

international construction

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**EXCLUSIVE
LISTING**

ICON200

The world's biggest
contractors **P18**

Falsework and formwork

P43

**construction
TECHNOLOGY**
IN ASSOCIATION WITH INTERNATIONAL CONSTRUCTION AND CONSTRUCTION EUROPE

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INTERVIEW: SCOTT CROZIER, TRIMBLE

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COMMENT

The new normal

I don't really like the phrase 'the new normal' which, I guess, is ironic given that's the headline for this editor's letter. If I had to self-reflect (oh, I can be pretty deep at times, believe me) then I would say I didn't like it because we are continuously adapting to new situations all the time, not just at the moment.

Of course, Covid-19 is – drastically – different to what we are used to, but we adapt to new situations constantly. This issue has another one of our construction technology supplements; this will be the fifth one that I have helped pull together, so it isn't new to me anymore like it was at the start.

In the supplement we have features on Building Information Modelling, machine learning and power generation. All important and interesting topics and in each of them there are examples in which people in the construction industry have got used to doing something new. That could be using an electric-powered excavator, putting down a pen and paper and using BIM on a project, or buying a skid-steer loader that is capable of doing some jobs autonomously.

The construction industry is full of people and companies adapting to the 'new normal' on a daily basis. It's not often (ever?) that I quote former leaders of the Soviet Union, but I agree with Mikhail Gorbachev who said, "If you don't move forward you begin to move backward." This is true when it comes to construction technology – take a look at the latest supplement from page 25.

This issue also contains the ICON top 200, a list of the world's biggest construction contractors by sales. As 2019 was a good year, generally speaking, for the construction industry, it is no surprise to report that the sales generated by the companies on the list increased again. To find out the figure, and to see all 200 companies in the list, turn to page 18.

Our July-August issue also has an article on falsework and formwork and an interview with Karl Werner, president, international, at Ritchie Bros. With the second-hand market for construction equipment being worth hundreds of billions of dollars annually it was interesting to catch up with him and see how Covid-19 has impacted sales of second-hand equipment and discuss future trends.

I hope that, wherever you are around the world, life is resuming and you are adapting to whatever life throws at you.

Andy Brown
Editor



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Generally, in feature articles, although figures may have originally been reported in currencies other than US dollars, *International Construction* will use the conversion rate that is correct at the time of writing and report the figure in US dollars.

Generally, within news stories, the US dollar figure will follow (in parentheses) the originally reported currency figure.



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India's robust economic growth in recent years is being erased by the effects of the pandemic, creating a steep road to recovery, writes *Scott Hazelton* of IHS Markit.

REGIONAL REPORT 14

The Asia Pacific (APAC) region is struggling, but there are pockets of potential growth, including China which is bouncing back to business, *Jenny Lescohier* reports.



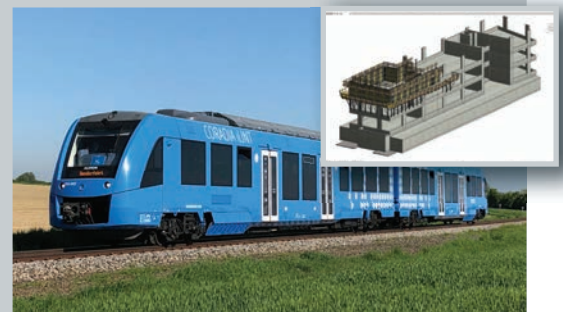
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The annual list of construction contractors with the highest sales volumes in the world reflects continued industry growth in 2019, but predictions for next year are not as bright, *Andy Brown* writes.



CONSTRUCTION TECHNOLOGY SUPPLEMENT

The second technology supplement of the year includes:
TECHNOLOGY NEWS
MACHINE LEARNING
POWER GENERATION
BIM
INTERVIEW: Scott Crozier, Trimble Civil Engineering and Construction



FALSEWORK AND FORMWORK 43

This sector is seeing the benefits digitalisation and Building Information Modelling (BIM) can bring to the construction process, reports *Jenny Lescohier*. The results include safer, more efficient job sites.



INTERVIEW: RITCHIE BROS 49

Andy Brown speaks to Karl Werner, president, international, of Ritchie Bros., about how the equipment auctioneer has managed to pivot in response to the worldwide pandemic and stay successful.



HIGHLIGHTS

CHINA Sany has announced an expanded ultra-large excavator product portfolio. The company has released the 78.6 tons (71.3 tonnes) SY870H, the 95.8 tons (86.9 tonnes) SY980H and the 125 tons (113.3 tonnes) SY1250H.

Four units of SY870H have reportedly been sold before coming out of the assembly line. "Since the launch of the SY750H and SY950H excavators, Sany's large excavator market share has witnessed steady growth over the last few years," said Cao Donghui, president of Sany Heavy Machinery R&D institute.

CHILE Reports say Chile's construction chamber (CChC) proposed a US\$22.6 billion investment plan to reactivate the country's infrastructure sector amidst the Covid-19 pandemic.

"We have to develop an intense investment plan with a significant contribution from the public sector, but also promoting private investment," said CChC head Patricio Donoso while presenting the proposal. What we are presenting here is a plan that is in line with that concern. Of the US\$22.6 billion, US\$12.3 billion are private investments."

SOUTH KOREA The Korea Construction Equipment Manufacturers Association (KOCEMA), has announced that the trade show CONEX KOREA 2020 has been postponed until 2021 due to the impact of Covid-19. The show was due to be held from 29 October to 1 November 2020, but has been pushed back to October 2021.

According to KOCEMA the association didn't feel able to guarantee the health and safety of all exhibitors and visitors due to Covid-19, so viewed postponing as the best action.

ITALY The largest tunnel boring machine (TBM) ever used in Europe has completed its drive as part of the 7.5km Santa Lucia Tunnel project in Italy. The 15.87m-diameter Herrenknecht supersize borer, manufactured in Southern Germany, broke through in June, following a complex dig process through the Apennine mountains.

The three-lane tunnel will be a significant element in the expansion of the A1 highway, running between the cities of Bologna and Florence. Once completed, the tunnel is expected to reduce the likelihood of road accidents as well as cutting levels of emissions.

GLOBAL

Trump to 'speed up' infrastructure projects

President Trump alters National Environmental Protection Act to reduce 'unnecessary delays' but move criticised by environmental groups

US President Donald Trump has announced alterations to the National Environmental Protection Act (NEPA) in a move which he said would speed up the review process of major infrastructure projects.

"This is a historical breakthrough that means better roads and highways," said President Trump, announcing the changes in Atlanta, Georgia, US.

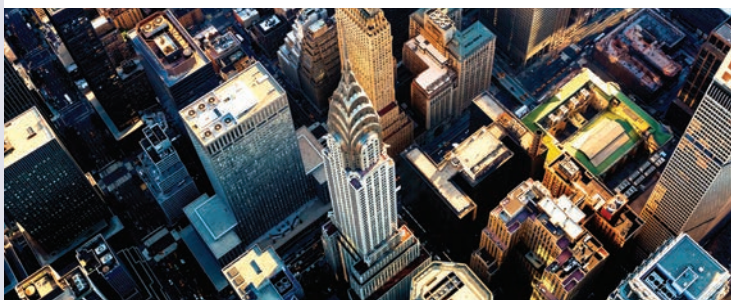
As part of the changes to the NEPA, Trump said that the review time frame will be cut down to two years or less.

The NEPA was signed into law by President Richard Nixon in 1970. It requires federal agencies to be transparent and consult with the public before embarking on infrastructure projects that could impact the environment.

Numerous environmental groups have voiced their opposition to Trump's plans. Brett Hartl from the Center for Biological Diversity said the move would, "weaken safeguards for air, water, wildlife and public lands."

Infrastructure investment has been a key battleground between President Trump and the Democratic party, with each side making various proposals but seemingly unwilling to work together to get a Bill passed into law.

Trump's main rival for the presidency, Joe Biden, has revealed a US\$2 trillion clean energy plan that promises huge investment in construction. His seven-point plan commits his administration to sparking a 'second great railroad revolution' as well as building 1.5 million affordable homes and upgrading four million buildings. Biden says that millions of jobs will be created from the construction of smart roads, schools, airports, railways and ports.



SOUTH KOREA 'Doosan to sell' stake in Doosan Infracore

Doosan group is reported to be selling its stake in construction equipment manufacturer Doosan Infracore to raise funds to repay loans. Reports say the deal does not include Doosan Bobcat.

According to press reports, the group received a 3.6 trillion won (€2.67 billion) emergency loan from the Korea Development Bank, after bailing out its engineering arm, Doosan Engineering & Construction, which suffered losses.

The 36.27% stake in Doosan

Infracore held by Doosan Heavy Industries & Construction is the sole interest Doosan group has in the construction equipment and diesel engine producer. The rest of the shares are held by investors.

Doosan Infracore owns a 51.05% stake in Doosan Bobcat. Doosan acquired Bobcat from Ingersoll-Rand in 2007. It spun off the business in November 2016 by means of an initial public offering of shares but retained a controlling stake.



CHINA Bauma China to proceed

Show organiser Messe München has announced that Bauma China will take place as planned 24-27 November, 2020, at the Shanghai New International Expo Centre (SNIEC) in China.

A host of construction equipment shows have been postponed this year due to the impact of Covid-19, but Messe München has said that Bauma China will proceed.

China's economy has recovered quicker from the impact of Covid-19 than many others around the world and the country's Gross Domestic Product (GDP) is predicted to grow by 1% in 2020. This figure is much lower than in previous years, but most countries are expected to see their economies contract.

According to Shanghai Securities Co. the growth rate of China's construction machinery industry will reach 10% this year.

The show organisers have reiterated that the health and safety of exhibitors, visitors and partners will continue to be top priority.

The notice and guidelines of preventing and controlling the epidemic on organising exhibitions published by Shanghai Municipal Commission of Commerce and Shanghai Convention & Exhibition Industries Association will be strictly followed during the show.

It is expected that more than 3,000 exhibitors will present their products and services on an exhibition area of 300,000 square meters.



UK JCB has developed what it claims is the construction industry's first ever hydrogen-powered excavator.

The 20 tonne 220X excavator powered by a hydrogen fuel cell has been undergoing rigorous testing at JCB's quarry proving grounds for more than 12 months. JCB is the first construction equipment company to unveil a working prototype of an excavator powered by hydrogen.

JCB Chairman Lord Bamford said, "The development of the first hydrogen fuelled excavator is very exciting as we strive towards a zero carbon world. In the coming months, JCB will continue to develop and refine this technology with advanced testing of our prototype machine and we will continue to be at the forefront of technologies designed to build a zero carbon future."

Power for JCB's prototype excavator is generated by reacting hydrogen with oxygen in a fuel cell to create the energy needed to run electric motors. The only emission from the exhaust is water.

The UK-based OEM announced last year that it had gone into full production with the fully electric mini excavator, the 19C-1E. JCB has also extended electric technology to its Teletruk telescopic forklift range with the launch of an electric model, the JCB 30-19E.

SWEDEN

Sales down 14% for Volvo CE

Volvo Construction Equipment (Volvo CE) has announced that sales in the second quarter of 2020 declined by 14% compared to the same quarter in 2019 due to the continuing impact of Covid-19.

Volvo CE said that weak demand in Europe and North America was partially offset by a strong rebound in the Chinese market.

Adjusted net sales in the second quarter decreased by 14%, amounting to SEK22.8 billion (US\$2.5 billion) compared to SEK26.8 billion (US\$2.9 billion) in the same quarter last year.

Despite the impact of the pandemic on sales, the second quarter saw order intake increase by 11%, driven by the company's SDLG branded machines, which were up 31%.

The second quarter saw sales decline in Europe and North America – both markets dropped, in unit terms, by 22%. Africa and Oceania saw a steep decline and the Asian market (excluding China), was down by 21%.

Some markets did see growth though, with China up 13% and the South American market up 8%.

"While demand for construction equipment in both Europe and North America was weak during the second quarter we were able to leverage our strong position in China, which rebounded strongly in the period," commented Melker Jernberg, head of Volvo CE.

EUROPE

Stage V extended

The European Parliament has backed a delay in the implementation of a major Stage V engine emissions regulation.

The original EU regulation (2016/1628) required a transition for non-road mobile machinery (NRMM) to Stage V engines in the power categories up to 56kW and equal to or above 130kW, by 31 December 2020.

The amendment – brought about by the impact of the coronavirus pandemic – gives equipment manufacturers an additional year to bring their modified equipment to market (31 December 2021).

The decision has been welcomed by the industry and follows lobbying from industry associations, including the Committee for European Construction Equipment (CECE) and the European federation for materials handling (FEM).

CECE Secretary General Riccardo Viaggi said, "The Parliament's vote was vital to prevent further economic damage caused by the Covid-19 pandemic to our manufacturing industries and protect thousands of qualified jobs that depend on them."

"Neutral from an environmental perspective, this measure will not soften the stringency of the European legislation. Instead, it will give our industry the necessary time to install transition engines, already acquired, in machines, place them on the market and be compliant with ever more demanding requirements."

INDIA

Construction in India to fall 7.5%

The construction industry in India is set to contract by 7.5% in 2020 due to the effects of the Covid-19 crisis coupled with weakness carried over from 2019.

According to GlobalData, the Indian construction industry had already been showing signs of weakening before the outbreak of Covid-19. The residential market was struggling due to rising unemployment, a liquidity crunch in the non-bank financial sector, and a decline in new residential projects launched across major cities.

The situation was expected to improve in 2020 due to government initiatives such as the National Infrastructure Programme. The pandemic, however, has caused disruption in the economy, worsening unemployment.

"The industry is expected to show unprecedented decline in the second quarter as the strict lockdown to prevent the virus outbreak has largely brought construction to a halt," said Dhananjay Sharma, construction analyst at GlobalData.

Companies, such as JCB, which recently cut 400 jobs at its factories in India, are being pinched by a lack of demand for equipment.

"We are seeing an approximately 80% decline in demand for products in May and June as compared to the same period last year," said JCB India managing director and chief executive officer Subir Kumar Chowdhury.

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13 – 15 October 2020
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www.intergeo.de

ESTA Awards of Excellence

13 October 2020
Online virtual event
www.khl-group.com/events/esta/

Diesel Progress Summit

20 October 2020
Online virtual event
www.dieselprogresssummit.com

SaMoTer 2020

21 – 25 October 2020
Verona, Italy
www.samoter.com

Tower Cranes North America (TCNA)

22 October 2020
Online virtual event
www.khl-tcna.com

World Demolition Summit

12 November 2020
Online virtual event
www.khl.com/wds

International Rental Conference

23 November 2020
Shanghai, China
www.khl-irc.com

International Offshore Crane & Lifting Conference

24 – 26 November 2020
The Event Complex Aberdeen (TECA), Scotland, UK
Liftingoffshore.com

Bauma China 2020

24 to 27 November 2020
Shanghai, China
www.bauma-china.com

2021

IPAF Summit (International Powered Access Federation)

17 March 2021
Online virtual event
www.iapa-summit.info

Hannover Messe

12 to 16 April 2021
Hannover, Germany
www.cemat.de

JAPAN

Brakes put on maglev

The US\$84 billion super-fast magnetic levitation (maglev) railway being built between Tokyo and Osaka in Japan is facing costly delays due to environmental concerns being raised by the governor of one of the districts it is to pass through.

According to reports, Heita Kawakatsu, governor of Shizuoka, used a televised meeting with the railway's developer, JR Central, to refuse to allow a 9km long tunnel to be built under Japan's Southern Alps in his jurisdiction.

Kawakatsu is concerned that the tunnel will divert water from the Oi River, which people in his district depend on. He has previously raised the issue with JR Central.

The rail company is worried about costly delays to the scheme, of which the first section from Tokyo to Nagoya is set to start running in 2027.

US

A building for post-Covid

Later this summer, the city of Chicago, US, is slated to see the completion of what some claim to be the world's first commercial building specifically designed for a post Covid-19 world.

Located in Chicago's Fulton Market District is a 12-storey, office and retail building which will be among the first multi-storey office buildings to employ airPHX ('air fix') non-thermal, plasma technology throughout to help reduce cross-contaminant risks and provide employees with cleaner air and work surfaces.

airPHX technology is currently used in hospitals and dental clinics, and reports say on-site testing has shown reductions of 90% to 99% of viruses, bacteria and mould.

The team implemented key structural changes, including the world's first new-construction installation of Canada-based MAD Elevator Inc.'s Toe-To-Go (T2G) elevator system, which utilises foot-activated call buttons for a hands-free elevator experience, reducing the spread of germs.



GERMANY

Wirtgen's new Slipform Paver

New large slipform paver SP 154i replaces SP 1500 model

Wirtgen has released the SP 154i, updating its family of large slipform pavers. The new paver is primarily used for two-layer concrete paving on highways and airport runways and replaces Wirtgen's SP 1500 model.

The SP 154i has a 436hp Cummins engine that meets EU Stage V/US EPA Tier 4f exhaust emission standards and can pave concrete surfaces up to 16m wide and 450mm thick.

When paving concrete in two layers, three separate machines work together to form a paving train: a bottom layer concrete paver, a top layer concrete paver, and a TCM (texture curing machine). In this process, the SP 154i can be used as either a bottom layer or top layer concrete paver.

As a bottom layer paver, the slipform paver is equipped with an automatic dowel bar inserter, up to three automatic side tie-bar inserters, and a concrete conveyor to the top layer paver. The heavy-duty paving mould paves the concrete true to line and level while the paver moves forward. Electric vibrators compact the concrete before dowels and tie bars are precisely inserted into the bottom layer concrete.

According to Wirtgen, the result is a homogeneous, cost-effective concrete surface that forms the ideal base for the high-quality top layer concrete.

NORTH AMERICA

Mecalac brings 11-ton swing loader to North America

Now available in North America, the 11-ton Mecalac AS1600 swing loader has the ability to pivot its bucket 90 degrees to either side, representing a departure from traditional wheeled loader design.

According to the company, the AS1600 - which was launched in Europe in 2015 - is the only wheeled loader in the 11-ton class that offers a load over height of 3.40 m. With a turning radius of only 4.35 m across the rear it is designed for confined worksites.

All models in the Mecalac AS Swing Loader Series have the unique ability to pivot the bucket, as well as a rigid frame and four-wheel steering to provide stability while driving, operating and unloading in various conditions or

terrains.

Mecalac claims the AS1600 requires only half the space of conventional loaders for tasks such as loading trucks or discharging materials into trenches with a standard 1.6-cubic-meter bucket.

Space on the jobsite has consistently been a concern in many markets, particularly Europe, and is becoming increasingly important in North America as well.



NETHERLANDS

BAM closes International subsidiary

Royal BAM group has announced it will wind up its BAM International subsidiary, the company that operates outside of BAM's European home markets.

The group said it expected to announce a loss of between €130-150 million (US\$151-174 million) in its half-year results, leading it to the decision to initiate the winding up process on the overseas business.

BAM also cited the damaging impact of its recent multi-million settlement with the city of Cologne, over a fatal accident during the construction of the Cologne Metro.

