NOVEMBER 2020 Vol 59 No 9

international construction

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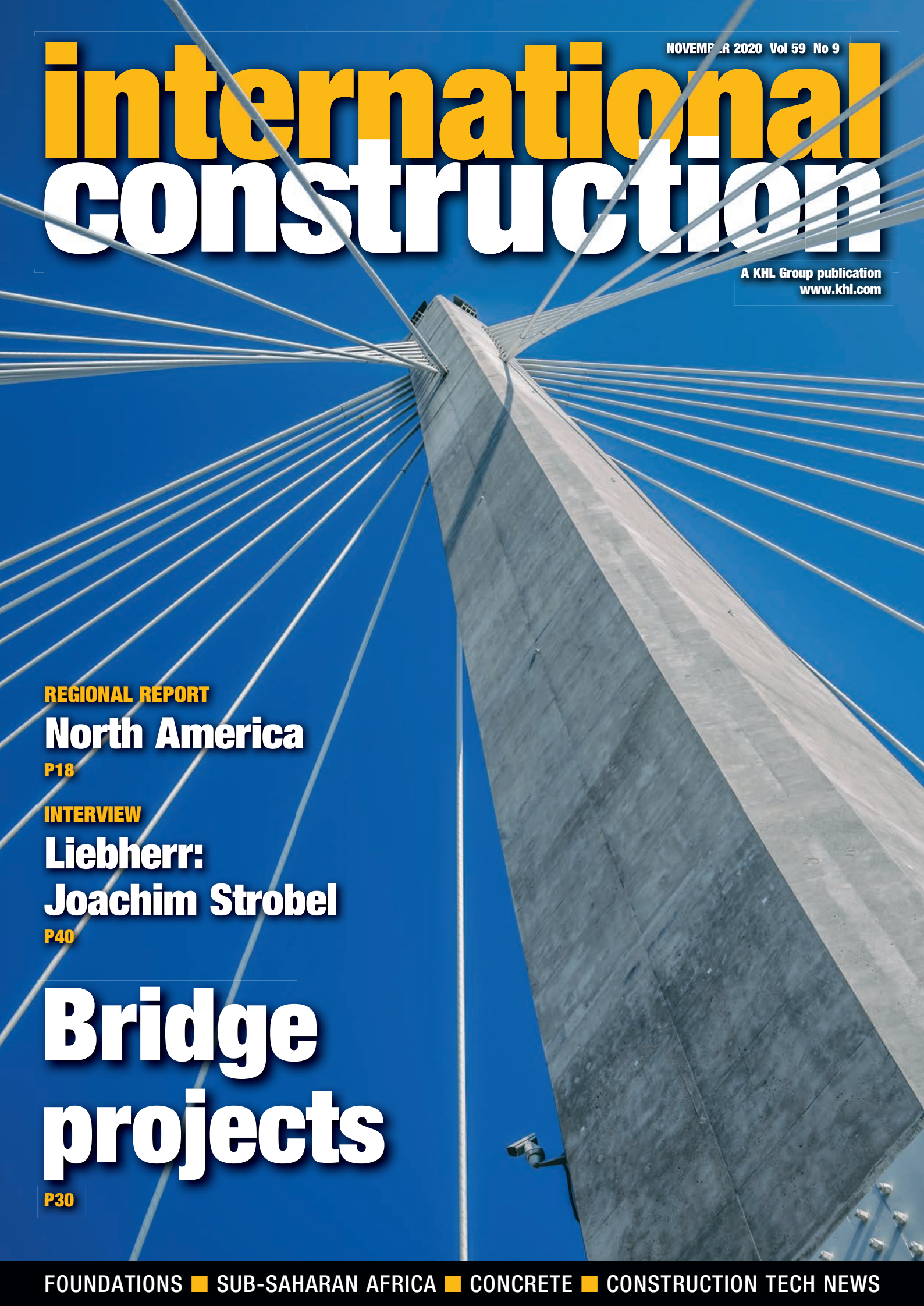

