**ACACIA BREEZE @ YISHUN**

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Acacia Breeze @ Yishun is bounded by Yishun Ring Road and Yishun St 51, comprising eight 13-storey high residential blocks with a generous landscape of verdant green and recreational amenities.

Key features:

- Extensive use of precast components such as double-tier precast columns cut down the construction time, compared to the cast in-situ method.
- High repetition of precast components helped to maximise the mould usage and facilitate ease of construction. This high repetition was further aided by block configurations that were replicated in the development for consistency in the design.
- Form of the residential block was decidedly simple with clean lines, so it was easy to construct the buildings as there were no major protrusions, tilts, bends and twists.
- Machinery like scissors lift, boom lift and Bobcat skid steer loader were widely used to boost work productivity.
- Adoption of innovative products, such as the double tier column ladder for ease of rigging and unrigging the two-tier precast columns, enhanced safety and work efficiency.
- Use of a movable safety screen integrated with working platform significantly improved labour efficiency and safety.

Project Team

Developer: Housing & Development Board
 Architectural Consultant: Surbana Jurong Consultants Private Limited
 Structural Consultant: Surbana Jurong Consultants Private Limited
 M&E Consultant: Surbana Jurong Consultants Private Limited
 Design and Build Contractor: Chip Eng Seng Contractors (1988) Pte Ltd
 Construction Cost: S\$124,630,000.00
 Gross Floor Area: 110,269.8 sq m

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Residential Non-Landed Buildings Category $\geq 25,000$ sq m**PUNGGOL EAST C38 (WATERWAY WOODCRESS)**

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Punggol East Contract 38 (Waterway Woodcress) is located along Punggol Waterway and Punggol Drive via Edgedale Plains. It is a condominium-like HDB residential project consisting of seven blocks with a full basement, first storey podium carpark and a second storey environmental deck.

Key features:

- Extensive use of standardised precast and prefabricated components helped to reduce formwork type, increase fabrication efficiency and enhance productivity.
- Adoption of prefabricated steel structures for linkway and drop-off porch offered better strength and flexibility in erection compared to concrete, thus saving time and labour.
- Stone column method used for soil improvement yielded higher productivity and reduced cost, compared to the conventional method of using jet grouting, vibro-compaction or soil mixing.
- Identical unit and façade layout design minimised the number of moulds required for the casting of precast facades and components, which increased site productivity.
- Form liner was used to form timber strip pattern on precast facade and balcony wall, which allowed painting to be carried out immediately, thus achieving the required pattern finishes effectively.
- Integration of water harvesting tank and E-deck landscaping irrigation reduced manpower for water pipes installation and usage

Project Team

Developer: Housing & Development Board
 Architectural Consultant: ADDP Architects LLP
 Structural Consultant: KTP Consultants Pte Ltd
 M&E Consultant: United Project Consultants Pte Ltd
 Builder: Rich Construction Company Pte Ltd
 Construction Cost: S\$114,000,000.00
 Gross Floor Area: 94,551.83 sq m

of PUB water for irrigation.

- Integration of electrical switch and conduit into the architectural work enhanced productivity as hacking of M&E recess was eliminated.
- Implementation of splice sleeve mechanical connection system for precast column/wall and the precast 'skin wall' for external side of precast components helped to improve site productivity.
- Building Information Modelling (BIM) was adopted to coordinate structural, architectural and M&E works and helped to reduce the risk of undetected clashing of M&E services. This helped to prevent abortive works.



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Residential Non-Landed Buildings Category $\geq 25,000$ sq m

YISHUN RIVERWALK



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Yishun Riverwalk is bounded on three sides by Yishun Ring Road, Yishun Street 31 and Yishun Avenue 6. There are 14 residential blocks, two multi-storey carparks, commercial facilities, a childcare centre, a senior activity centre and a residents' committee centre.