Frans den Houter, CFO and interim CEO, said, "The combination of Covid-19 and the ongoing underperformance of BAM International in the second quarter, has led to a severe impact on profitability. We will immediately start the process of winding down BAM International, which was already under strategic review."

EUROPE

'Tense, not dramatic'

Germany's Construction Equipment and Plant Engineering (VDMA) trade association has reiterated its previous forecast of a 10% to 30% decline in sales for 2020.

The figures were delivered during a virtual annual conference, to take stock of the current coronavirus crisis in which the situation was described as, 'tense, not dramatic.' Positive messages from VDMA were that construction companies are still benefiting from solid order backlogs and that significant economic recovery packages are expected from the European Union.

For Europe as a whole, the VDMA forecast is for a decline of 25% in construction equipment sales. Between January and May, incoming orders for construction equipment manufacturers in Germany declined by 26%, year on year. Between March and May, the situation deteriorated, with orders 40% down on the same period in 2019.



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7.0-8.0 m³



HIGHLIGHTS

US A contract to design and construct a Loop system for the Las Vegas Convention Center that would enable visitors to get from one end of the campus to the other in roughly one minute has been approved.

To do this, The Boring Company, owned by entrepreneur Elon Musk, is constructing a US\$50 million underground people-moving system similar to a subway. The Loop will connect the LVCC's existing space with its new West Hall expansion. Both projects are expected to be ready for the public by January 2021, well before the next Conexpo in 2023.

POLAND The Polish-Chinese consortium PUT Intercor is set to begin construction work on the third and final section of Rail Baltica, following the signing of a €747 million (US\$858 million) contract.

The consortium comprises Intercor, Stecol Corp and Sinohydro Corp and it will upgrade a 71km section of line between Czyzew and Bialystok in Poland. Once the line is completed, trains will be able to travel on it at speeds of up to 200kmh. As part of the contract, PTU Intercor will also build a 200m-long bridge.

BANGLADESH EquipSol, in Bangladesh, has joined JLG's global distributor network for its access products. "JLG is pleased to announce this distribution agreement with EquipSol," said Ian Hume, sales director JLG Middle East, Africa, Russia and India. "In EquipSol, JLG has found a knowledgeable partner in the Material Handling and Industrial segment."

GERMANY

Design award for MK-42 dump truck

Red Dot award, known as the Oscars for industrial designers, for German-based GHH's dump truck

GHH's 42 metric tonne dump truck for underground mining, construction and tunnelling has won a Red Dot award for its design quality.

The dump truck can carry up to a maximum of 45 metric tons with the dump box range from 19 m³ up to 24 m³ and a large dumping angle of 68°.

The MK-42 has a large ergonomic ROPS/FOPS certified safety cabin with high performance aircon and air filtration. The pressurised cabin is said to be noise and dust isolated with no high pressure hoses inside. It also includes a strategically placed trainer seat for on the job operator training.

According to GHH, the dump truck has been designed in collaboration with operators and miners in order to ensure the most fit-for-purpose product with best in class operator comfort and safety in mind.

Red Dot CEO, Professor Peter Zec, said, "The winners of the Red Dot Award have proved that they have created excellent products worthy of winning an award.

"The products won over the jury not only through their aesthetic, but also thanks to their incomparable functionality. With their designs, the award winners are setting new standards in their industry."

The Red Dot Award: Product Design offers designers and manufacturers from all over the world a platform for assessing their products.

In 2020, designers and companies from 60 countries entered more than 6,500 products in the competition.



US

Briggs & Stratton files for bankruptcy

US-based engine manufacturer Briggs & Stratton has filed for Chapter 11 bankruptcy protection and agreed the sale of the business to private equity firm KPS Capital Partners for US\$550 million.

The Chapter 11 filing was triggered by the firm's failure to repay a US\$6.7 million debt interest payment as a result of Covid-19. First quarter sales dropped 18%.

Terms of the agreement say a KPS affiliate will act as the stalking-horse 'minimum-bidder' through a court-supervised sale process. The deal is subject to higher or better bids.

Briggs & Stratton said it had also obtained US\$677.5 million in debtor-in-possession (DIP) financing, with US\$265 million committed by KPS and the remaining US\$412.5 from the company's existing group of asset-based lender banks.

Following court approval, Briggs said the DIP will ensure that it can continue normal operations and meet its financial obligations, including the payment of employee, production activities and shipments.

ETHIOPIA

African Dam tensions rise

The Grand Ethiopian Renaissance Dam, set to be Africa's largest and built in Ethiopia at an estimated cost of US\$4.8 billion, is set to be filled with water despite concerns from Egypt and Sudan.

The two neighbouring countries of Ethiopia fear that filling the dam will lead to water shortages in their countries – the countries share access to the Blue Nile river.

Construction on the hydropower project began in 2011 and will have the capacity to generate 6,000 megawatts of electricity, making it Africa's largest. The dam is seen by Ethiopia as a way of allowing it to bring electricity to tens of millions of its people.

Ethiopia has said it will fill the dam regardless of whether an agreement is reached or not.

Exchange rates: July-August 2020

VALUE OF 1:	AUS	BRL	UK£	CNY	€	INR	YEN	MXN	RUB	SAR	ZAR	KRW	CHF	US\$
Australian Dollar	AUS	0.27	0.559	4.97	0.619	53.0	76	15.91	50.3	2.67	11.71	850	0.665	0.712
Brazilian Real	BRL	3.70		0.151	1.34	0.167	14.3	20.5	4.30	13.6	0.72	3.16	0.180	0.192
British Pound	UK£	1.79	6.62		8.9	1.11	94.9	136	28.5	90.0	4.78	21.0	1.19	1.27
Chinese Yuan	CNY	0.201	0.745	0.112		0.125	10.68	15.3	3.20	10.12	0.537	2.357	0.134	0.143
Euro	€	1.61	5.98	0.90	8.02		85.7	123	25.7	81.2	4.31	18.91	1.07	1.15
Indian Rupee	INR	0.019	0.070	0.011	0.094	0.012		1.4	0.300	0.948	0.0503	0.221	0.0125	0.0134
Japanese Yen	YEN	0.013	0.049	0.007	0.065	0.008	0.698		0.2094	0.661	0.0351	0.1540	11.2	0.0087
Mexican Peso	MXN	0.063	0.233	0.035	0.312	0.039	3.33	4.78		3.16	0.168	0.736	53	0.042
Russian Ruble	RUR	0.020	0.074	0.011	0.099	0.012	1.06	1.51	0.317		0.053	0.233	16.9	0.0132
Saudi Riyal	SAR	0.375	1.387	0.209	1.861	0.232	19.875	28.480	5.963	18.832		4.39	0.249	0.267
South African Rand	ZAR	0.085	0.316	0.048	0.424	0.053	4.531	6.492	1.359	4.293	0.228		73	0.057
South Korean Won	KRW	0.0012	0.0041	0.0007	0.0059	0.0007	0.0620	0.0896	0.0178	0.0563	0.0031	0.0139		0.00079
Swiss Franc	CHF	1.50	5.57	0.84	7.47	0.93	79.80	114.35	23.94	75.61	4.01	17.61	1278	
US Dollar	US\$	1.41	5.2	0.785	6.98	0.87	74.53	106.8	22.36	70.62	3.75	16.45	1194	0.934

For example US\$ 1 = AUS 1.405

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An economy in reverse

India's strict lockdown in a bid to limit Covid-19 has caused severe economic damage. However, writes **Scott Hazelton** from IHS Markit, the country has great resources and potential to bounce back

The Covid-19 viral pandemic will send India's struggling economy in reverse. IHS Market expects India's real GDP (Gross Domestic Product) growth for fiscal year (FY) 2020-21 (ending March 2021) will contract 6.3%, as a result of the disease.

The country's strict nationwide lockdown to battle the spread of Covid-19 infections shut down most of the economy for nearly two months. While the government is trying to unwind lockdown restrictions, major urban economic areas are still largely under strict containment measures because of rising infection rates.

The weak containment of the virus is impacting the ability and willingness of the populace to go out of the home, which has significant negative ramifications for the economy. Prior to the lockdown, consumer spending had been battered by a combination of factors, including falling household savings and stagnant rural income.

Uncertainty about health and safety, not to mention weaker business revenues and household income, are likely to undercut the country's recovery, and we expect real GDP growth of just 6.7% for 2021-22.

Owing to current conditions, a further collapse in investment activity is expected despite accommodative monetary policy, and measures

to help shore up businesses through the crisis. Evidence of continued investment weakness is reflected in sharply contracting domestic capital goods output, but because firm profitability and cash flows are expected to be exacerbated by Covid-19 there is a concern that a recovery in private-sector investment will take several years.

After the initial lockdown announcement, the Indian government announced an INR1.7 trillion (US\$22.6 billion) package targeting food and cash distributions to the country's poorest. Another fiscal package amounting to close to 5% of GDP was announced in May, which further focused on support to businesses, vulnerable households and the agricultural sector.

New budget

Indian Finance Minister Nirmala Sitharaman presented the government's fiscal year (FY) 2020-21 budget on 1 February, the first full budget in Prime Minister Modi's second term. The agricultural sector received a budget increase of 28%. Combined with the rural development budget, this should provide support to India's struggling rural economy.

The transport budget was increased by 7% to support infrastructure works, including expanded highway and airport development.

The government also introduced a 100% tax exemption for sovereign wealth funds on interest and dividend receipts, and for capital gains achieved on investments made before 31 March 2024 to encourage external funding for infrastructure projects. The budget also includes increased import tariffs on more than 30 products, aligning with the government's protectionist stance within its 'Make in India' policy.

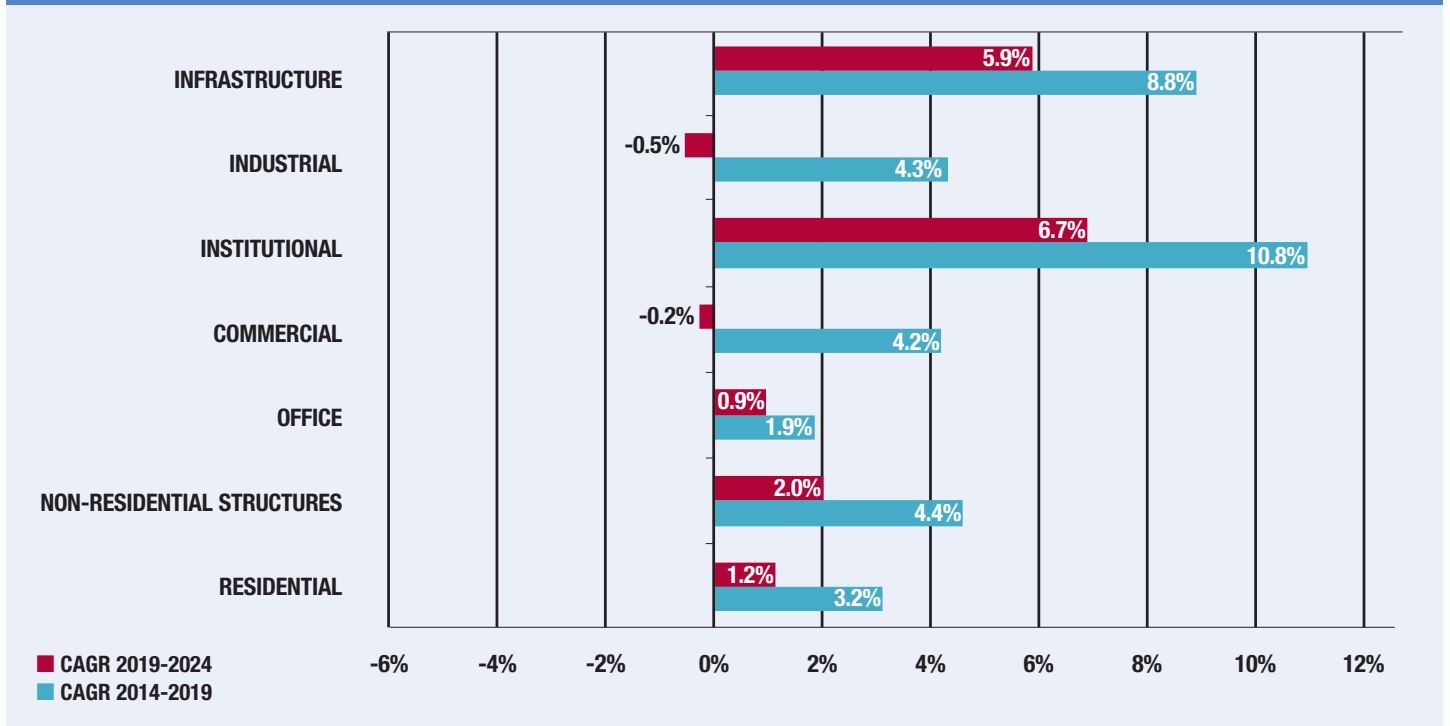
IHS Markit expects the government to overshoot the 3.5% of GDP target for FY 2020-21, largely due to revenue underperformance. With corporate tax cuts and the government's privatisation program falling short of past targets, chronic revenue underperformance appears likely to continue, limiting the government's financial flexibility to revive the economy.

The budget's spending plans do not appear to address the key issues driving the current economic slowdown, including continued weakness affecting banks and non-bank financial companies. This will constrain private consumption and investment.

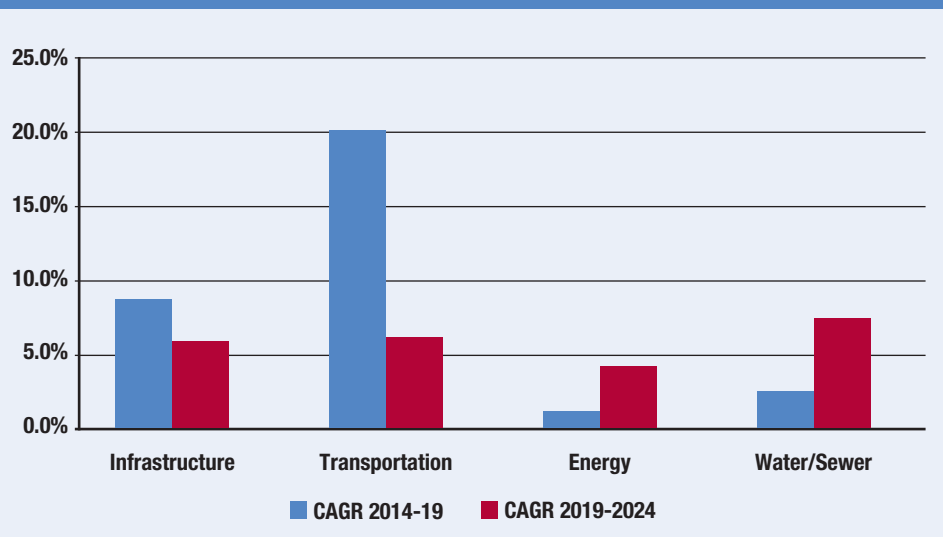
The government's limitations in pursuing reforms indicates that new projects under Make in India will progress slowly, limiting scope to expand employment or improve India's position in global supply chains.

Compound real annual growth (constant US\$2010) by major building type

The charts below indicate growth, and estimated growth, by building type



Compound real annual growth in India (constant US\$2010) by infrastructure type



About IHS

Established in 1959, IHS is the leading source of information, insight and analytics in critical areas that shape today’s business landscape. Businesses and governments in more than 150 countries around the globe rely on the comprehensive content, expert independent analysis and flexible delivery methods of IHS to make high-impact decisions and develop strategies with speed and confidence. Headquartered in Englewood, Colorado, USA, IHS is committed to sustainable, profitable growth and employs about 8,800 people in 32 countries around the world.



The forecast for the residential sector is lower than the past five-year performance but remains above the global average. The forecast is driven by India’s rapid population growth and while consumer confidence has weakened, demand remains from spending associated with urbanisation and an expanding middle class.

Office construction remains weak, despite India’s IT and other service industries. Commercial construction also features a contraction, as

consumer spending remains weak, e-commerce eats into brick and mortar activity, and the pandemic limits tourism and business travel.

Infrastructure has been a top performing segment over the past five years, and it will remain strong. There is some risk in the current financial environment, but delivering goods and services to the market, and even getting people to their jobs, is critical to continued economic development. Similar logic holds for institutional spending. For

India to realise its potential, the education and health care systems require significant investment.

India’s outlook has weakened over the past year, as Covid-19 impacts an already weakened economy. Reforms have been slower and less wide-ranging than expected (and needed), yet the resources of India, especially its people, offer tremendous potential. India remains a solid long-term construction economy, but the next few years will be challenging. **IC**



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Fighting to recover from Covid-19

Can investment in infrastructure, tourism and oil and gas save the economies in Asia Pacific? **Jenny Lescohier** investigates

Construction in the Asia Pacific (APAC) region has taken hits as a result of the Covid-19 pandemic, like the rest of the globe. However, there are pockets of potential growth, despite the crisis, that depend on a commitment to infrastructure, tourism and general economic health.

The global pandemic is not the only challenge facing the APAC region, though. Recent weakness in oil prices and real estate markets, as well as increasing unemployment, have taken their toll on this part of the world which had seen significant economic expansion in recent years.

According to data from The World Bank, growth in the APAC region is projected to fall to 0.5% in 2020, the lowest rate since 1967. China's growth is expected to slow to 1% this year, but then rebound to 6.9% in 2021 as activity gradually normalises as lockdowns are lifted around the world.

Economic activity in the rest of East Asia and Pacific is forecast to contract by 1.2% in 2020 before rebounding to 5.4% growth in 2021. Among the major economies of the region, Malaysia, the Philippines, and Thailand are forecast to experience the biggest contractions this year.

China powers regional growth

The powerhouse of the APAC region is, of course, China. Although it was the epicentre of the Covid-19 pandemic, China has shown signs of recovery in recent months, supported by investment in infrastructure.

According to data and analytics firm GlobalData, investments in real estate development have also grown, increasing by 7% year-over-year in April.

Construction in Australia was struggling before the Covid-19 crisis, and some say it lies on the brink of collapse



This is significant, following marginal growth of 1.1% in March and a 16.3% contraction during the first two months of 2020.

China has resumed construction on just under 90% of key projects, according to an official with the National Development and Reform Commission (NDRC). All major railway projects have resumed operation, with 97% of major highway and waterway projects and 87% of airport projects also resuming construction.

The rest of Northeast Asia is seeing expansion of construction output curtailed to 1.1% in 2020, down from a prediction of 4.2% growth earlier this year.

"Trade disruption is likely to present a major challenge to the export-oriented economies of Taiwan, South Korea, Hong Kong, and to a lesser extent on Japan and China, as companies cut back on expansion due to cash flow problems, thereby affecting the industrial construction sector badly," said Dhananjay Sharma, construction analyst at GlobalData.

In South Korea, where the government's extensive tracing and testing method has limited the spread of the virus, the total value of construction orders received still declined by 11.8% during the first four months.