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KHL OFFICES

UNITED KINGDOM (HEAD OFFICE)
Southfields, Southview Road,
Wadhurst, East Sussex TN5 6TP, UK.
Tel: +44 (0)1892 784088
Fax: +44 (0)1892 784086
www.khl.com

USA OFFICE
KHL Group Americas LLC
3726 East Ember Glow Way,
Phoenix, AZ 85050 USA
Tel: +1 480 659 0578
e-mail: americas@khl.com

SOUTH AMERICA OFFICE
KHL Group Américas LLC
Av. Manquehue Sur 520, of. 205,
Las Condes, Santiago, Chile
Tel: +56 9 77987493
e-mail: cristian.peters@khl.com

GERMAN OFFICE
Niemöllerstrasse 9,
73760 Ostfildern, Germany
Tel: +49 711 34 16 74 0
e-mail: gabriele.dinsel@khl.com

CHINA OFFICE
KHL Group China
Room 769, Poly Plaza,
No.14, South Dong Zhi Men Street,
Dong Cheng District,
Beijing, PR China 100027
Tel: +86 (0)10 6553 6676
e-mail: cathy.yao@khl.com

KHL SALES REPRESENTATIVES

SALES MANAGER and UK
Simon Kelly, UK Head Office
Tel: +44 (0)1892 786223
e-mail: simon.kelly@khl.com

DEPUTY SALES MANAGER
Eleanor Shefford, UK Head Office
Tel: +44 (0)1892 786236
e-mail: eleanor.shefford@khl.com

BENELUX
Ollie Hodges
Tel: +44(0)1892 786253
e-mail: ollie.hodges@khl.com

USA
Thomas Kavooras
Tel: +1 312 929 3478
e-mail: thomas.kavooras@khl.com

USA/CANADA
Alister Williams
Tel: +1 312 860 6775
e-mail: alister.williams@khl.com

AUSTRIA/SWITZERLAND/EASTERN EUROPE
Simon Battersby
Tel: +44 (0)1892 786232
e-mail: simon.battersby@khl.com

GERMANY/SPAIN
Petra Kaiser
Tel: +49 711 34167472
e-mail: petra.kaiser@khl.com

FRANCE
Hamilton Pearman
Tel: +33 1 45 93 08 58
e-mail: hpearman@wanadoo.fr

ITALY
Fabio Potestà
Tel: +39 010 570 4948
e-mail: info@mediapointsrl.it

SCANDINAVIA
Bridget Leary
Tel: +44 (0)1892 786220
e-mail: bridget.leary@khl.com

TURKEY
Emre Apa
Tel: +90 (0)532 324 36 16
e-mail: emre.apa@apayayincilik.com.tr

CHINA
Cathy Yao
Tel: +86 10 6553 6676
e-mail: cathy.yao@khl.com

JAPAN
Michihiro Kawahara
Tel: +81 (0)3 3212 3671
e-mail: kawahara@rayden.jp

KOREA
CH Park
Tel: +82 2 730 1234
e-mail: mci@unitel.co.kr

COMMENT

Wait and see

Whenever I interview someone there are always a couple of phrases that stand out to me afterwards, that really make me stop and think. When I transcribe the interviews – a long and laborious process made worse by having to listen to my own voice – I make a point of looking out for these phrases and thinking about how I will use them in the magazine.

In this issue we have an interview with Joachim Strobel from Liebherr, and one of the phrases he used that resonated with me was, "The pandemic lasts much longer than was expected in the beginning and this creates more uncertainty; this is poison for the economy." It struck a chord with me because it is true and also it is where we are at the moment in the world: uncertain.

Many countries across Europe have gone into another form of 'lockdown' with different rules depending on the country. At the moment it is uncertain what the long-term plan is, and it is certainly questionable how feasible it is for countries to remain locked down for the winter. There is also uncertainty in the US where, at the time of writing, Biden looks to have secured enough votes to become the next president, but Trump is contesting the result. This issue could run and run.

This uncertainty is indeed poison for the economy but we must remain positive. Without wanting to sound like a broken record, given how many times I have said this before, construction is better placed than many other industries to deal with the impact of Covid-19. Also, a number of companies have released their third quarter financial results and they haven't been as bad as some feared.