Key features:

- Prevalent usage of precast elements for superstructure works helped to accelerate the speed of superstructure construction and eliminated logistics problems, thereby increasing productivity.
- Full coverage of the external precast facade eliminated the use of external scaffold and reduced the amount of formwork needed.
- Repetitive unit designs and identical floor plans enabled the repeated use of formwork and precast moulds, which saved time and manpower.
- Eighty percent of the internal walls were precast panels and these were easy to transport, install and carry out finishing works.
- Prefabricated welded mesh was used, which reduced the tasks of rebar positioning and tying work, thus improving productivity.
- Most of the linkways were designed using steel structures of identical sizes. Prefab steel columns together with a raft slab cum footing were used to expedite the linkway construction.
- Simple flat plate design concept at the first floor helped to reduce the time and manpower needed to construct the ground beams.

Project Team

Developer: Housing & Development Board
 Architectural Consultant: ADDP Architects LLP
 Structural Consultant: DE Consultants (S) Pte Ltd
 M&E Consultant: United Project Consultants Pte Ltd
 Builder: Teambuild Engineering & Construction Pte Ltd
 Construction Cost: S\$183,310,093.00
 Gross Floor Area: 153,746.58 sq m

GOLD

Commercial Buildings Category

GALAXIS

Galaxis is situated at the heart of One-North development region, dedicated to the growth of infocomm, media, science and engineering research and development. The project includes a 17-storey Business Park, a two-storey retail block, a five-storey work loft building and two basement carparks at Fusionopolis Place.

Key features:

- Self-compacting concrete was adopted and this drastically improved productivity through eliminating the need for vibration compaction.
- The construction of the high volume space using ST100 helped to increase productivity and enhance safety at the same time.
- Table formwork for horizontal components and jump form for lift core and staircase core walls were adopted, which improved safety, saved time and increased productivity.
- Semi-precast concrete components were adopted to simplify on-site construction process.
- Building Information Modelling (BIM) adopted allowed better visualization of the development even before construction and was able to highlight clashes and conflicts at an earlier stage, thus preventing abortive or rectification works. This helped to ensure that non-value added works were abolished, which in turn achieved higher productivity and constructability.
- Use of flat plate with perimeter beams, post-tensioned beam and slab system, precast planters and staircase flights as well as prefabricated steel cage for columns increased the constructability of the project.



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Project Team

Developer: Ascendas Fusion 5 Pte Ltd
 Architectural Consultant: Aedas Pte Ltd
 Structural Consultant: Meinhardt Infrastructure Pte Ltd
 M&E Consultant: Mott MacDonald Singapore Pte Ltd
 Builder: Singapore Piling & Civil Engineering Pte Ltd
 Construction Cost: S\$166,103,529.74
 Gross Floor Area: 68,838.88 sq m

Mixed Development Buildings Category

APERIA



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Aperia consists of a three-storey podium, a 17-storey tower and a 14-storey tower. Sky bridges connect the two towers at the fourth storey and 15th storey. The podium houses a shopping mall, a through block link connecting Lavender Street and Kallang Avenue, and 500 carpark lots together with the drop-off point for the towers. It is topped with a roof garden at the third storey deck.

Key features:

- The structural design of the project was based on flat slab with drop panels. For slabs with larger spans, post tensioning of the slab was adopted to reduce the slab thickness and the overall load on the columns and foundations.
- Standardisation of column sizes was adopted for efficient fabrication and construction.
- Extensive use of precast components such as staircases, concrete walls, concrete parapet in the carpark and concrete fins reduced labour on site and maximised productivity.
- Large diameter bored piles were used as much as possible to reduce the quantity of the bored piles needed, thus improving efficiency in the installation work.
- The extensive use of aluminium-glass curtain wall and aluminium composite cladding together with use of precast wall and parapet reduced labour required for in-situ works and these improved the productivity for the architectural works.
- System toilet cubic partition, dry wall partition and lightweight hollow core precast concrete wall which were fast to erect were adopted to provide huge labour saving and increase the speed of construction.