Hong Kong's construction industry was already weakening prior to the Covid-19 outbreak, with output contracting by 9.3% in 2019, according to reports. The situation worsened amid the crisis and renewed tensions with China. The US government's trade war with China and the removal of Hong Kong's special status are expected to decrease investment in industrial construction.

"Led by the recovery in China, [construction in Northeast Asia] is expected to grow by 5.7% in 2021, and an annual average growth rate of 4.2% over 2021-2024, as government focuses more on new age infrastructure, including 5G networks and data centers," Sharma states.

Southeast Asia struggles

Even before the pandemic, construction in South and Southeast Asia had slowed, led by a deceleration in real estate markets across many of the countries, including India.

Prior to the outbreak of Covid-19, the region was expected to regain some of its growth



momentum in 2020 to post an expansion of 6%. With growing disruption in the area, however, the industry is now expected to contract by 4.3%.

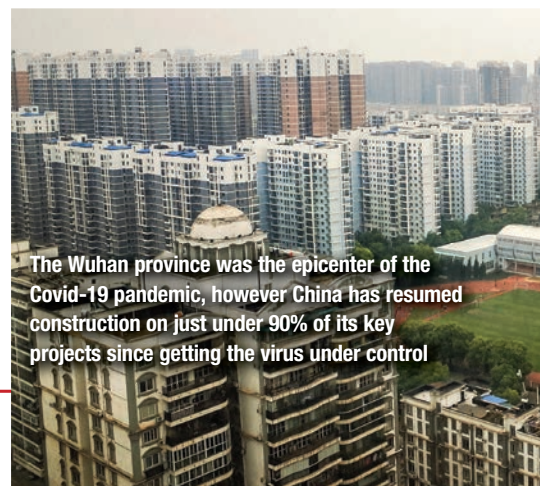
Besides India, there were signs of weakness in Malaysia, Vietnam and Thailand, particularly in the real estate segment.

First quarter data for several of the countries in the region showed signs of disruption, with Thailand witnessing the highest contraction of 9.9%, followed by Malaysia with a contraction of 7.7%, India by 7.5%, Singapore by 4%, and the Philippines by 3.4%.

There has been positive growth in Indonesia and Vietnam; however, even in these countries the growth rate has decelerated to a decade low.

Prior to the pandemic, the situation in India was expected to improve as a result of government initiatives to improve its liquidity position and the National Infrastructure Program. However, current circumstances are causing disruption.

“ Economic activity in East Asia and Pacific is forecast to contract by 1.2% in 2020 before rebounding to 5.4% growth in 2021 ”



The Wuhan province was the epicenter of the Covid-19 pandemic, however China has resumed construction on just under 90% of its key projects since getting the virus under control



China reports that 97% of major highway and waterway projects and 87% of airport projects have resumed construction

The Indian government imposed a strict lockdown in a bid to keep the number of its citizens infected with Covid-19 down, leading to much of the country's economy being closed for two months. According to IHS Market, India's real GDP growth for fiscal year 2020-21 (ending March 2021) will contract 6.3%.

While the government is trying to unwind lockdown restrictions, major urban economic areas are still largely under strict containment measures because of rising infection rates.

According to the World Bank, India's debt to GDP ratio is expected to rise from 70% in FY 2020 to more than 80% due to lower revenue generation and higher expenditure. This could limit the government's ability to invest in infrastructure.

In India a large percentage of infrastructure projects are managed, and financed, by the government rather than private companies or even PPP (public-private-partnerships) that share the risks and rewards. With both individual states' revenues – and central government – being hit due to the lockdown it is expected that budgetary allocations for new projects will be cut.

An indication of the seriousness of the situation in the country occurred when JCB India recently made 400 jobs redundant as sales continue to fall due to the impact of Covid-19. According to reports, JCB India has a total workforce of approximately 8,000 people, which includes 4,000 permanent employees. Both contracted and temporary workers



have lost their jobs.

"The construction equipment sector, like many other sectors, has been adversely affected due to Covid-19. As construction activity slowed down, there was almost no demand for construction equipment in the month of April.

"We are seeing an approximately 80% decline in demand for products in May and June as compared to the same period last year," said JCB India managing director Subir Kumar Chowdhury.

JCB India has five factories in India and manufactures a wide range of equipment.

Australia looks to infrastructure

The Australian construction industry is expected to contract by 5.7% in 2020, due to the twin challenges of Covid-19 and drastically low oil prices. However, the Australian government is pushing ahead with infrastructure investment in an attempt to give the nation's economy a proverbial shot in the arm.

The Australian federal government's Infrastructure Investment Program was expected to deliver US\$57.5 billion in infrastructure funding through 2026-27, including funding of the US\$7.7 billion National Rail Programme and equity for other major infrastructure investments. On top of this, PM Scott Morrison has announced AUD\$1.5 billion (US\$1.05 billion) extra in funding to immediately commence work on priority projects identified by states and territories.



The Australian construction industry is expected to contract by 5.7% in 2020, due to the twin challenges of Covid-19 and drastically low oil prices

The priority list includes around 150 nationally significant proposals across transport, water, energy, telecommunications and social infrastructure and identifies a AUD\$60 billion (US\$43 billion) pipeline of projects that have been assessed by Infrastructure Australia.

Despite this, there are still fears for the health of the construction industry. Joe Barr, CEO of Australian construction firm John Holland, told *The Australian Financial Review* that the country's construction industry, which accounts for 13% of Australia's GDP and one in ten jobs, is on the brink of collapse.

"I won't sugar coat it," he was quoted as saying. "Tier one contractors in Australia are not making any money, and governments across Australia ➤

India to ramp up border construction

Dispute with China over Line of Actual Control spurs action

Indian Defense Minister Rajnath Singh recently ordered the Border Roads Organization (BRO) to complete strategic border road and bridge projects as 'top priority,' the Anadolu Agency (AA) reports.

The decision to ramp up road construction comes at a time when Indian troops are locked in a bitter standoff with the Chinese army over the construction of a 255km road on the Indian side of the Line of Actual Control (a demarcation line that separates Indian-controlled territory from Chinese-controlled territory in the Sino-Indian border dispute) in the northern Himalayan region of Ladakh.

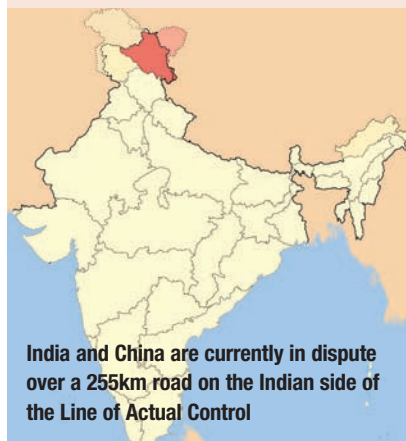
"The consistent need for boosting the ongoing projects and to expedite the construction of strategic roads, bridges, and tunnels in the border areas was discussed," confirmed a statement issued by the Ministry of Defense in India following a meeting led by Home Ministry's Additional Secretary for Border Management, BR Sharma.

"The 255km Dabruk-Shyok-Daulat-Beg-Oldi (DSDBO) road is a strategic road along the LAC. The ongoing construction here is almost complete except for the last 45km. Defense Minister [Singh] has ordered that this be completed by October," a source from the Defense Ministry reported to AA.

"This ensures rapid and early movement of troops and logistics to forward areas. Trials have also been carried out successfully for indigenously produced modular bridges under the Prime Minister's 'Make in India Initiative'. This will revolutionise the bridge laying capability in the forward areas," read the statement.

China has been objecting to Indian road and infrastructure development at several points along the LAC. A road branching from the DSDBO road towards the Galwan valley is believed to be one of the reasons for their objections.

India Today reports that under Phase 2 of the India-China Border Roads (ICBR) project, 32 roads will be built along the India-China border.



India and China are currently in dispute over a 255km road on the Indian side of the Line of Actual Control

keep having successive project cost blowouts.

“While [the government has] projects worth hundreds of billions in planning along the east coast, it is unclear if there will be an industry left to build them.”

Across the APAC region, infrastructure stands to benefit from government infusion of funds. But with lower revenues due to the economic slowdown, and higher fiscal expenditures to sustain weaker segments of the population, nations’ debt to GDP ratios will increase, potentially hampering major infrastructure spending.

Prior to the pandemic, APAC governments had generally been investing heavily in infrastructure. In the past five years, the value of global infrastructure construction grew by 3.2% on an average annual basis, with infrastructure construction in Northeast Asia growing an average of 5.4% per year and 6.8% in South and Southeast Asia, according to GlobalData.

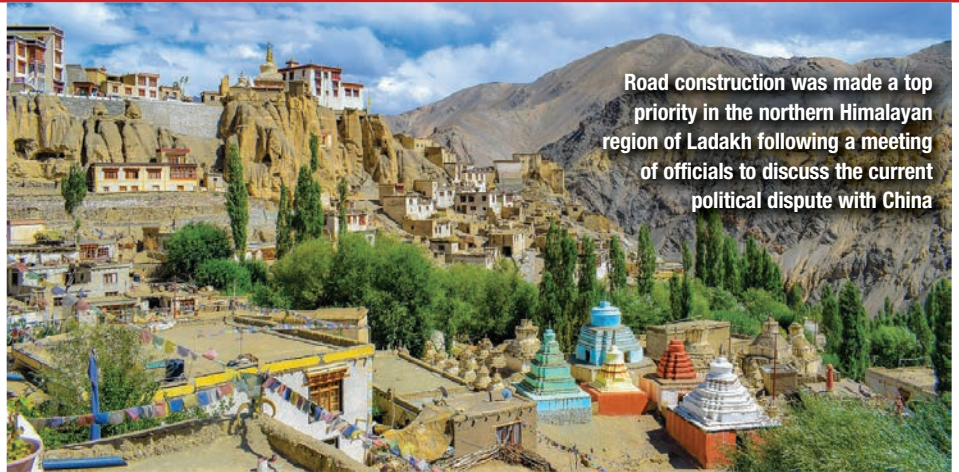
Overall economic growth for the region (excluding China) will drop to just 0.5% in 2020, down from an average of over 7% in the past five years, reports said. As a result, investment will decline, notably hitting commercial, industrial and residential construction.

“Governments and public authorities will likely be aiming to advance spending on infrastructure projects as soon as normality returns so as to reinvigorate the construction industry and the wider economy,” said Danny Richards, lead economist, GlobalData.

“This will spread across all areas of transport infrastructure and energy and utilities. Investment in infrastructure is generally considered to have a high multiplier effect, with the overall increase in economic value being higher than the value of direct investment itself.”

With public funds not enough to meet infrastructure needs, businesses are calling on

“ The shape of things prior to Covid-19 could position the APAC region for uniquely positive change next year ”



Road construction was made a top priority in the northern Himalayan region of Ladakh following a meeting of officials to discuss the current political dispute with China



Building of digital infrastructure, such as the 5G network, promises a degree of construction activity in the APAC region

governments in Southeast Asia to encourage greater private sector participation in projects.

Bright spots

Despite Covid19 wreaking havoc in the global hospitality industry, analysts at TopHotelNews report the hotel project pipeline across APAC remains full.

The TopHotelProjects construction database reveals that 2,476 new hotels are slated to open in the APAC region in the coming years. APAC has been driving growth in the global hotel market for some time, and that remains the case, with 671 properties in the pipeline for 2020 and 667 scheduled for 2021.

China is in front with 1,206 planned openings, making up almost half of the entire region’s upcoming launches. Australia follows in a very distant second place with 183 new hotels, while India concludes the top three with 148 new properties.

Asia is also set to lead the global construction of new trunk/transmission oil and gas pipelines by 2024, holding 36% of total estimated additions.

The region expects 109 projects with a 46,699km length of new-build oil and gas pipelines. Roughly 78% of these projects have already received approvals for development, while the remaining 10,114km are from early-stage announced projects.

“The Power of Siberia 1 (China section) is the longest upcoming pipeline in the region with a length of 3,371km,” analyst Soorya Tejomootula was quoted as saying.

Looking ahead, global growth is projected at -4.9% in 2020, 1.9% below the April 2020 forecast, according to the International Monetary Fund (IMF).

The pandemic has had a more negative impact on activity in the first half of 2020 than anticipated, and the recovery is projected to be more gradual than previously forecast.

Despite that sobering prediction, in 2021 global growth is projected at 5.4%. Overall, this would leave 2021 GDP some 6.5% lower than in the pre-Covid-19 projections of January 2020. The adverse impact on low-income households is particularly acute.

China is, of course, key to the health of the world’s economy and the Asia Pacific region. A recent report from market analyst Fitch Solutions painted an optimistic picture for the future.

“We remain positive on the outlook of China’s construction sector, which is the world’s largest in terms of nominal value,” the report says. “Growth will be driven by government efforts to invest in infrastructure, both in the transport and energy sectors, to improve connectivity between cities and to reduce pollution.”

The report added that construction is set to be the main beneficiary of government attempts to stimulate demand into the economy.

This positivity is echoed by Sharma from GlobalData. “The underlying potential in the region means that there could be a sharp recovery in 2021, followed by robust expansion in the following few years,” he said. “This would be driven by the buoyant economic state and the rising middle-class population, driving consumption growth and leading to investments in housing and infrastructure.”

IC



JCB India has cut jobs due to the impact of Covid-19



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World's top 200 revealed

The league table of the world's biggest construction contractors shows good growth – reflecting that 2019 was a positive year for the construction industry. While next year's table is likely to see a decline, this year's enjoys growth once again, and continued dominance of the top positions by Chinese contractors, reports **Andy Brown**

The world in which we are currently living – a world with Covid-19, social distancing, mask wearing, and a majority of economies all around the world experiencing negative growth – is vastly different to the one that we enjoyed and took for granted in 2019.

Last year was another positive one for the construction industry; for instance in May's Yellow Table, the ranking of the world's top 50 construction equipment OEMs by sales, it was revealed that sales reached US\$202.7 billion, the first time that the figure had reached over US\$200 billion.

Construction equipment sales around the world were thought to be reaching their cyclical peak in 2019, with a small decline predicted – this was before Covid-19 – for 2020, but only by a couple of percentage points.

The figures of the ICON Top 200 also reflect this positive year for construction. The total sales figure generated by the 200 contractors on the list is US\$1.744 trillion – a strong increase from the last list, which had sales of US\$1.677 trillion.

China-based contractors continue their dominance of the upper echelons of this list. The Belt and Road Initiative continues to spread across the world – with Chinese contractors attached to these projects it really is a major driver of growth for those involved.

It is also worth noting the ongoing impact of high-speed rail development in China – since its first line opened in 2009 the country has developed by far the largest high-speed rail network in the world and has announced plans to extend it even further. These projects help boost the figures for some of the China-based contractors on this list.

The number one contractor on the list, China State Construction and Engineering saw sales rise from US\$178 billion to US\$203 billion, a quite staggering figure and the

	(US\$ million)	SALES	COMPANY	COUNTRY	2019 CHANGE	WEBSITE
1	203,101		China State Construction & Engineering (CSCEC)	China	1↔	www.cscec.com.cn
2	124,333		China Railway Group	China	2↔	www.crec.cn
3	120,676		China Railway Construction Corporation	China	3↔	www.crcc.cn
4	80,742		China Communications Construction	China	4↔	www.crbc.com
5	54,656		Vinci	France	5↔	www.vinci.com
6	49,208		Metallurgical Corporation of China (MCC)	China	6↔	www.mccchina.com
7	43,776		ACS	Spain	7↔	www.grupoacs.com
8	42,521		Bouygues' Construction Divisions	France	8↔	www.bouygues.com
9	29,488		Shanghai Construction Group	China	11↔2	www.scg.com.cn
10	28,981		Hochtief	Germany	9↔1	www.hochtief.de
11	22,256		Lennar	US	12↔1	www.lennar.com
12	22,205		Sekisui House	Japan	15↔3	www.sekisuihouse.co.jp
13	21,800		Bechtel*	US	10↔3	www.bechtel.com
14	20,953		Eiffage	France	13↔1	www.eiffage.fr
15	20,533		Larsen & Toubro E&C	India	20↔5	www.larsentoubro.com
16	19,200		Fluor*	US	16↔	www.fluor.com
17	19,060		Obayashi	Japan	17↔	www.obayashi.co.jp
18	18,487		Kajima Corporation	Japan	19↔1	www.kajima.co.jp
19	18,300		Skanska	Sweden	14↔5	www.skanska.com
20	17,592		D R Horton	US	21↔1	www.drhorton.com
21	17,565		Strabag	Austria	18↔3	www.strabag.com
22	16,102		Taisei Corporation	Japan	26↔4	www.taisei.co.jp
23	15,754		China Gezhouba	China	24↔1	www.cgcc.ceec.net.cn
24	15,614		Shimizu Corporation	Japan	23↔1	www.shimz.co.jp
25	14,842		Hyundai Engineering & Construction	South Korea	27↔2	www.hdec.co.kr
26	13,451		Doosan Heavy Industries & Construction	South Korea	28↔2	www.doosanheavy.com
27	13,436		TechnipFMC	UK	22↔5	www.technip.com
28	12,689		Jacobs Engineering	US	25↔3	www.jacobs.com
29	12,430		Takenaka Corporation	Japan	30↔1	www.takenaka.co.jp
30	11,179		Lendlease Group	Australia	29↔1	www.lendlease.com.au
31	10,212		PulteGroup	US	33↔2	www.pultegroupinc.com
32	10,201		Saipem	Italy	34↔2	www.saipem.it
33	9,927		CIMIC Group	Australia	32↔1	www.cimic.com.au
34	9,338		Balfour Beatty	UK	38↔4	www.balfourbeatty.com
35	9,174		Emcor Group	US	41↔6	www.emcorgroup.com
36	8,948		GS Engineering & Construction	South Korea	31↔5	www.gsconstir.co.kr
37	8,669		Whiting-Turner Contracting	US	54↔17	www.whiting-turner.com
38	8,425		McDermott International	US	52↔14	www.mcdermott.com
39	8,332		Daelim	South Korea	35↔4	www.daelim.co.kr
40	8,200		Peter Kiewit*	US	39↔1	www.kiewit.com
41	8,082		Bam Group	Netherlands	40↔1	www.bam.nl
42	8,061		Acciona	Spain	37↔5	www.acciona.es
43	7,947		China State Construction International Holding	Hong Kong	46↔3	www.csci.com.hk
44	7,795		Spie	France	43↔1	www.spie.eu
45	7,778		Haseko	Japan	42↔3	www.haseko.co.jp
46	7,658		SNC-Lavalin	Canada	44↔2	www.snc-lavalin.com
47	7,432		Daewoo Engineering & Construction	South Korea	36↔11	www.dwconst.co.kr
48	7,260		NVR	US	49↔1	www.nvrinc.com
49	7,223		Toll Brothers	US	45↔4	www.tollbrothers.com
50	7,036		FCC	Spain	47↔3	www.fcc.es
51	6,787		Ferrovial	Spain	51↔	www.ferrovial.es
52	6,406		VolkerWessels	Netherlands	50↔2	www.volkerwessels.com