Doosan Infracore's preliminary third quarter financial results showed a 4% increase in sales thanks to strong growth in China, and German OEM and contractor Bauer AG published an earnings forecast for the year, showing expected group revenues of around €1.5 billion (US$1.75 billion), roughly similar to the same figure last year.

Caterpillar's construction industries segment saw sales drop 23% but still had total sales of just over US$4 billion in the third quarter of 2020 while Volvo Construction Equipment's net sales for Q3 decreased by 2% but grew when adjusted for currency movements.

There's no denying that things are difficult at the moment, but there are glimmers of positive news out there. We must not forget about them.

Andy Brown
Editor

ISSN No: 0020-6415
USPS No: 021-895

https://subs.icon.khl.com/registrationselection

International Construction (USPS No: 021-895) is published 13th November 2020 by KHL Group and distributed in the US by DSW, 75 Aberdeen Rd, Emigsville, PA 17318-0437. Periodicals postage paid at Emigsville, PA. Postmaster: send address changes to *International Construction*, PO Box 437, Emigsville PA 17318-0437.

PLEASE NOTE: The default currency of *International Construction* is the US dollar; When the standalone dollar symbol ($) is used, it refers to the US dollar, unless otherwise stated.

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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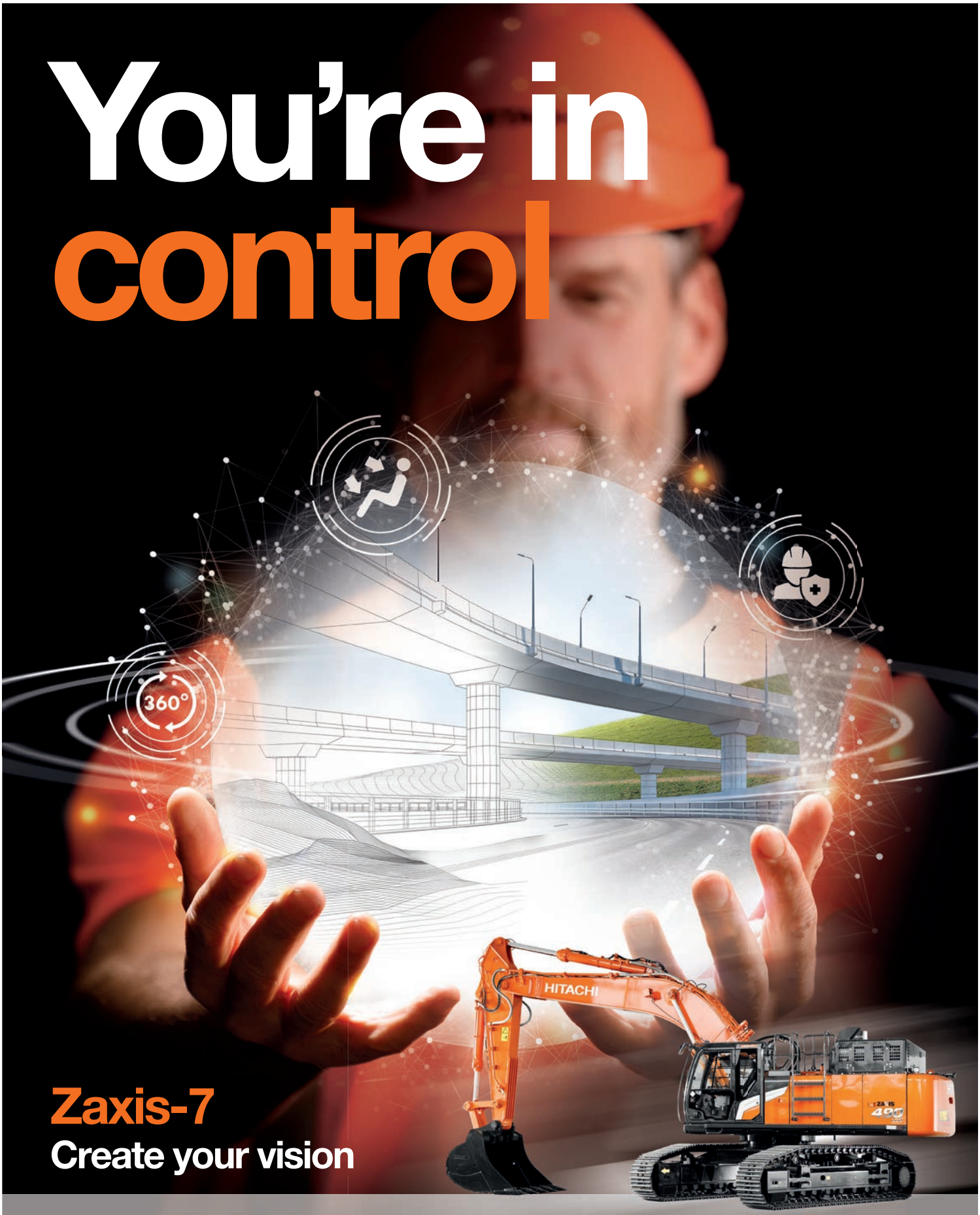