Project Team

Developer: Ascendas Real Estate Investment Trust
 Architectural Consultant: ADDP Architects LLP
 Structural Consultant: T C Sin Consultants Pte Ltd
 M&E Consultant: Beca Carter Hollings & Ferner (S.E. Asia) Pte Ltd
 Design and Build Contractor: Soil-Build (Pte) Ltd
 Construction Cost: S\$192,000,000.00
 Gross Floor Area: 86,744.88 sq m

GOLD

Industrial Buildings Category

73 AYER RAJAH CRESCENT



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The JTC LaunchPad @ one-north is located at Ayer Rajah Crescent and occupies 40,000 sq m, housing 600 start-ups and 40 incubators. It was developed to seed the growth of start-ups and incubators in industries such as science and engineering, biomedical, electronics, infocomm and media.

Key features:

- Using a raft foundation with a relatively light steel frame super-structure reduced the overall dead load of the building and eliminated the need for piling. The ground floor raft slab was able to be constructed with minimal excavation, thus saving time and cost.
- The steel frame structural system adopted resulted in ease of construction at site.
- Regular grid was introduced, which allowed a modular structural and architectural layout and elevation finish, thus ensuring all materials could be prefabricated to a tighter tolerance and achieving economies of scale. This helped to save time during fabrication and installation.
- Windows and external aluminium cladding were standardised to a single module for all tenancies, allowing rapid off-site fabrication which reduced wastage and fabrication time.
- Steel frame drywalls which can be erected easily were used for all tenancies, corridors and the external elevation to shorten the overall construction time.
- A simple platform lift that did not require a dedicated lift shaft, extensive lift pits or machine rooms was adopted to save installation cost and labour.

Project Team

Developer: JTC Corporation

Architectural Consultant: Tan + Tsakonas Architects

Structural Consultant: Harvest Consulting Engineers LLP

M&E Consultant: Unipac Consulting Engineers LLP

Design and Build Contractor: CCECC Singapore Pte Ltd

Construction Cost: S\$4,853,442.39.00

Gross Floor Area: 2,550.62 sq m

Institutional Buildings Category

NANYANG PRIMARY SCHOOL



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Nanyang Primary School had recently undergone upgrading to meet the requirements of the single session primary school model. The project involved the implementation of new norms facilities for primary school, addition of 24 classrooms and an indoor sports hall.

Key features:

- Extensive use of precast elements such as staircase and precast slabs throughout the whole project reduced manpower usage on site.
- All the steel reinforcements were prefabricated off site and delivered to the worksite for installation. This reduced wastage of rebars and improved cycle time greatly.
- Standardisation of unit door and window sizes as well as repetitions of grids and floor heights resulted in efficient fabrication with better quality and less wastage in production.
- Dry partition wall system was used to divide the classrooms, resulting in fast erection and in turn saving time.
- Use of mast climbing platform and self-climbing perimeter scaffold reduced time and labour and resulted in improved productivity on the facade works, compared to the use of traditional scaffoldings.
- Use of system formwork in-lieu of metal scaffolding helped to achieve higher productivity.
- Concreting operation using hydraulic pump truck resulted in faster rate of casting, thus reducing cold joints issue and saving man-hours and machinery time.
- Timber floor directly laid over structural floor omitted the need for screeding, thus saving time and cost.
- For surfaces such as ceiling soffit and columns, spray painting was used to achieve more consistent finish and higher productivity.

Project Team

Developer: Nanyang Primary School
 Architectural Consultant: LT&T AVID Architects Pte Ltd
 Structural Consultant: ECAS-EJ Consultants Pte Ltd
 M&E Consultant: William Ng Consultants Pte Ltd
 Design and Build Contractor: Guan Ho Construction Co (Pte) Ltd
 Construction Cost: S\$35,700,000.00
 Gross Floor Area: 17,785.36 sq m



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