	(US\$ million)	SALES	COMPANY	COUNTRY	2019 CHANGE	WEBSITE
53	6,166	NCC Group	Sweden	48	05	www.ncc.se
54	6,083	Barratt Developments	UK	53	01	www.barratthomes.co.uk
55	5,976	Consolidated Contractors Company (CCC)*	Greece	59	04	www.ccc.gr
56	5,718	Peab	Sweden	55	01	www.peab.se
57	5,706	Gilbane Building	US	71	014	www.gilbaneco.com
58	5,665	Kandenko	Japan	67	09	www.kandenko.co.jp
59	5,639	KBR	US	70	011	www.kbr.com
60	5,544	Taylor Wimpey	UK	62	02	www.taylorwimpey.com
61	5,471	Porr	Austria	56	05	www.porr.at
62	5,470	Samsung Engineering	South Korea	74	012	www.samsungengineering.co.kr
63	5,463	Petrofac	UK	57	06	www.petrofac.com
64	5,387	Kinden	Japan	75	011	www.kinden.co.jp
65	5,348	Salini Impregilo (Webuild SpA)	Italy	58	07	www.impregilo.it
66	5,283	Kier Group	UK	60	06	www.kier.co.uk
67	5,276	Penta-Ocean Construction	Japan	72	05	www.penta-ocean.co.jp
68	5,268	Tecnicas Reunidas	Spain	65	03	www.tecnicasreunidas.es
69	5,157	Fayat Group*	France	66	03	www.fayat.com
70	5,046	M.A.Mortenson*	US	105	035	www.mortenson.com
71	5,008	Sinohydro	China	69	02	www.sinohydro.com
72	4,933	Ed Züblin	Germany	89	017	www.zueblin.de
73	4,861	Implenia	Switzerland	83	010	www.implenia.com
74	4,851	Bilfinger	Germany	73	01	www.bilfingerberger.de
75	4,791	Toda	Japan	77	02	www.toda.co.jp
76	4,787	Ackermans & van Haaren	Belgium	63	013	www.avh.be
77	4,709	Nexity	France	76	01	www.nexity.fr
78	4,674	Sacyr Vallehermoso	Spain	80	02	www.sacyr.com
79	4,661	Persimmon	UK	68	011	www.persimmonhomes.com
80	4,604	Hensel Phelps*	US	104	024	www.henselphelps.com
81	4,559	Lotte Engineering & Construction	South Korea	64	017	www.lottecon.co.kr
82	4,553	KB Home	US	79	03	www.kbhome.com
83	4,485	Maeda Corporation	Japan	81	02	www.maeda.co.jp
84	4,451	Tutor Perini	US	82	02	www.tutorperini.com
85	4,421	JGC	Japan	61	024	www.jgc.com
86	4,343	Sumitomo Mitsui Construction	Japan	88	02	www.smcon.co.jp
87	4,250	DPR Construction*	US	78	09	www.dpr.com
88	4,104	Bellway	UK	91	03	www.bellway.co.uk
89	4,063	Compagnie D'Entreprises CFE SA	Belgium	86	03	www.cfe.be
90	4,010	Kumagai Gumi	Japan	100	010	www.kumagaigumi.co.jp
91	3,955	Parsons Corporation	US	114	023	www.parsons.com
92	3,945	Nippo	Japan	95	03	www.nipphodo.co.jp
93	3,926	McCarthy Building*	US	96	03	www.mccarthy.com
94	3,922	Morgan Sindall	UK	90	04	www.morgansindall.co.uk
95	3,851	Interserve*	UK	94	01	www.interserveplc.co.uk
96	3,802	YIT	Finland	84	012	www.yitgroup.com
97	3,735	Besix	Belgium	119	022	www.besix.com
98	3,725	Veidekke	Norway	85	013	www.veidekke.no
99	3,697	Maire Tecnimont	Italy	87	012	www.mairetecnimont.com
100	3,667	Meritage Homes	US	99	01	www.meritagehomes.com
101	3,601	Nishimatsu Construction	Japan	112	011	www.nishimatsu.co.jp
102	3,548	Chiyoda	Japan	115	013	www.chiyoda-corp.com
103	3,477	Hazama Ando	Japan	110	07	www.ad-hzm.co.jp
104	3,466	Galliford Try	UK	93	011	www.gallifordtry.co.uk
105	3,368	PCL Construction Group	Canada	111	06	www.pcl.com
106	3,363	DEME*	Belgium	113	07	www.deme.be
107	3,318	Granite Construction	US	106	01	www.graniteconstruction.com
108	3,318	Obrascon Huarte Lain	Spain	101	07	www.ohl.es
109	3,308	Misawa Homes*	Japan	98	011	www.misawa.co.jp
110	3,307	ISG	UK	122	012	www.isgplc.com

Global trends

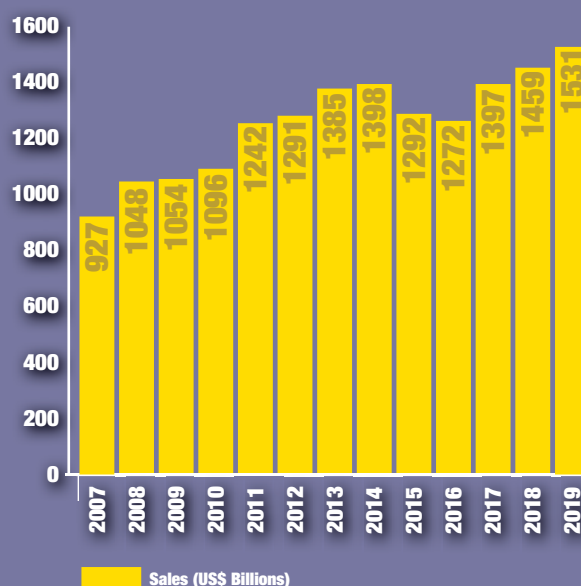
Revenue roundup for the top 100 on the list

The global construction league table is based on sales achieved in 2019 by the top 200 contractor companies. However, please note that the graph below only looks at the sales for the top half of the list – so it is only for the top 100 companies.

The total sales for the top 100 contractors combined is US\$1.531 trillion. This is an increase from last year's table, which had a figure of US\$1.459 trillion.

The fact that the revenue from the top 100 contractors has increased is to be expected, given that the construction industry was reaching a cyclical high peak in 2019. It is worth noting that the gap between the top 100 contractors and the rest of the list has increased once again.

In order to ensure that the figures are as accurate as possible, an average estimation has been taken for all of the currencies used before they were converted into dollars. The average trading price of, for example, the Euro, for the year was calculated to try and gain as accurate a picture as possible.



first time that any contractor on the list has seen sales of over US\$200 billion. Second on the list is China Railway Group; last year the company had sales of US\$111 billion, this has increased to US\$124 billion meaning that the gap from first to second place has widened further since last year.

Chinese firms make up the top four companies on the list, with China Railway Construction Corporation in third position and China Communications Construction in fourth. France-based Vinci round out the top five and are the first non-Chinese company on the list. None of the top five change positions from last year, although the gap between second and third position remains (relatively) small.

Movers and shakers

In positions six to ten there is some movement, with Shanghai Construction Group rising from number eleven to nine, German-based Hochtief dropping one place to number ten and US-based Bechtel falling from number ten to number thirteen on the list.

In total there are six new companies this year, an increase >

* = estimate



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Analysis by country

Which country's contractors performed the best in 2019?

COUNTRY	NO. OF COMPANIES	NEW	UP	DOWN	SAME	TOTAL SALES (US\$ mill.)	% OF TOTAL	AVERAGE SALES (US\$ mill.)	AVERAGE HEADCOUNT	AVERAGE SALES/EMPLOYEE (US\$)
China	9	-	2	2	5	631,002	36.2%	70,111	140,014	\$500,745
US	33	-	20	11	2	226,957	13.0%	6,877	11,381	\$604,316
Japan	34	1	24	7	2	195,051	11.2%	5,737	6,203	\$924,811
France	8	-	-	6	2	139,829	8.0%	17,479	55,941	\$312,447
UK	21	-	9	11	1	87,241	5.0%	4,154	10,254	\$405,147
Spain	11	1	2	5	3	85,255	4.9%	7,750	42,450	\$88,831
South Korea	10	-	5	5	-	68,179	3.9%	6,818	5,495	\$1,240,727
Germany	7	-	4	3	-	47,169	2.7%	6,738	18,178	\$370,696
Sweden	4	-	-	4	-	31,836	1.8%	7,959	18,786	\$423,664
Italy	6	-	3	3	-	25,345	1.5%	4,224	15,342	\$275,327
Netherlands	9	1	2	6	-	27,878	1.6%	3,098	7,806	\$396,814
Austria	3	-	1	2	-	26,033	1.5%	8,678	32,996	\$348,373
Australia	3	-	-	3	-	23,584	1.4%	7,861	22,566	\$348,373
India	3	1	2	-	-	23,004	1.3%	7,668	15,403	\$497,804
Belgium	5	-	2	3	-	17,864	1.0%	3,573	8,841	\$404,101
Canada	4	-	3	1	-	16,078	0.9%	4,019	18,680	\$215,174
Greece	3	-	1	2	-	8,698	0.5%	2,899	39,219	\$73,923
Russia	3	-	-	3	-	5,282	0.3%	1,761	17,410	\$101,127
Norway	2	-	-	1	1	6,023	0.3%	3,011	5,752	\$523,529
Turkey	3	-	-	3	-	5,293	0.3%	1,764	23,773	\$74,217
South Africa	2	-	1	1	-	4,231	0.2%	2,115	16,321	\$129,616
Finland	2	1	-	1	-	4,990	0.3%	2,495	3,271	\$762,952
Brazil	1	-	-	1	-	1,359	0.1%	1,359	5,706	\$238,229
Mexico	2	1	1	-	-	2,224	0.1%	1,112	11,402	\$97,534
Others	12	0	10	2	-	33,747	1.9%	2,812	-	-
ALL	200	6	92	86	16	1,744,152	100.0%	8,721	21,246	

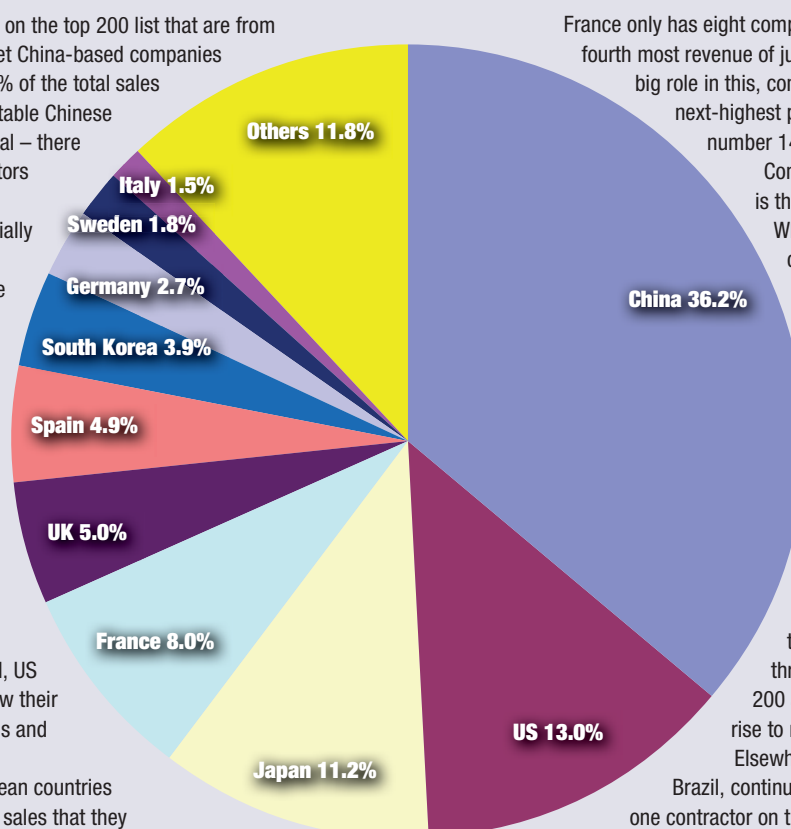
There are only nine contractors on the top 200 list that are from China – less than 5% – and yet China-based companies account for a staggering 36.2% of the total sales

generated by the list. On last year's table Chinese firms accounted for 33.7% of the total – there were also nine China-based contractors last year, so it shows the growth the companies have experienced, especially those towards the top of the list.

To put this into some context, the country with the largest number of contractors on the list is Japan, with 34 contractors in total. However, these firms accounted for a – relatively speaking – meagre 11.2% of the total sales.

The US is only one behind Japan when it comes to number of companies on the list at 33 but accounts for a higher percentage of total sales at 13%. The highest US-based contractor on the list is Bechtel at number 13 but, in general, US contractors had a strong year; 20 saw their rankings increase, 11 dropped places and two retained their rankings.

As was the case last year, European countries come next on the list in terms of the sales that they generate, with France, the UK and Spain taking up these positions.



France only has eight companies on the list but they generate the fourth most revenue of just under US\$140 billion. Vinci plays a big role in this, coming in at number five on the list. The next-highest placed French company is Eiffage at number 14 with sales of just under US\$21 billion.

Continuing to punch above its weight is the UK, with 21 companies on the list. While many of these will be global companies operating across borders some will be UK-based in terms of their business; in both cases it will be interesting to see what impact the UK leaving the European Union and potential new trade restrictions and regulations has on their sales.

For a country of its size and one in which numerous large scale infrastructure projects are ongoing, India is certainly underrepresented. The country does have one new entry to the list, meaning that there are now three India-based contractors in the top 200 and Larsen & Toubro enjoyed a strong rise to number 15 from 20.

Elsewhere, South America's largest economy, Brazil, continues to be underrepresented with only one contractor on the list. This is less than Mexico (two), Greece (three) and Finland (two) and it may be some time before this changes.

from last year's four. These companies are from: Japan, Spain, Netherlands, India, Finland and Mexico.

Regarding the biggest moves on the list, US-based MA Mortenson rises from number 105 on the list to number 70, an increase of 30 places. The company designs and constructs office buildings, college, university, hotels, laboratories, sports facilities, and manufacturing units and has 12 regional offices in North America.

The other big mover is the Zachry Group at number 128. The company specialises in turnkey construction, engineering, maintenance, turnaround and fabrication services in the power, energy, chemicals, manufacturing and industrial sector. The company has been 'bouncing around' on the list somewhat – last year it was at number 200, just scraping onto the list itself, but this was a fall from the previous year when it was ranked number 168.

Looking ahead

As mentioned towards the start of this article, 2019 was a good year for construction; 2020 has not been. The recent trend of the top 200 table has been for the sales generated by the companies in the list to increase year-on-year, but this is unlikely to be the case next year.

Covid-19 has had a massive impact on people's lives in all aspects with one of the major ones being economically – with almost every country in the world instigating a 'lockdown' economies have gone into freefall.

Many countries are now slowly, tentatively, starting to emerge from this lockdown but for the vast majority life is still a long way from normal. The good news for construction, and those companies on this list, is that the industry was not as badly affected as many other major sectors. Even during the height of lockdowns construction work was deemed essential in many countries and continued, albeit in a different way and with new processes and precautions in place.

Large-scale infrastructure projects don't just get cancelled as there is too much financial money and political capital invested in them. Countries around the world may look to invest in new projects as a way of 'kick-starting' their economies. The UK has already announced such a plan and both President Trump and his main rival for the Presidency, Joe Biden, have outlined ambitious infrastructure plans should they be elected. Australia's PM Scott Morrison has highlighted infrastructure investment as a way for his country to begin to economically recover. China and India will continue to invest in infrastructure.

As touched upon, China has a major role in the top 200, accounting for four of the top five contractors. It therefore may also bode well for next year's list that China has arguably recovered faster from the pandemic than any other major economy. The latest economic and construction predictions for the remainder of the year for China are generally positive.

Next year's top 200 will surely see the sales figure drop down from US\$1.744 trillion. The trillion dollar question is by how much this will drop, whether it will be a bump in the road or a large hole that requires a change of route.

“ China is the world's largest market for construction equipment sales and the Belt and Road Initiative continues to spread across the world ”

	(US\$ million)	SALES	COMPANY	COUNTRY	2019 CHANGE	WEBSITE
111	3,306	PanaHome	Japan	109	02	www.panahome.jp
112	3,238	Astaldi	Italy	102	010	www.astaldi.it
113	3,233	Walsh Group*	US	97	016	www.walshgroup.com
114	3,169	Mota-Engil	Portugal	107	07	www.mota-engil.pt
115	3,119	Goldbeckbau	Germany	117	02	www.goldbeckbau.de
116	2,996	Swietelsky	Austria	127	011	www.swietelsky.com
117	2,965	Boskalis Westminster	Netherlands	116	01	www.boskalis.com
118	2,962	Tokyu Construction	Japan	118	0	www.tokyu-cnst.co.jp
119	2,947	J.E. Dunn Group	US	121	02	www.jedunn.com
120	2,938	Keller Group	UK	120	0	www.keller.co.uk
121	2,848	Aecon Group	Canada	131	010	www.aecon.com
122	2,827	WBHO	South Africa	126	04	www.wbho.co.za
123	2,820	Brasfield & Gorrie* (ok JL)	US	123	0	www.brasfieldgorrie.com
124	2,697	Redrow	UK	129	05	www.redrowplc.co.uk
125	2,693	China Railway Erju*	China	124	01	www.crec.com.cn
126	2,642	Samsung C&T	South Korea	132	06	www.samsungcnt.com
127	2,601	Arab Contractors*	Egypt	134	07	www.arabcont.com
128	2,600	Zachry Group	US	200	072	www.zachrygroup.com
129	2,596	Takamatsu	Japan	143	014	www.takamatsu-cg.co.jp
130	2,536	Black & Veatch	US	103	027	www.bv.com
131	2,490	M/Ihomes	US	141	010	www.mihomes.com
132	2,478	Brookfield Multiplex*	Australia	128	04	www.brookfieldmultiplex.com
133	2,468	Laing O'Rourke	UK	135	02	www.laingorourke.com
134	2,453	Berkeley Group	UK	92	042	www.berkeleygroup.com
135	2,392	Austin Industries*	US	139	04	www.austin-ind.com
136	2,390	Tekfen Holding	Turkey	133	03	www.tekfen.com.tr
137	2,387	NGE*	France	136	01	www.nge.fr
138	2,354	Isolux Corsan*	Spain	137	01	www.isoluxcorsan.com
139	2,330	Sigdo Koppers	Chile	149	010	www.sigdokoppers.cl
140	2,298	AF Gruppen	Norway	140	0	www.afgruppen.no
141	2,237	Max Boegl*	Germany	145	04	www.max-boegl.de
142	2,204	Graham Construction*	Canada	161	019	www.grahambuilds.com
143	2,186	Maeda Road Construction	Japan	153	010	www.maedaroad.co.jp
144	2,162	Bloor Holdings	UK	156	012	www.bloorhomes.com
145	2,148	Strukton Groep	Netherlands	142	03	www.strukton.com
146	2,133	Mostotrest	Russia	108	038	www.mostotrest.ru
147	2,130	Van Oord*	Netherlands	146	01	www.vanoord.com
148	2,105	Budimex SA	Poland	152	04	www.budimex.com.pl
149	2,088	Beazer Homes USA	US	151	02	www.beazer.com
150	2,081	Okumura Corporation	Japan	158	08	www.okumuragumi.co.jp
151	2,024	Clark Construction*	US	160	09	www.clarkconstruction.com
152	2,018	TBI Holdings BV*	Netherlands	154	02	www.tbi.nl
153	2,014	Toyo Engineering (TEC)	Japan	125	028	www.toyo-eng.co.jp
154	2,012	Hovnanian Enterprises	US	159	05	www.khov.com
155	1,992	Per Aarsleff AS	Denmark	165	010	www.aarsleff.dk
156	1,977	Wates Group	UK	157	01	www.wates.co.uk
157	1,972	Italian-Thai Development	Thailand	163	06	www.itd.co.th
158	1,931	CTCI	Taiwan	150	08	www.ctci.com.tw
159	1,915	Jan De Nul	Belgium	155	04	www.jandenu.com
160	1,806	Shikun & Binui	Israel	170	010	www.shikunbinui.co.il
161	1,794	Heijmans	Netherlands	166	05	www.heijmans.nl
162	1,773	Tekken Corporation	Japan	178	016	www.tekken.co.jp
163	1,757	Enka	Turkey	144	019	www.enka.com
164	1,749	Toa	Japan	179	015	www.toa-const.co.jp
165	1,740	Techint Engineering & Construction*	Italy	172	07	www.techint.it
166	1,674	Fukuda	Japan	176	010	www.fkd.co.jp
167	1,674	Abengoa	Spain	180	013	www.abengoa.es
168	1,652	LSR	Russia	138	030	www.lsrgroup.ru
169	1,652	JM	Sweden	168	01	www.jm.se
170	1,650	Kaufman & Broad	France	167	03	www.kaufmanbroad.fr
171	1,648	Bauer	Germany	164	07	www.bauer.de
172	1,639	IJM	Malaysia	186	014	www.ijm.com
173	1,607	Toyo Construction	Japan	182	09	www.toyo-const.co.jp