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NOVEMBER 2020
Vol.59 No.9

international construction

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The magazine is published 10 times a year. It is available to anyone who does not meet the criteria at an annual subscription rate of UK£215, US$345, €260.

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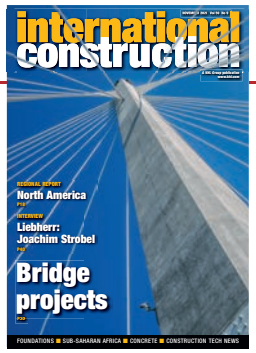

INSIDE

The Gerald Desmond replacement bridge, US, page 30

HIGHLIGHTS

CHINA Haulotte has opened a new branch in Wuhan, China. The new office is part of the Haulotte China subsidiary's strategy to strengthen its presence across the country's provinces and to be closer to its customers.

Located in Wuhan Qiaokou district, Haulotte's new branch will provide Central China and western southern China with faster parts supply delivery, training, technical support and refurbishment options.

US Hyundai Core Motion, a subsidiary of Hyundai Construction Equipment, has established a new parts distribution centre in Miami, Florida, US, to enhance its services related to construction equipment parts.

The new Miami Parts Distribution Center will supply approximately 14,000 A/S parts for excavators, wheeled loaders and forklifts to 27 countries in Latin America, including Mexico, Colombia, and Chile. The establishment of the centre is expected to reduce the company's delivery period for construction equipment parts.

FRANCE Vinci's latest financial results show revenue down 12% to US$36.4 billion for the first nine months of 2020. The construction and concessions specialist stressed, however, that, after a difficult second quarter of the year, most of its divisions were seeing a return to normal business in the third quarter of 2020.

The group's revenue for the third quarter alone, for example, was down only 6.4% on the same period in 2019. In its quarterly information, the company said its contracting arm was operating at close to full capacity in three business lines: Vinci Energies, Eurovia and Vinci Construction.

CANADA Terex Trucks has signed Headwater Equipment Sales as its new dealer in Alberta, Canada, to bring its articulated haulers to more customers in the province's construction, mining, agriculture and oil and gas sectors. Headwater Equipment will sell and rent the TA300 and TA400, as well as provide aftermarket support, to its customers in the province in the west of Canada.

Headquartered in Coalhurst near Lethbridge in Alberta, Headwater Equipment operates from three locations in Alberta and one in British Columbia.

GLOBAL

New lockdowns currently exclude construction

Different governments around the world are tackling Covid-19 in various ways, but numerous countries are embarking once again on 'lockdowns'

Europe and the UK face a new wave of lockdowns in response to surging cases of Covid-19, forcing millions to once again stay at home. Other regions, including North America, India and Brazil, are less restrictive.

In the UK, a new directive came into effect on 5 November, stipulating that everyone must stay home, except for a limited set of reasons, but construction remains 'essential'. Prime Minister Boris Johnson said, "Workplaces should stay open for where people can't work from home, for example in the construction and manufacturing sectors."