* = estimate

	(US\$ million)	SALES	COMPANY	COUNTRY	2019 CHANGE	WEBSITE
174	1,497		Daiho	Japan	188↔14	www.daiho.co.jp
175	1,496		Glavstroy*	Russia	171↔4	www.glavstroy.ru
176	1,475		Costain Group	UK	162↔14	www.costain.com
177	1,427		Ellaktor	Greece	147↔30	www.ellaktor.com
178	1,412		Hindustan Construction Company (HCC)*	India	181↔3	www.hccindia.com
179	1,404		Murray & Roberts	South Africa	175↔4	www.murrob.com
180	1,401		Köster*	Germany	184↔4	www.koester-bau.de
181	1,400		Willmott Dixon	UK	169↔12	www.willmottidixon.co.uk
182	1,393		Africa Israel Investments	Israel	187↔5	www.africa-israel.com
183	1,383		Hanjin Heavy Industries & Construction	South Korea	148↔35	www.hanjinsc.com
184	1,367		Nippon Road	Japan	190↔6	www.nipponroad.co.jp
185	1,359		MRV Engenharia	Brazil	183↔2	www.mrv.com.br
186	1,326		Dura Vermeer	Netherlands	185↔1	www.duravermeer.nl
187	1,301		Asanuma	Japan	195↔8	www.asanuma.co.jp
188	1,295		GEK Terna	Greece	173↔15	www.terna.gr
189	1,233		COMSA Corporación*	Spain	189↔	www.comsa.com
190	1,225		OHL Mexico*	Mexico	194↔4	www.ohlmexico.com.mx
191	1,213		Bowmer & Kirkland*	UK	193↔2	www.bandk.co.uk
192	1,188		SRV Group	Finland	-NEW	www.srv.fi
193	1,146		Renaissance Construction*	Turkey	174↔19	www.rencons.com
194	1,121		CMC Ravenna*	Italy	199↔5	http://cmcgruppo.com
195	1,120		Halla	South Korea	198↔3	www.halla.co.kr
196	1,074		Grupo San Jose	Spain	-NEW	www.grupo-sanjose.com
197	1,059		Lanco Infratech	India	-NEW	www.lancogroup.com
198	1,009		Van Wijnen*	Netherlands	-NEW	www.vanwijnen.nl
199	1,003		Toa Road	Japan	-NEW	www.toadoro.co.jp
200	999		ICA	Mexico	-NEW	www.ica.com.mx

* = estimate

“ The recent trend of the top 200 table has been for the sales generated by the companies to increase year-on-year but this is unlikely to be the case next year ”

Methodology

How the league table is compiled

The league table is a ranking of the world's largest construction companies, based on their sales figures for 2019 – either full or financial years, depending on the individual accounting practices of the companies in question.

It is compiled from a range of sources, including audited annual accounts, companies' own statements of revenues and reputable third parties, such as Factiva. In some cases iC has estimated the revenue – in all of these cases this is highlighted with an asterisk.

The ranking is based on sales in US dollars – the exchange rate for all currencies used has been compiled and averaged.

While every care is taken to ensure that the information in the iC Top 200 league table is accurate, iC can not be held responsible for any inaccuracies or errors. If your company should be included in the league table, or the information supplied is not correct, then contact iC's editor, Andy Brown, at: andy.brown@khl.com

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Models shown may include optional equipment. Available models may vary by region or country. Materials and specification are subject to change without notice.

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LIEBHERR'S REMOTE SERVICE TOOL

Remote Service App available for use free of charge to all Liebherr customers until the end of 2020



Liebherr has announced that the company has developed a remote service tool to work alongside crawler cranes, deep foundation equipment and maritime cranes.

The new tool, aptly named Remote Service, is designed to improve assistance through visual information, leading to faster and easier troubleshooting. As part of an extended test phase, all customers will have free access to the new app throughout 2020.

Audio and video calls, a chat function, screen sharing, image and document exchange, as well as whiteboarding functions are some of the features that have been integrated in the tool. These enable real-time customer support.

Liebherr reports that over the last year the tool has been tested in remote locations and challenging situations.

The current pandemic has proven how indispensable the Remote Service tool can be. In April this year, Liebherr customer Adani Murmugao Port Terminal Pvt. Ltd. required immediate assistance for one of their Liebherr machines; however attendance on site was not permissible.

Using Remote Service, the Liebherr engineers instructed the Adani staff how to remove the defect pump, inspected the condition of the gearbox remotely, and then guided the site staff through the installation of the new pump.

Due to Covid-19 Liebherr has accelerated the market launch of Remote Service in terms of an extended test phase. This means all Liebherr customers can use the Remote Service app free of charge until the end of 2020.

DOOSAN BOBCAT PARTNERS WITH RADAR TECH FIRM

Doosan Bobcat North America has partnered with Ainstein AI, a radar technologies company, to develop next-generation radar sensor systems for Bobcat equipment.

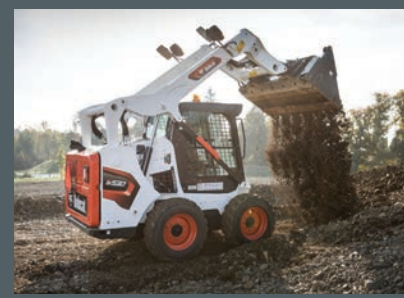
Through this partnership, Ainstein and Doosan Bobcat North America will collaborate to create radar-based sensing solutions to detect objects and people on job sites.

The two companies will collaborate to create next generation radar sensor solutions to detect objects and people on jobsites when using Bobcat equipment. At its core, the radar system collects object position data to provide real-time alerts to operators by incorporating a combination of mmWave radar, sensor fusion and artificial intelligence.

This allows an operator to be more immersed in the task being performed as opposed to focusing on obstacle and collision avoidance. This technology will enable obstacle avoidance solutions and future technologies that support autonomous operations.

"This strategic partnership leverages the respective strengths of Bobcat and Ainstein to further advance our connected and autonomous technology," said Joel Honeyman, vice president of global innovation at Doosan Bobcat North America.

"Working together, we can evolve autonomous operations and provide our customers with optimal productivity and the ultimate operator experience through sensor technology."



sponsored the development of the first generation of self-driving vehicle software. Now, with the acquisition of the Marble team, together we will drive the next generation of autonomy solutions for Caterpillar customers in the construction, quarry, industrial and waste industries."

CATERPILLAR ACQUIRES MARBLE ROBOT

Caterpillar has acquired select assets and hired employees from San Francisco, US, robot and autonomy technology company Marble Robot.

The acquisition is said to be part of Caterpillar's automation and autonomy strategy, which the company says demonstrates its commitment to the next

generation of jobsite solutions.

Building on its work in autonomous mining, Caterpillar plans to leverage the expertise of the new team to bring scalable solutions to meet the changing needs of construction, quarry, industrial and waste industries.

The new team is comprised of leading roboticists with a background in the robotics industry. Caterpillar claims it intends to leverage the team's fully integrated on-board autonomy technology – including perception, localisation and planning – to continue delivering smart, safe, more productive and cost-effective solutions to customers.

"We're excited to join the autonomy team at Caterpillar," said Kevin Peterson, former Marble CEO, now Caterpillar technologist.

"In many ways, this completes a full circle for me. I had the privilege of working with Caterpillar early in my career at Carnegie Mellon, where they

their support to the competition this year. The five industry players invite all entrepreneurs worldwide with innovative construction solutions to participate in this year's edition.

► **GE RENEWABLE ENERGY, COBOD and LAFARGEHOLCIM** will partner to co-develop wind turbines of heights of up to 200m with optimised 3D printed concrete in the towers.

The three partners will undertake a multi-year collaboration to develop this solution, which they say will increase renewable energy production, lower the cost of energy and optimise construction costs. Traditionally built in steel or precast concrete, wind turbine towers have typically been limited to a height of under 100m.



CT NEWS IN BRIEF

► **SANDVIK** has announced a partnership with **EXYN TECHNOLOGIES** to increase autonomy in underground mining. Sandvik has been implementing digital mining solutions for more than two decades and says that working with Exyn, specialists in autonomous aerial robot systems, will lead to a 'transformation' in autonomous equipment in underground mining.

Sandvik's OptiMine, combined with data collected by Exyn's aerial robots, will create progressive visualisation and information of a mine's actual environment to increase overall transparency of the mining process.

► **CEMEX VENTURES** has launched the fourth edition of its Construction Startup Competition which aims to identify startups to lead the transformation of construction.

Ferrovial, Hilti, VINCI Group's Leonard, and NOVA by Saint-Gobain have added

Machine learning unlocks the opportunity for those in construction to make more accurate decisions quicker than ever before and to free up workers by using automation, reports ANDY BROWN

IT'S ALL ABOUT THE DATA

When it comes to the construction industry machine learning means many things. However, at its core, it all comes back to one thing: data.

The more data that is produced through telematics, the more advanced artificial intelligence (AI) becomes, due to it having more data to learn from. The more complex the data the better for AI, and as AI becomes more advanced its decision-making improves. This means that construction is becoming more efficient thanks to a loop where data and AI are feeding into each other.

Machine learning is an application of AI that

provides systems the ability to automatically learn and improve from experience without being explicitly programmed. As Jim Coleman, director of global IP at Trimble says succinctly, "Data is the fuel for AI."

Coleman expands on that statement and the notion that AI and data are in a loop, helping each other to develop. "The more data we can get, the more problems we can solve and the more processing we can throw on top of that, the broader set of problems we'll be able to solve," he comments.

"There's a lot of work out there to be done at AI and it all centers around this notion of collecting data, organising the data and then mining and evaluating that data."

Karthik Venkatasubramanian, vice president of data and analytics at Oracle Construction and Engineering agrees that data is key, saying, "Data is the lifeblood for any AI and machine learning strategy to work. Many construction businesses already have data available to them without realising it."

"This data, arising from previous projects and activities, and collected over a number of years, can become the source of data that machine learning models require for training. Models can use this existing data repository to train on and then compare against a validation test before it is used for real world prediction scenarios."

There are countless examples of machine learning at work in construction with a large number of OEMs having their own programmes



LINKING ALL OF THE DATA OF SMART MACHINES TOGETHER IN ONE PLACE IS KEY

in place, not to mention what's being worked on by specialist technology companies.

One of these OEMs is US-based John Deere. Andrew Kahler, a product marketing manager for the company tells *International Construction* that machine learning has expanded rapidly over the past few years and has multiple applications.

"Machine learning will allow key decision makers within the construction industry to manage all aspects of their jobs more easily, whether in a quarry, on a site development job, building a road, or in an underground application. Bigger picture, it will allow construction companies to function more efficiently and optimise resources," says Kahler.

He also makes the point that a key step in this process is the ability for smart construction machines to connect to a centralised, cloud-based system – John Deere has its JDLink



BOSTON DYNAMICS' SPOT THE DOG' IS AN EXAMPLE OF AUTOMATION IN CONSTRUCTION

“DATA IS THE LIFEBLOOD FOR ANY AI AND MACHINE LEARNING STRATEGY TO WORK

BUILT ROBOTICS LAUNCHED IN 2016 TO ADDRESS A GAP IN THE MARKET – AUTONOMOUS CONSTRUCTION EQUIPMENT





SMART MACHINES PROVIDE DATA TO AI, WHICH THEN IMPROVES THE AI



JIM COLEMAN, DIRECTOR OF GLOBAL IP AT TRIMBLE

Dashboard, and most of the major OEMs have their own equivalent system.

“The potential for machine learning to unlock new levels of intelligence and automation in the construction industry is somewhat limitless. However, it all depends on the quality and quantity of data we’re able to capture, and how well we’re able to put it to use through smart machines.”

AUTOMATION SPECIALIST

US-based Built Robotics was founded in 2016 to address what they saw as a gap in the market – the lack of technology being used across construction sites, especially compared to other industries. The company upgrades construction equipment with AI guidance systems, enabling them to operate fully autonomously.

The equipment that the company typically works with are: excavators, bulldozers, and skid steer loaders. The equipment can only work autonomously on certain repetitive tasks; for more complex tasks an operator is required.

Erol Ahmed, director of communications at Built Robotics says that founder and CEO Noah Ready-Campbell wanted to apply robotics to where it would be really helpful and have a lot of change and impact, and thus settled on the construction industry.

Ahmed says that the company are the, “only

commercial autonomous heavy equipment and construction company available.” He adds that the business – which operates in the US and has recently launched operations in Australia – is focused on automating specific workflows.

“We want to automate specific tasks on the job site, get them working really well. It’s not about developing some sort of all-encompassing robot that thinks and acts like a human, and can do anything you tell it to. It is focusing on specific

things, doing them well, helping them work in existing workflows. Construction sites are very complicated, so just automating one piece is very helpful and provides a lot of productivity savings.”

Ahmed confirms that as long as the equipment has an electronically controlled hydraulic system converting a, for example, Caterpillar, Komatsu or a Volvo excavator isn’t too different. There is obviously interest in the company as in September 2019 the company announced it had received US\$33 million in investment, bringing its total funding up to US\$48 million. >

USING AI TO CUT COSTS AND EMISSIONS

Contractor Skanska and Volvo CE working together on AI project

Skanska announced earlier this year that it had teamed up with Volvo Construction Equipment (Volvo CE), a research organisation and a software company to use AI to help better coordinate the movement of heavy machinery on construction sites.

The company said that excavators, loaders and haulers can waste up to 40% of their time idling while operators wait for their slot to work, and that optimising the deployment of machinery through AI would cut emissions, cost and boost productivity.

The goal is for every construction machine to know where the others are, what they are doing and the most optimal way to self-organise.

The consortium, which includes research organisation SINTEF and construction software company Ditio – which Skanska partly owns – will use equipment operating data to manage machinery automatically on sites with machine learning, route optimisation and AI.

“The number of simultaneous operations in a large civil engineering project is very comprehensive and complex, so this project will give the construction managers solid real-time decision support,” said Lars Horn, project leader with Skanska Norway.

“Once the algorithms can handle the simple tasks, supervisors will have more time available to use their skills to solve the most demanding bottlenecks.”

The project is currently testing algorithms on a live highway project in Norway and will do so until 2022.



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TRIMBLE WORK WITH A NUMBER OF MAJOR OEMS TO HELP PRODUCE AUTONOMOUS MACHINES

develops it will work best with repetitive tasks like excavation, paving or milling but thinks that the potential goes beyond this. “As we move forward and AI continues to advance, we’ll begin to apply it across all aspects of construction projects.

“The potential applications are countless, and the enhanced efficiency, improved workflows and accelerated rate of industry it will bring are all within reach.”

Automated construction equipment needs operators to oversee them – as this sector develops it could be one person for every three or five machines, or more, it is currently unclear. With construction facing a skills shortage this is an exciting avenue. There is also AI which helps contractors to better plan, execute and monitor construction projects – you don’t need to have machine learning type intelligence to see the potential transformational benefits of this when multi-billion dollar projects are being planned and implemented. **CT**

“ IT'S NOT ABOUT DEVELOPING SOME SORT OF ALL-ENCOMPASSING ROBOT THAT THINKS AND ACTS LIKE A HUMAN

BEHIND THE SCENES

Of course, a large excavator or a mining truck at work without an operator is always going to catch the eye, and our attention and imagination. They are perhaps the most visual aspect of machine learning on a construction site, but there are a host of other examples that are working away in the background.

As Trimble’s Coleman notes, “I think one of the interesting things about good AI is you might not know what’s even there, right? You just appreciate the fact that, all of a sudden, there’s an increase in productivity.”

AI is used in construction for specific tasks, such as informing an operator when a machine might fail or isn’t being used productively to a broader and more macro sense. For instance, for contractors planning on how best to construct a project there is software with AI that can map out the most efficient processes.

The AI can make predictions about schedule delays and cost overruns. As there is often existing data on schedule and budget performance this can be used to make predictions – and these predictions will get better over time. As we said before; the more data that AI has, the smarter it becomes.

Venkatasubramanian from Oracle adds that ‘smartification’ is happening in construction, saying that, “Schedules and budgets are becoming smart by incorporating machine learning-driven recommendations.

“Supply chain selection is becoming smart by using data across disparate systems and comparing performance. Risk planning is also getting smart by using machine learning to

identify and quantify risks from the past that might have a bearing on the present.”

There is no doubt that construction has been slower than other industries to adopt new technology but this isn’t just because of some deep-seated reluctance to new ideas.

For example, agriculture has a greater application of machine learning but it is easier for that sector to implement it – every year the task for getting in the crops on a farm will be broadly similar.

As John Downey, director of Sales EMEA, Topcon Positioning Group, explains, “With construction there’s a slower adoption process because no two projects or indeed construction sites are the same, so the technology is always confronted with new challenges.”

Downey adds that as machine learning

TOPCON'S X-53X AUTO EXCAVATOR – THE SYSTEM USES MACHINE LEARNING TO ASSESS THE MATERIAL TYPE IT'S DIGGING AND ADJUSTS SENSITIVITY TO SUIT



ELECTRIC MINING AUTOMATION

Sany sees two electric unmanned mining trucks link up with 5G controlled excavator

China-based OEM Sany has reported that two units of electric unmanned SKT90E wide-body mining trucks successfully realised a connection with a 5G remote controlled excavator, meaning that the task could be completed with no danger to any operators.

These two SKT90E wide-body mining trucks were said to have demonstrated high-level environmental identification and positioning capacity, conducting timely decision making and accurate route planning in the operation field.

The deviation of the horizontal control of the unmanned operation can be kept under 30cm and the truck can independently complete route-tracking, load and unload of materials, and parking.

With the support of an integration of multiple sensing technologies including millimeter-wave radar, laser radar, and visual sensor, the truck can conduct the scanning and tracking of obstacles within 150m. It can also implement distance ranging and identification within 100m in response to different weathers in different seasons.

According to the company, intelligent decision-making includes the automatic creation of the three-dimensional map of routes in the mine with laser radar, independent obstacle avoidance and optimisation of driving routes with dynamic simulation.



THE POWERS

Traditional and alternative power sources both have their place in today's equipment, reports JENNY LESCOHIER

THAT BE

Ask anyone involved with construction equipment and they'll have an opinion on the future of diesel power. Some say it's on its way out as the adoption of electrified equipment increases, others say it will always have its place on construction sites. One thing is certain, alternatives are available and some are becoming more realistic options in terms of practicality and cost.

The hybridisation and electrification of construction equipment is a trend that has been gaining momentum. It started with diesel-electric machines powered by an engine coupled with an electric generator, AC drive motor or other source of electric power.

Today, lithium-ion battery technology is commonplace and hydrogen fuel cells (HFC) can be clearly seen on the horizon. And there's still the good old internal combustion engine which burns cleaner with every iteration, calling into question which power source is really the best choice from both an environmental and performance standpoint.

The goal for every technology is to reduce carbon emissions while maintaining high performance standards without a prohibitive increase in cost to equipment owners.

"Cummins Stage V Performance Series engines have been developed with the philosophy of delivering 'more with less'," explains Steve Nendick, marketing communications director, global off-highway at Cummins. "They deliver on average 10% more power and 20% more

torque across the 75-321 kW range when compared to Stage IV predecessors."

Cummins claims its four-cylinder F3.8 and B4.5 engines have high power density for their size, enabling manufacturers to improve machine capability and add value to machine owners.

"Cummins B6.7 engine produces over 30% more torque than its predecessor, so OEMs can downsize and replace engines of higher displacement," Nendick says. "This reduces installation costs with no impact on productivity, as well as reducing running costs for the operator."

These engines and aftertreatment systems are more compact and lighter than before, which suggests they are more efficient, potentially driving down fuel use and CO2 emissions.

"Another alternative is GAS (Liquefied petroleum gas)," notes Glen Hampson, business development manager, construction, Kubota UK. "We see this as the middle ground between traditional diesel and electric. The benefits of GAS are the initial purchase price, which is significantly lower than electric, and the ability to perform a full day's work without specialist infrastructure for charging."

He continues, "Operators can change the gas cylinder of the unit in less than three minutes. GAS machinery also emits both low noise and low vibration compared to diesel, whilst retaining engine durability due to having the same core design."



THE CATERPILLAR EU STAGE V C18 HYBRID ENGINE CAN PLUG INTO THE GRID IF NECESSARY

HYBRIDS HAVE IT

While diesel engines become cleaner, smaller, and more efficient, construction equipment manufacturers are also developing diesel-electric solutions that allow them to meet performance requirements needed for off-highway equipment, as well as operate within changing environmental regulations for both noise pollution and carbon emissions.

"Pairing diesel engines with an electric drivetrain can offer the same benefits expected of electrification – improved fuel efficiency, reduced noise, lower operating costs, and reliable power – but with the added durability that's expected from diesel engines," states Sandrine Couasnon, manager, marketing support at John Deere Power Systems.

John Deere's 644K and 944K wheeled loaders were some of the first machines to utilise electric drive technology. According to Couasnon, they've collectively logged more than 1.5 million operating hours in the field to date.

Elsewhere, Caterpillar recently introduced its EU Stage V C18 hybrid engine at ConExpo, noting it provides 800hp diesel and 600hp hybrid for a total of 1,400hp with low noise and zero emissions. It's a plug-in hybrid as well, so it can work off of the grid.

According to the company, the Cat C18 hybrid concept helps optimise machine performance by capturing surplus energy through a parallel hybrid system which, when required, will

“DIESEL WILL REMAIN THE GO-TO POWER SOURCE FOR HEAVY-DUTY CONSTRUCTION EQUIPMENT DUE TO ITS FLEXIBILITY IN ENDURING LONGER AND HARDER WORK PERIODS AND THE EASE OF REFUELING



CUMMINS RECENTLY COLLABORATED WITH XCMG ON A 3.5-TON ELECTRIC EXCAVATOR

re-introduce the energy back into the machine.

“Hybrid systems offer many benefits to the OEM and end user,” notes James Gardiner, product development manager for the hybrid concept.

“We achieve engine downsizing, reduced noise and emissions levels, enhanced machine performance, and many other efficiency gains through proper integration of the complete machine system including the engine, hybrid system, drivetrain and other components with the machine.”

For its part, Perkins featured four new hybrid concepts at ConExpo. Utilising the Perkins Syncro 2.8 L engine, each of the hybrid technologies offers its own set of benefits at 75kW/100hp – all of which allow the deletion of the diesel exhaust fluid (DEF) system.

Perkins also debuted its new second-generation hybrid-electric concept, which offers OEMs a zero-emissions, zero-noise, electric-only mode.

“Perkins is focused on delivering more choice and increasing value to our customers. The four hybrid concepts are examples of future technologies that will take machine efficiency to the next level,” said Tom Nankervis, electrification marketing manager, Perkins.

“With our range of hybrid engines, customers can choose to downsize their engine and use the hybrid power for peak-load, or they can reduce output from the diesel engine, choosing to lower fuel consumption up to 20%.”

ELECTRIFICATION GAINS MOMENTUM

Particularly in compact machinery, electrification continues to be a primary alternative to diesel power for construction equipment. Increasing numbers of OEMs are moving to electric power, such as Volvo CE which announced at the start of 2019 that, by mid-2020, it would launch a range of electric compact excavators (EC15 to EC27) and wheeled loaders (L20 to L28) and stop new diesel engine-based development of these models. However, it is important to state there is no one-size-fits-all solution.

“The off-highway applications in which it’s used vary greatly, so a single electrification solution cannot address the diverse integration and application considerations,” Couasnon says.

“Electrification is still new to market



STEVE NENDICK, CUMMINS

segments, and we understand that some OEMs will introduce a few electric drivetrain-powered vehicles into an existing product line,” she continues. “Our engineers have identified key electric drivetrain components that will easily integrate into an existing envelope where a transmission exists, minimising changes to the vehicle chassis.”

For full electric requirements, Cummins has bought in technology companies Brammo, JMBS and EDI, which has led to industrial projects with numerous OEMs, Nendick notes.

“Working with XCMG, Cummins has developed power for a 3.5-ton electric excavator using eight Cummins battery modules connected in a series configuration,” he says. “Producing total energy of 35 kWh, it’s ideal for urban construction site use, with zero emissions and low noise.”

Juergen Haberland, director, sales engines at MAN Engines & Components, notes electric drives have the advantage of providing instant torque over a wide range of RPMs.

“This is a very desirable characteristic,” he says. “And there is considerably lower effort in terms of maintenance. But the energy storage degrades over time... so this is the downside of that approach. I would say the technology is fantastic, but for many applications size and weight of batteries need to come down in order to successfully realise new concepts.”

THE CORADIA ILINT IS AN ARTICULATED RAILCAR MANUFACTURED BY ALSTOM, WHICH IS AMONG THE FIRST RAILWAY MANUFACTURERS IN THE WORLD TO DEVELOP A PASSENGER TRAIN BASED ON HYDROGEN FUEL CELL TECHNOLOGY

HOW VIABLE ARE HYDROGEN FUEL CELLS?

Hydrogen fuel cell (HFC) technology and its potential application in construction equipment is being increasingly talked about in certain circles, but there are questions surrounding how cost effective it can be in real-world applications. To date, it’s mostly being used in lift trucks, offering lower operating costs, reduced emissions, improved reliability, and much faster refueling compared with battery charging/swapping.

The concept is fairly simple; HFCs essentially combine hydrogen and oxygen to produce electricity, which runs a motor. The only byproducts are heat and water.

The fuel cells are compact too, taking up less space than batteries, giving equipment manufacturers more room to play with in machine designs. Unlike traditional lead-acid batteries, hydrogen fuel cells have no power degradation, and refueling takes about three minutes, much like an internal combustion engine.

So what’s the downside? Expense, for one. The cost is higher than more time-tested technologies, but experts report that will come down over time as adoption increases. Another positive is that there is no grid dependency and solar power can be harnessed to make hydrogen on site so, in concept, it could be a sustainable technology.

Some companies are working diligently to make HFC a reality on construction sites. Cummins, for example, recently acquired Hydrogenics for its fuel cell production capabilities. Their technology is being tested on trucks and rail and will be applicable to industrial use at some time in the future, Nendick says.

“Hydrogen as a power solution is very exciting and there is certainly a future for the development of hydrogen fuels cells in equipment in the future,” he states.

“Cummins is investing in long-term hydrogen capability. Following the Hydrogenics acquisition we have also developed relationships with Loop Energy and NPROXX, looking at hydrogen storage and transportation as well as production.”

There are challenges with this technology, of course. Haberland at MAN notes that hydrogen is very difficult to store and distribute because its atomic structure is very volatile. “Over time it dissipates,” he explains. “It requires a very complex and expensive storage infrastructure on the vehicle itself.”



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JCB'S 220X WORKING PROTOTYPE EXCAVATOR POWERED BY A HYDROGEN FUEL CELL

He also adds, "It needs to be stated that this technology is only beneficial if you take the electricity to produce the hydrogen out of renewable sources. If you use a fossil fuel to do it, then it's not a green technology at all."

JCB recently announced that it has developed what it claims to be the construction industry's first ever working prototype of a hydrogen-powered excavator.

The 20 tonne 220X excavator powered by a hydrogen fuel cell has been undergoing testing at JCB's quarry proving grounds for more than 12 months.

JCB Chairman Lord Bamford said, "The development of the first hydrogen fuelled excavator is very exciting as we strive towards a zero carbon world."

"In the coming months, JCB will continue to develop and refine this technology with advanced testing of our prototype machine and we will continue to be at the forefront of technologies designed to build a zero carbon future."

COST CONSIDERATIONS

The cost of power is an important consideration – electric power has a higher up-front investment cost, and a lower running cost compared to diesel. The cost, capacity and life of batteries is a key challenge to their adoption in construction but, as the technology advances, the cost will come down.

The industry is already seeing increasing numbers of OEMs adopt electric as the main power source for compact equipment, especially where the equipment is working in urban environments with strict emissions and noise regulations.

For larger equipment, diesel is likely to remain the 'go to' power source due to its flexibility in enduring longer and harder work periods and the ease of re-fueling. However, it shouldn't be forgotten that electric machines offer better torque response compared to internal combustion engines and hydraulic systems.

According to Antti Väyrynen, off-highway business line director at Danfoss Editron, this improves the overall productivity and performance of the machine.

"Since electric machines can operate at a much higher peak power for a longer period of time, optimisation of the machine's duty cycle and dimensioning can boost operational performance

even further," he says.

Electric powered equipment also boasts a high tolerance to shocks and vibrations that can lead to better reliability and an improved experience for operators.

"Benefits such as these mean that electric machines have a significantly longer lifespan than traditional hydraulic alternatives," Väyrynen says. "Our electric motors operate on synchronous reluctance assisted permanent magnet technology, which provides outstanding efficiency in terms of low energy consumption and smaller battery size over a wide operating area."

WHERE BATTERIES ARE BEST

Battery technology will play an interesting role in how electrification solutions evolve. Due to the power requirements in off-highway applications, the number of kilowatt hours needed from battery technology to sustain operations for a full work cycle – combined with the time it takes to charge those batteries – makes it challenging for off-highway applications to be fully electric for the foreseeable future.

"There are specific market segments that are driving off-highway electrification solutions," notes Couasnon from John Deere Power Systems. "This is because they are invested in lowering their environmental footprint, using more efficient power generation methods and addressing emissions regulations. These include materials handling, mining, rail transportation and hybrid power generation."

She adds, "Advancements made to support these key electrification-leading markets will eventually support the electrification development in surface off-road applications."

Predictions on the future of power generation vary from expert to expert, but most believe there's a lot of runway left for diesel engines.

"While the off-highway industry continues to grow and adapt, the demands remain the same. To that point, a rugged market demands a product that can meet customers' expectations in a variety of applications," Couasnon states. "Diesel engines offer the power density that's required to meet the needs of off-highway applications in a way that other fuel and energy sources can't currently match."

Nendick agrees, adding, "For construction site managers to adopt electric power, the challenge of charging must be resolved. We expect that eventually worksites of the future will include charge stations, not that dissimilar to those fast-charging stations seen at service stations and

some car parks, albeit on a greater scale.

"Fixed charge towers will be suitable for diverse, high-power and high-voltage fleet charging applications," he adds. "Portable energy storage solutions will also be available to support non-grid enabled charging and potentially provide batteries with a useful second life. Making the most of these charging stations will require charge management through improved connectivity to monitor and coordinate the availability of energy, charger proximity, and eventually could include self-directed platforms that support autonomous machinery."

The future of power generation in construction looks set to consist of a host of different options to meet the industry's varying needs. **CT**

COMPONENTS PLAY A ROLE

Improving current hydraulic systems by minimising losses and reducing battery wear consumption

The development of zero-emission vehicles is a top priority for The Danfoss Group, says the company.

"At Danfoss Editron, we offer fully electric and hybrid drivetrain systems that have been specifically designed to operate in harsh conditions across heavy-duty applications," Antti Väyrynen, the company's off-highway business line director claims.

"Meanwhile, Danfoss Power Solutions provides mobile hydraulics for various off-highway markets, integrating electronics and hydraulics to achieve total machine management. It was also the first company to introduce load-sensing proportional valves into hydraulic machines that could be controlled electronically," he states.

Danfoss aims to improve current hydraulic systems by minimising losses and reducing battery wear consumption, thereby extending the operating time of machines when they are running on battery power.



ANTTI VÄYRYNEN, OFF-HIGHWAY BUSINESS LINE DIRECTOR AT DANFOSS EDITRON

SOFTWARE SHOWS THE FUTURE

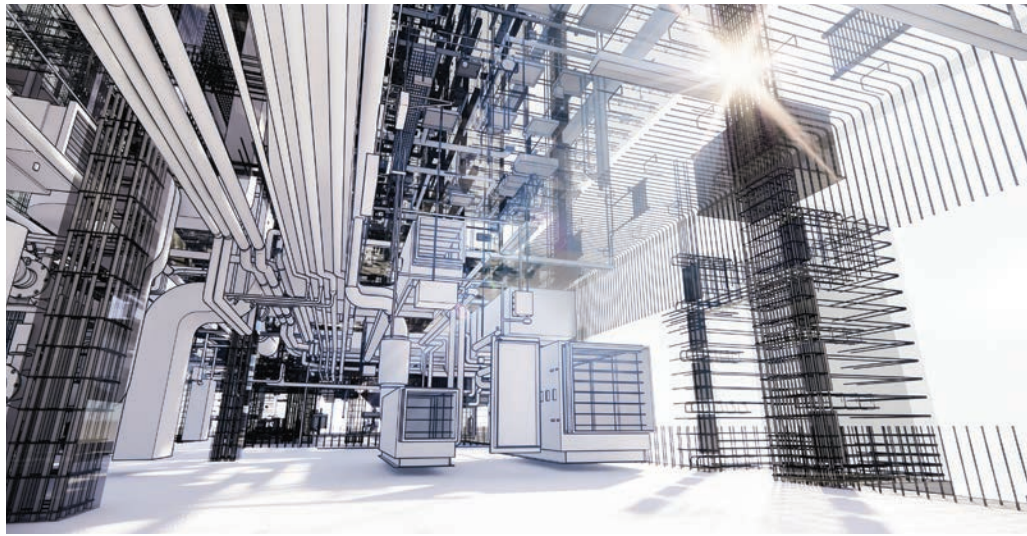
There is little doubt that the post-Covid 'new normal' will see the rapid growth of digital technology in construction – with BIM at its very heart, MIKE HAYES reports

Few would deny that construction has fallen well behind other industries that have adopted technology and used it to boost their own productivity levels.

Take large-scale manufacturing, where production lines are now routinely 'manned' by robots; they can perform relatively complex tasks with ease – and at speeds no human can match.

The difference between manufacturing and construction is that the same process is repeated

“ IN BIM WE SEE THE FIRST APPROACH TO MAKE CITIES SMARTER AND MORE INNOVATIVE



ADVANCED BIM MODELS CAN NOT ONLY OFFER A VISUALISATION OF A PROPOSED STRUCTURE, BUT CAN ALSO DETAIL REQUIRED MATERIALS AND ESTIMATE TOTAL COSTS

DOKA SHOWS ITS TECHNOLOGICAL FORM

New solution optimises safety, time, and costs

BIM models are increasingly being used as the basis for formwork planning and, working closely with Autodesk, Doka has taken the step of launching its own automated planning product, DokaCAD for Revit.

The BIM model of a planned structure requires a detailed representation of the formwork. Doka has established a BIM competence centre, which employs some 50 designers worldwide, working in the fields of planning, visualisation and simulation of formwork solutions.

The plug-in allows automated formwork planning in BIM software, enabling 3D planning using positioning guides and providing access to more than 40,000 model solutions.

Doka says its new solution can optimise safety, time and costs, and includes calculations of required materials.

time and again in manufacturing, a situation that lends itself very well to automation. In construction, every project is unique and comes with its own never-before-seen challenges.

That said, it must also be conceded that there is an inherent reluctance to change the way things are done in construction – and it is becoming clear that technology has answers to some of the biggest productivity questions found in the industry.

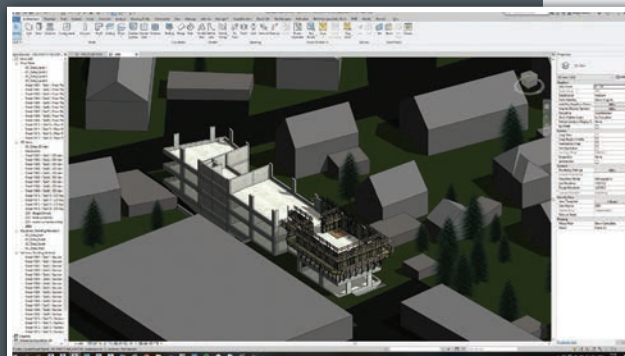
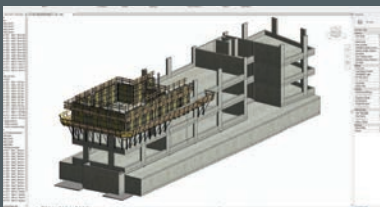
Could BIM (building information modelling) be the answer? It is a prime example of how, without making too big a leap – at least in terms of the job site – a host of benefits can be gained at every stage of a major project.

As the name suggests, building information modelling begins with the creation of a three-dimensional virtual model of a proposed structure.

This is the first advantage as, when it comes to tendering, a BIM model demonstrates that a contractor has the requisite technological know-how to deliver a project in a timely and efficient manner. In other words, it breeds confidence.

It also shows with great accuracy the

DOKA USED THE SOFTWARE DOKACAD FOR REVIT TO MAP THE FORMWORK SOLUTIONS FOR THE SOFISTIK OFFICE BUILDING PROJECT IN GERMANY



materials that will be necessary for the build and can accurately forecast the total cost, both in material terms and manpower.

PRACTICAL APPLICATIONS OF BIM

The German company TÜV SÜD provides integrated services for planning, building and operating infrastructure projects. It has been offering its clients BIM services for a number of years and insists it is now the backbone of any serious project.

Tobias Schmidt, the company's senior BIM consultant, says the cost and time of construction can now be monitored in real time, to ensure that the building is built within the planned budget and to a concrete timescale.

He says his company can not only design structures using digital technology, but can also optimise it and simulate their lifecycle.

Regarding the wider potential of the technology, he says, "In BIM we see the first approach to make cities smarter and more innovative. In former times we needed to program simulations towards energy efficiency, which costs a lot of money and was very time intensive.

"BIM allows us to understand the design effects of a building, or infrastructure. I can say that, if you use BIM at the design phase, for sure, you will have a much faster project. We have seen time savings from a few weeks up to two months."

Another key benefit of using BIM is clash detection. A clash occurs when components within a built asset are not spatially coordinated and conflict with each other; in other words, they are found to occupy the same space, or one component in some way interferes with another's operation.

Clashes detected within the virtual BIM design can be simply resolved, without the need to hold up construction, waste valuable resources or incur the expense of purchasing replacement components or materials.

Of course, clashes should not occur in modern construction. However, as a project moves from architectural design, through structural, environmental, mechanical and electrical engineering, to the construction itself, there are

BRIGHT COLOURS WITHIN A BIM REPRESENTATION HELP DESIGNERS IDENTIFY POTENTIAL CLASHES



TÜV SÜD SAYS ITS SERVICES HELP TO SUPPORT THE WHOLE LIFECYCLE OF THE BUILT ENVIRONMENT

many opportunities for errors to creep in.

These opportunities can be drastically reduced when all stakeholders are working on and viewing the same structure – as a 3D visualisation – at the same time.

UK-based company NBS provides cloud-based systems that enable architects, engineers and designers to reduce the risk of unfortunate clashes within built structures.

The company says, "In a Level 2 BIM process, a range of federated models are produced and coordinated data drops used to inform a master model. BIM modelling software and BIM integration tools allow designers to check for clashes in their own models and when models are combined."

NBS continues, "Clash detection software is becoming increasingly sophisticated, allowing the user to check for clashes within specific subsets (structural elements against walls, for example) and for these to be flagged on screen."

IMPACT OF COVID-19

Autodesk is one of the world's leading proponents of BIM technology and recently launched a European data centre to support the increasing popularity of its services – especially its new BIM 360 Design software. According to the company this is now used in more than 150 countries and on some 40,000 projects.

In fact, Autodesk says subscribers to the system have doubled in Europe in the first quarter of this year, and leapt up by around 350% globally since working conditions shifted from the office to home, due to the spread of Covid-19.

BIM 360 Design uses the cloud to allow collaboration between disparate project teams – across architecture, engineering and construction disciplines.

Alex Mortiboys, head of BIM at Dutch architecture firm Office of Metropolitan Architecture, says, "We are always

HOW BIM KEPT HS2 ON TRACK

Collaboration was key to creating design concept

The group developing HS2, a huge rail infrastructure project underway in the UK, is committed to applying global best practices in design and construction and has set strict data and modelling requirements in accordance with Level 2 BIM standards, as mandated by the UK Government.

As part of the project, a joint-venture partnership of Skanska Costain Strabag (SCS) was contracted to perform civil works on a 230km stretch of line, between London and Birmingham.

The first order of business was for the contractors to collaborate with designers to create a conceptual design for 26km of high-speed railway – including 20km of tunnels and several bridges – within a 14-month timeframe.

SCS needed interoperable technology to implement a collaborative BIM strategy to accommodate the existing British railway systems and approximately 6,000 utility assets, as well as to coordinate a geographically dispersed, multidiscipline team.

The group initially created a content plan to define the model structure, starting with the asset to be added to the model, and then the elements to be incorporated.

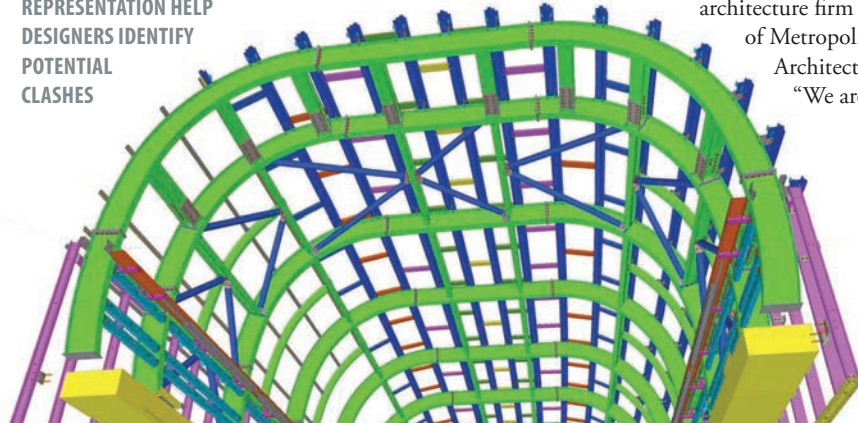
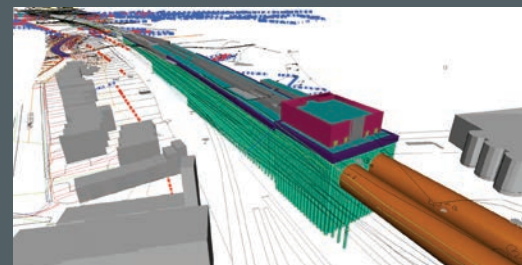
The contractors and designers created a library of components, which they shared via the cloud-based ProjectWise and OpenBuildings Designer solutions developed by Bentley Systems.

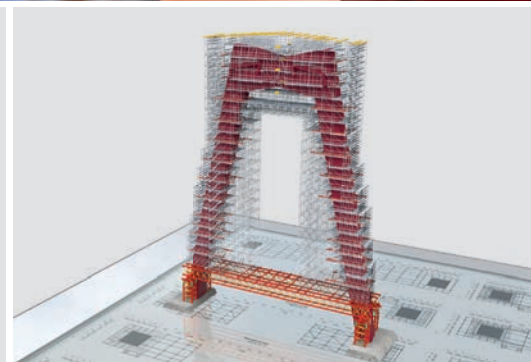
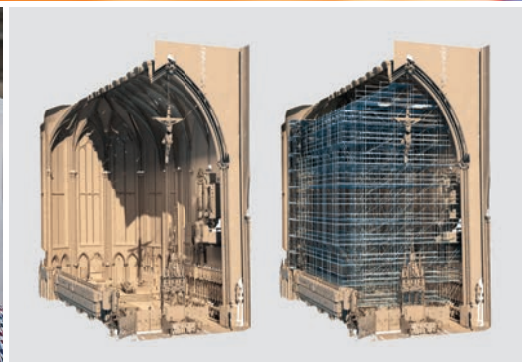
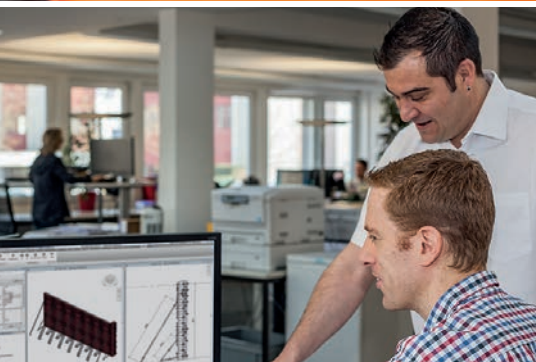
Using these products, plus Bentley's AssetWise software, the SCS team established a common data environment, which they were able to share with other stakeholders, including Network Rail, London Underground and Crossrail.

With this data library in one location, the team established effective workflows and the custom component library ensured all elements were identical and enabled certifying consistency and accuracy for estimates, planning, constructability, and safety.

The SCS team has estimated that using Bentley's applications to implement this collaborative BIM strategy has brought about a reduction in design time of 50%, a 75% reduction in resources, a 30% reduction in planning time and early error detection, saving up to €1.1 million (US\$1.3 million).

PERSPECTIVE VIEW OF RUISLIP PORTAL AND HEAD HOUSE ON HS2'S SOUTHERN SECTION





BIM – The future-oriented method to design and control all construction processes

High planning security

and minimizing of risks by creating simulation planning and execution variations at a very early stage of the project.

3D visualization of construction projects

with fast access to associated data via QR codes on pre-assembled formwork and scaffolding units.

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based on the transparent documentation of all execution details and the consistent documentation of all processes on the construction site.



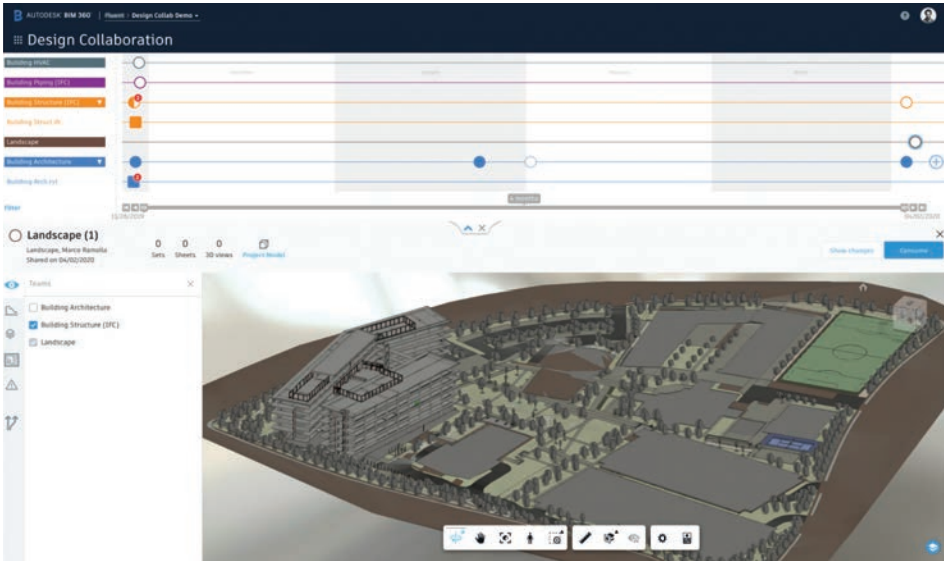
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A DESIGN COLLABORATION MODEL CREATED FROM DATA INPUT TO AUTODESK'S BIM 360 DESIGN SOFTWARE

looking to drive efficiency in our design process, so we have put cloud-based collaboration at the core of our practice.”

In basic terms, current users of Autodesk’s Revit 3D design software can now use BIM 360 Design to effectively manage permissions for all stakeholders in a project, making it much easier – and more secure – to share files across different disciplines and between different organisations, wherever in the world they are working.

COMPLEX PROJECTS

Nicolas Mangon, vice president of Autodesk’s AEC business strategy and marketing, says the exponential growth in BIM 360 Design users over the past two years is an acknowledgment of the, “increasing complexity of projects and the teams working on them.”

He adds, “In these unprecedented times, there’s a greater need for project continuity and flexibility of teams to stay on track from wherever and whenever they must work.”

Topcon Positioning Group is a global

TOPCON SAYS SCANNING EQUIPMENT, SUCH AS ITS GTL-1000, CAN VERIFY THE INSTALLED GEOMETRY, INCREASING CLIENT CONFIDENCE IN BIM



“ IN THESE UNPRECEDENTED TIMES, THERE’S A GREATER NEED FOR PROJECT CONTINUITY AND FLEXIBILITY OF TEAMS TO STAY ON TRACK FROM WHEREVER AND WHENEVER THEY MUST WORK

construction technology leader, specialising in geospatial solutions through both software and precision measurement hardware.

The company’s business development manager for vertical construction, Adam Box, says that while there is still some way to go for the technology to propagate the whole delivery cycle of a construction project, “a number of BIM’s key principles are now seen as ‘business as usual’.”

He says the value BIM has brought to

producing well-coordinated, buildable models cannot be argued with. However, he cautions that the industry needs to be aware that, “delivering that value through the construction phase and into asset ownership and maintenance still represents a challenge.”

He adds, “Within the delivery space, BIM has yet to realise its full potential. This is evident from the enormous strides being made to bring technology to the construction site to drive use of the BIM data and spatial information. Ensuring that construction data is easily accessible to all and that it remains accurate and current is certainly an area that Topcon is heavily focused on.

“This ranges from helping companies embrace autonomous or assisted construction machines, to offering solutions that provide a near real-time, as-built model as construction takes place – factors that are essential in helping to get the full BIM vision onto the construction site.”

Last year, Topcon released the GTL-1000 scanning robotic workstation, which Box says is the kind of tool that can give companies more confidence on their BIM journey.

Box comments that the workstation, “puts everyday as-built verification into the hands of the site engineer.” He adds that without this continual verification of the installed geometry, “the value of the 3D model diminishes throughout the project, making it almost impossible to deliver an accurate Building Information Model to the client.”

CT



WORKERS ON SITE EXAMINE THE COMPONENTS OF A CONSTRUCTION PROJECT USING AUTODESK SOFTWARE

4D MODELLING FOR SOCIAL DISTANCING
Technology puts 'virtual bubbles' around personnel

UK-based contractor Balfour Beatty is using 4D modelling technology to ensure the health and safety of staff working on Junction 3 of the M4 motorway in England.

In simple terms, the models (including a time/scheduling – hence 4D – element) incorporate people with their own 2m-radius ‘virtual bubbles’ around them; this allows the team to plan socially distanced operations.

When the software highlights a task that requires workers to be in close proximity, the team is given advance warning, allowing them to devise alternative methods of completing the job.

GIVING CONSTRUCTION MACHINERY A BRAIN

Automation, remote control and artificial intelligence are here now in construction but, explains SCOTT CROZIER, vice president, Trimble Civil Engineering and Construction to ANDY BROWN, we are only at the start of the journey



TRIMBLE'S SCOTT CROZIER

The topic of construction technology is so large, encompasses so many different areas such as BIM, electric and hybrid power, drones, automation and remote control that it can be difficult to know where to start. This is why it can be good to get back to basics and reiterate the importance that those in the industry embrace it.

On the subject of technology in the construction industry Scott Crozier, vice president, Trimble Civil Engineering and Construction, states that, "If you're not using technology in five years, you're not going to be able to be competitive."

Crozier accepts that in the beginning it was the larger contractors that were the 'innovators' and adopted construction technology, but says that the tide is now beginning to turn and increasing amounts of smaller contractors are embracing it. "We see a big gap at the smaller contractor level, between those that don't believe in it and those that realise they are not going to be in business if they don't invest in it."

New technology does require investment – both financially and emotionally. For any business, changing the way that it operates, and



THERE'S NO DOUBT THAT IT'S THE FRAGMENTATION OF THE INDUSTRY THAT IS DRIVING THE INEFFICIENCIES

has operated for years, or even decades, requires a degree of courage. However, if construction technology is implemented properly than it can save businesses both time and money.

Of course, there are some companies in construction that have adopted this technology for some time.

In terms of 'advanced' geographical regions Crozier picks out Australia, parts of the US, and Norway and Sweden as having a high degree of these companies and says that these firms have seen an increase in efficiency and are now looking for what the next gains are.

"Those that have been using digital construction tools for a period of time, now they're onto data-driven and analytics to help them help find additional efficiencies. You need

NEW TECHNOLOGY IS INFLUENCING CONSTRUCTION IN ALL KINDS OF WAYS, SUCH AS REMOTE OPERATION AND AUTOMATION



those digital tools to be able to get the data. Now they're running analysis on that data to find out areas where they could improve, help their future estimates and look for efficiencies to be gained in certain tasks and coordination of tasks that they're working on."

DATA STANDARDISATION

One of the biggest issues for the adoption of technology in the industry is, regarding telematics, just how much data there is out there and – because it is produced by different technology companies and OEMs – how it doesn't all speak to each other, it isn't all compatible. Step forward ISO 15143.

This is an International Organization for Standardization (ISO) committee with the aim of standardising digital construction data. It is, concedes Crozier, absolutely vital.

"It's a really important topic. Trimble does have its own proprietary protocol just like other digital technology providers for construction. The only way to succeed is going to be having a consistent data set, or at least an interoperable data set."

Trimble is one of the companies working with the committee to produce a standard for digital construction in different tiers, starting with the basics of digital construction and then looking at connecting data file formats on a site, before



AUTOMATION IS AVAILABLE NOW, BUT THE LEVEL OF MACHINE INTELLIGENCE WILL INCREASE FROM SET PARAMETERS IF THE MACHINES ON A SITE HAVE ACCESS TO MORE DATA

eventually looking at the data required for automation.

Crozier is passionate about the importance of this saying, "There's no doubt that it's the fragmentation of the industry that is driving the inefficiencies. Creating a collaborative, standardised environment is where significant efficiencies are going to come from."

As mentioned at the start of this article, construction technology is such a broad sector. With this in mind, is there one aspect of it that Crozier can highlight as being especially exciting? The answer is tied into artificial intelligence and Trimble's WorksOS, which was launched at the Conexpo show.

The new launch is all about bring data together, something that Crozier says is key to the development of machine intelligence. Automation is available now, but the level of machine intelligence will increase from set parameters if the machines on a construction site have access to more data.

INTELLIGENCE IS KEY

"A robotic machine by itself is just a robot. It needs the intelligence to actually perform the task effectively," he says.

"Let's start to give intelligence on a workflow and then that intelligence is the first step to being able to enable autonomous construction. There's a whole lot of things required to create robotic machines, but the intelligence is the key part, creating a machine that can stop when it sees something, can do the task it is told to do. That's all possible. It's giving the right information to a machine so it acts efficiently and effectively, that is the key.

"WorksOS will be the brain of a construction site. The aggregation of all this data coupled with artificial intelligence and machine learning algorithms really start to step us towards enabling autonomy.

"The robot is not what's holding us back at the moment, it's the ability to provide real time intelligence." **CT**

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Digitalisation spearheads innovations

Today's systems take advantage of digital technologies to overcome time and cost constraints, writes **Jenny Lescohier**

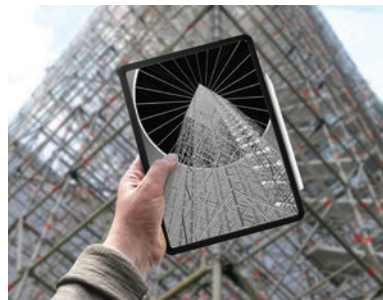
Architects seemingly know no bounds when it comes to building design. The world's premier cities are dotted with the innovative creations of inspired geniuses whose ideas have been brought to life by people and equipment whose job it was to ensure the designs could be executed safely and efficiently. The falsework and formwork involved in the construction of today's most innovative building designs is itself getting more advanced, thanks to the same technology responsible for so many of the changes occurring in the construction process.

Digitalisation is being increasingly integrated in many facets of construction, with falsework and formwork no different. Rightly so, because nothing else optimises project planning so effectively, while opening up enormous potential for both transparency and cost savings.

Increased efficiency from digital

The use of Building Information Modelling – BIM methodology – along with its associated tools, represents one of the most significant technological developments in recent years, transforming the design of scaffolding and formwork solutions.

“The comprehensive digitisation of our warehousing system now allows us to connect directly with the client's worksite and monitor progress, adjusting material supply to maximise productivity and reduce expenses,” states Asier Santos Bikuna,



The Layer SIM (Scaffolding Information Modelling) system is a process based on 3D models to meet the requirements of scaffolding construction

Layer Allround Shoring Frames TG 60 reduce the number of individual components and, when used in conjunction with standard parts, can be combined to build shoring towers with a load-bearing capacity of up to six tonnes per standard

Ulma Construction. “We are also working with laser scanner technology that will allow us to precisely adjust our scaffolding

design to the true dimensions of restoration projects.”

The methodology made possible by BIM represents a radical shift in the construction process, seamlessly integrating all stakeholders in the planning process from start to finish.

“The interaction between the physical elements onsite – the materials – with our digital tools, allow us to design projects based on exact 3D models,” adds Bikuna. “And we can work more efficiently, in stages with detailed lists that precisely meet real needs onsite. Improvements in engineering and logistics also improve productivity and safety throughout the project.”

Laser scanner technology streamlines the data point collection process, drastically improving precision. Bikuna says that, as a result, it's possible to measure the exact distance between any two points at any time and design the scaffolding with a point cloud generated for the renovation of any building or structure, adjusting whenever necessary.

BIM is gaining in acceptance, supported by legal guidelines such as European Directive 2014/24/EU, which requires the use of BIM for all public building and infrastructure tenders, while offering a range of benefits for any construction project.

“Digitisation is key in the development of BIM tools,” Bikuna says. “It allows for realistic 3D models from which formwork and/or scaffolding projects can be designed, as well as online oversight of the project and worksite as it progresses.”

Staying with the theme of technology, Doka has launched DokaCAD for Revit, its software for automated formwork planning.

Efficient formwork systems have a significant influence on the success of a shell construction project, which requires correct and reliable formwork planning and optimal cycle planning. BIM software can be used to simulate situations and determine the optimal construction sequence before the project even begins. ➤



The improved cross-section of the new MevaDec edge profile and the modified primary beam groove reduce the concrete adhesion to a minimum

FAI SEWORK & FORMWORK



Ease of cleaning, ergonomics and low weight are decisive factors for the use of modular slab formwork systems and MEVA aims to fulfill these requirements

The BIM model for the shell must provide a detailed representation of the formwork. Doka has its own BIM competence centre to ensure successful BIM implementation. The company adds that it works closely with architecture, engineering, and construction partner Autodesk to create BIM-compatible building models.

Standards increasing

Talking about changes to the sector, Roland Hassert, head of construction applications engineering at Layher, comments that, "Wage costs are increasing as well as legal standards. Therefore, provisional solutions are often no longer accepted. With our

'Folded' design presents challenges

Custom formwork and climbing solutions used at Gioia 22 in Milan

Gioia 22, the 30-storey, 120m tower being constructed at the heart of the Porta Nuova district in Milan, Italy, features a characteristic folded shape, which is said to have ecological significance. Slated for completion later this year, Peri provided support during construction using a combination of custom-made formwork and climbing solutions.

The design consists of a main core with 26 floors and a secondary core with 13 floors. The special feature: from the second floor upwards, the tower starts to fold in on itself so the slabs become wider with each passing floor. A project-specific combination of different systems was required to create the unusual shape of the building.

The construction work had to be completed as quickly as possible to meet tight deadlines. For these reasons, the decision was made to combine the Peri Skydeck Slab Formwork with an additional RCS P System Solution to realise the slabs from the second floor upwards. Systematic erection sequences and lightweight system components made it possible to complete an entire floor in a week, according to reports.

Characteristic features of the building are the 17 round columns of which seven are inclined. They were erected using SRS Circular Column Formwork. The diameter of the columns vary between 1m and 0.8m, becoming smaller with the increasing height of the tower.

The process of connecting the main core of the building to the secondary core was a key technical challenge. To achieve this, the first RCS Climbing Unit was installed using

vertical as well as laterally inclined climbing rails. The cantilevered section of the roof slab on the 25th floor, which, at 10m, is twice as high as the other floors, was implemented with the aid of Peri UP Flex Shoring Towers.



Gioia 22 is special in that from the second floor upward, the tower starts to fold in on itself so the slabs become wider with each passing floor

“ The methodology made possible by BIM represents a radical shift in the construction process, seamlessly integrating all stakeholders in the planning process from start to finish ”

Layher Allround Scaffolding system, scaffolding, safety and efficiency are not contradictions. On the contrary, a major factor in improving safety as well efficiency is digitalisation.”

Hassert says the Layher SIM (Scaffolding Information Modeling) system is a process based on 3D models to meet the specific requirements of scaffolding construction.

“SIM not only allows you to plan, assemble and manage temporary scaffolding structures more efficiently, but also affords access to BIM at the same time,” he says, noting, “with the integrated Layher software solution LayPLAN SUITE, you have a tool for the SIM process. LayPLAN CLASSIC facilitates a start in digital planning by allowing

automated planning of predefined scaffolding applications – and if required even with temporary roof structures.”

Dependable 3D planning of scaffolding structures without collisions is just one of many benefits. There is also the realistic visualisation of scaffolding, allowing work to be coordinated with other trades or construction sequence simulation, the transfer of the scaffolding planning to structural analysis programs, and the output of material lists and assembly plans.

“Transparency at every step results in a reduction in costs and an increase in safety and profitability,” Hassert says.

Focusing on the specific sector of modular slab formwork systems, key factors for this segment are ease of cleaning, ergonomics and low weight. With the development of the MevaDec, Meva aims to fulfill these requirements and offers a new generation of this smart system.

Currently in use for the construction of a three-storey office building in Waldmössingen, Germany, with additional slab areas in an adjacent factory building, the improved cross-section of the new MevaDec edge profile and the modified primary beam groove reduce the concrete adhesion to a minimum. In addition, the new generation has optimised handling properties with integrated grip profiles and low weight. The company says it's also easy to clean.

“Early stripping and the resulting reduction of material stock on the construction site provides us with clear benefits in terms of rapid construction process,” says Sascha Grübel, site manager at the Waldmössingen building project.

As timelines and budgets contract, the twin concerns of safety >



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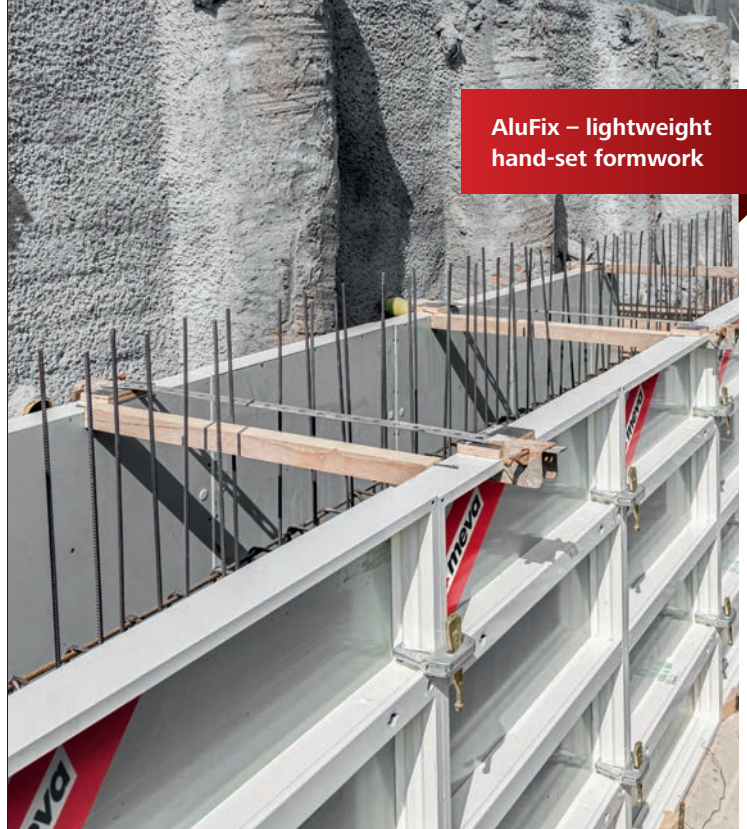
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“ Transparency at every step results in a reduction in costs and an increase in safety and profitability ”

and efficiency have never been more important.

“Safety and efficiency have always played a major role on construction sites, but have become even more important, particularly when it comes to upward access – and not just for regular shoring constructions,” says Hassert. “Customers are looking for more versatile solutions, for instance shoring constructions including work platforms.”

Hassert says, for example, that Layher Allround Scaffolding consists of just three basic components: standards, ledgers and diagonal braces. For further tasks, Layher also supplies matching supplementary components, including the Allround Shoring Frames TG 60 for an efficient system.

“Uniform system dimensions make all our new products, generally speaking, combinable with existing components of the Layher product portfolio – including earlier product generations,” he says. “This ensures that investments are protected, one of the strengths of the integrated system.”

Supplementary components can be safely planned using Technical Documentation and the LayPLAN SUITE scaffolding planning software.

Innovative solutions

Apart from digitalisation, falsework and formwork suppliers are devising ways to make working with their systems simpler.

RMD Kwikform has launched Tetrashor, a lightweight modular propping system that can deliver a loading capacity of up to 400kN. The system was designed for the building refurbishment and civil engineering markets, finding applications in dead shoring, façade retention, propping and needling, supporting precast concrete bridge beams and structural steelwork frames, and restraining tall single and double-sided formwork.

The system’s 400kN loading capacity means a minimum number of props are required, helping to reduce costs and assembly time for contractors. At the same time, it has been designed with lightweight components, so the product can be easily carried by workers, without the need for a crane.

“When superior prop strength is a key requirement, the compromise is generally a heavier system that is more difficult to manoeuvre,” says Ian Fryer, divisional product innovation director at RMD Kwikform. “Conversely, lightweight but less

The variable formwork system LOGO.3 from Paschal is in use for building an ecological passage channel structure in Germany

strong systems often require more materials to meet loading capacities, adding to erection times and costs.

“With Tetrashor, there’s no need to compromise. It provides a safe, cost-effective and efficient solution, helping to overcome common industry challenges by supporting heavy loads, while also improving productivity through its versatility and design. For instance, less bracing is required on longer props than alternative solutions, helping contractors to keep costs down.”

Finally, all of these innovative solutions and digital advancements are made to be used on projects, and one eye-catching project currently underway is Katara Towers in Qatar. Due to be ready for the 2022 football FIFA World Cup, Katara Towers, which will be just over 200m high, will contain hotel rooms, apartments, offices, leisure facilities and restaurants.

For erecting the core walls in the towers, climbing formwork systems from Doka were used. The completed silhouette of Katara Towers, rising from the southernmost point of the 38km² planned city of Lusail, Qatar, aims to become a landmark for the nation.

“Our vision for Katara Towers is to set new standards that go beyond the borders of the hospitality industry and will provide an architectural landmark that is instantly recognised and understood right across the globe”, said Sheikh Nawaf bin Jassim Al Thani.

The tower, scheduled for completion in May 2021, is structurally divided into five areas and has a total of eight core walls. The central component of the project is a pair of symmetrically arched towers. They cover an area of 2,315m², rise 36 storeys into the sky, and the clear height of the slabs ranges from 4.45m to 9.15m.

According to Doka, the biggest challenge arising from the structural design was to install the formwork on the protruding slabs while adhering to the construction schedule. Doka’s table lifting system TLS was used to accelerate the slab cycle, moving the Dokaflex tables in the two high-rise towers two storeys upwards. Due to the inclined façade of the building, the table lifting system had to be modified. **IC**

Falsework and Formwork rental?

Managing director of Paschal talks about the future of the sector

The Covid-19 pandemic is expected to increase rental penetration in the falsework and formwork sector, according to Michael Stoevelbaek, managing director of Germany-based manufacturer Paschal.

“The trend towards rental is growing, and it will be helped by the financial crisis caused by the coronavirus pandemic. People will see the financial sense of rental,” says Stoevelbaek.

Pandemic aside, Stoevelbaek says the continuing growth of rental will also be driven by the fact that projects are increasingly differentiated and therefore different types of formwork are required from one job to the next.

“A benefit of formwork compared to pre-fabrication is that it can make interesting or unusual structures,” says Stoevelbaek.

Paschal has five depots in Germany, plus its head office, and it works with a network of 30 partners to give coverage across the country. About one third of those partners offer rental. Paschal has operations around the globe in 18 countries in total.



Michael Stoevelbaek,
managing director, Paschal





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Bidding for success

Used construction equipment sales worldwide is worth hundreds of billions of dollars a year. **Karl Werner**, president, international, at leading used equipment auctioneer Ritchie Bros. tells

Andy Brown why prices are holding firm and how Covid-19 will lead to changes in how business is done throughout construction

An exact figure regarding the value of used construction equipment sold every year is impossible to come by, due to many transactions taking place in private. However, it can be said with a high level of confidence that the figure is easily in the hundreds of billions of US dollars every year. Auctioneer Ritchie Bros. sell more than US\$5 billion worth of used equipment around the world globally, with approximately 85% of that construction equipment, from mini excavators all the way up to giant cranes.

On a late afternoon call in the UK, early morning in the US, Karl Werner, president, international, Ritchie Bros., told *International Construction* how the company has adapted to the challenges presented by Covid-19 and that the used equipment segment is holding its value.

Despite the call taking place at 8.00am in the US, Werner (who had already, astonishingly, been up for four hours by the time of the call) was enthusiastic and open as he revealed that the company was actually very well placed to deal with the issues brought about by Covid-19.

“Online participation has grown quarter after quarter throughout the years. Pre-Covid approximately 75% of the buyers at Ritchie Bros. auctions were online,” he comments.

When Covid hit he says that, “Over a weekend, we came up with this plan to say to customers, look, you can come in and inspect the equipment where it’s approved by the authorities but we will limit the number of people in the yards at one time and practice social distancing.” Because of Covid the company changed from live onsite auctions with online bidding to fully online

auctions. Werner adds that, “Over a weekend, the plan was launched and it’s been very successful.”

Slightly different versions of online auctions are taking place in North America, Europe and Asia-Pacific to cater for different market requirements, but the key point is that business has been able to carry on. People are still buying used construction equipment and, interestingly, the prices for used equipment have held steady.

“The most intriguing scenario now that we’re seeing is that demand is actually fairly steady globally. We’re seeing pricing holding up – we haven’t seen any price erosion to speak of,” says Werner. He attributes a lot of this to the uncertainties that the global pandemic has brought in its wake.

“There’s still a lot of business going on in the world, but there’s also uncertainties. If you have a project that’s coming up are you going to go out and buy new machines that you’re going to be paying for over the next three years? Or are you

“ **The most intriguing scenario now that we’re seeing is that demand is actually fairly steady globally. We’re seeing pricing holding up – we haven’t seen any price erosion to speak of** ”



Karl Werner, president, international, Ritchie Bros.

going to buy a used machine, get your project done, and then liquidated after if there’s no business coming down the pipeline for you? The used market, in times like this, actually flourishes a bit. We’re also seeing that with dealers, they are confirming that new sales are down but used is still strong.”

Industry trends

The company, which has been operating for over 60 years, sells all types of construction equipment but Werner says that the biggest growth area is – ironically enough – in the smaller machines such as mini excavators and compact loaders. Another big driver has been emissions regulations; whenever countries raise the levels of emissions regulations the market for older and non-compliant machines gets smaller and smaller.

“Every time a country raises their emissions requirements it shrinks down the area where those older used machines can be sold. Right now, a bigger market for lower tier machines is countries in Africa, Middle East and some of Southeast Asia.”

Another issue is related to the higher levels of technology on newer machines. For example, even if a contractor based in, say, Nigeria wanted the highest specification wheeled loader available, it isn’t much good if the right spare part can’t be delivered to it quickly in the case of a breakdown or the right fuel isn’t available to run it.

Staying on the theme of technology, and Werner says that it is now a ‘given’ for buyers in developed countries to want construction equipment with inbuilt technology and it is a trend that is accelerating. He adds that, “Technology is



Even before Covid-19 Ritchie Bros. was seeing increasing numbers of its customers bidding online rather than in person at an event

just transforming the industry itself, it is truly amazing.”

If technology is a must for some buyers, then what else are they looking for? An experienced hand, Werner refuses to be drawn on the question of which OEMs equipment is viewed as more valuable than others by buyers, but does say that those attending auctions, be it in person or virtually, are more savvy than ever before.

“Today’s buyers are way more educated and informed. They look at total cost of ownership, so that means all your maintenance costs, your ownership costs and how much the machine is going to be worth in five years,” he says.

“If you’re buying machine X and you’re running it, the fuel cost is X, the maintenance cost is Y and at the end of five years, you’re going to sell it for, say, 40% of what your new cost was. Machine Y has virtually the same operating cost, but you’re going to sell it for 50% of your original equipment costs. Those are factors that educated buyers are taking into consideration.”

While a lot of businesses have been suffering recently, Werner makes the point that he does not think that the construction industry has been anywhere near as badly impacted as it was in the financial crash of 2008-2009.

The company produce a used equipment market survey report and, for the US, estimate that for the three months ending May, prices for used heavy



Prices of used construction equipment have remained steady through the Covid-19 pandemic

“ Every time a country raises their emissions requirements it shrinks down the area where those older used machines can be sold ”

equipment declined 3% compared to the same time frame last year. In 2008-09 this percentage was closer to 20-25%, giving some indication as to the difference between the two downturns.

While some companies have fared better than

others in this ‘new normal’ brought on by Covid, there is no doubt that the way that businesses operate will be changed by the impact of the pandemic. There was already a trend for meetings to take place remotely rather than in person, for people to work at home rather than out of the office and to use technology to improve efficiencies. In a world where social distancing is necessary these trends have hit light-speed.

Werner comments that, “I’ve been telling our team that if there was a trend pre Covid, this has accelerated that from 50 kilometres an hour to 150. Online mobile and technology was trending before, now it’s full speed. We’re not going back. There’s going to be new models that come out of this, the way people do business. A lot of eyes have been opened.”

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