New lockdowns are in effect throughout Europe, where construction is set to continue as an essential service. Germany's directive went into effect on 2 November and will last until the end of the month.

On 29 October, French president Emmanuel Macron said Covid-19 had overwhelmed France and declared a second national lockdown from 30 October until at least 1 December. In Spain, the government has declared a state of emergency, introducing a curfew between 11pm and 6am.

In India, things are less restrictive. Satyendar Jain, Delhi health minister said on 31 October that as the virus has spread to the community, it is,"impossible to eliminate the spread of coronavirus through a lockdown."

Brazilian President Jair Bolsonaro, a longtime critic of stay-at-home measures to combat the pandemic, has said that it was "crazy" for countries to start locking down again to control second waves of the virus.

In the US numbers of those infected are high but restrictions vary state by state. China continues to see low numbers of people with the virus, as does Australia and New Zealand.

GLOBAL

Positive results for United Rentals

United Rentals' Q3 results show demand is now tracking to normal seasonal patterns. The world's largest equipment rental company reported a total Q3 revenue of US$2.187 billion, down -12% from last year. For the nine months to Sept. 30, total revenues were down -10% this year compared to 2019 at US$6.251 billion versus US$6.895 billion.

Rental revenue included United's owned equipment rental revenue, re-rent revenue and ancillary revenue.

Matthew Flannery, chief executive officer of United Rentals, said, "The recovery that we've seen since the Spring has been evident in most of our markets with demand tracking to normal seasonal patterns. We expect current trends to continue and have raised our full-year 2020 outlook for revenue, profitability and free cash flow. While the pace of the recovery remains uncertain, we are encouraged by the steady improvements we are seeing."

US

Cat reports 23% drop in sales

Caterpillar's latest financial results have revealed that the company's construction industries segment saw total sales of just over US$4 billion in the third quarter of 2020, a decrease of US$1.2 billion – 23% – compared to the third quarter of 2019.

The only region to see sales grow was Asia Pacific, which saw sales increase 14% in the third quarter of this year compared to 2019. Sales in the region were driven by a strong Chinese market. North America saw a drop of 35%, Latin America by 44% – unfavourable currency impacts from a weaker Brazilian Real were said to have been a factor – and EAME (Europe, Africa, Middle East) was down by 24%.

The profit of the Construction Industries' segment was US$585 million in the third quarter of 2020, a decrease of US$355 million, or 38%, compared with US$940 million in the third quarter of 2019.

Caterpillar's Resource Industries' total sales – which includes quarrying and mining equipment – were US$1.8 billion in the third quarter of 2020. This is a decrease of US$494 million, or 21%, compared with US$2.3 billion in the third quarter of 2019.

Sales were down in all geographical regions, with North America seeing the biggest decline at 38% and EAME the smallest at 3%. Latin America declined 23% in the third quarter of 2020 compared to the same period in 2019, and Asia Pacific was down 13%.

SWEDEN Swedish OEM Volvo Construction Equipment (Volvo CE) has launched a new 5-tonne zero tail-swing compact excavator.

The company says the ECR50 combines ease of operation and the ability to operate in confined spaces with enhanced durability. The overall width of the machine is 2m; the overall length is 5.1m.

The excavator's engine has a gross power of 31.2kW at 2,200 r/min, and an operating weight of 5,050kg.

The ECR50's manoeuvrability and tight turning radius is aided, says Volvo, by an in-track boom swing, which ensures the swing post and cylinder remain within the track width when digging alongside obstacles.

This could benefit rental companies, keen to incorporate equipment that can be kept as free from damage as possible. Another feature that could make the ECR50 attractive to rental companies is the reinforcement of its digging equipment, undercarriage and hoods, giving it greater durability.

Extras on the ECR50 include a tilt quick coupler, extra counterweight and seatbelt warning beacon. The excavator is, according to Volvo, more than 93% recyclable and also compatible with bio hydraulic oils.

FINLAND

Metso to 'exit recycling'

Aggregates and mining equipment specialist Metso Outotec has announced plans to divest its recycling business. It cited limited synergies with the core of the new company, which was created at the end of June, as the main reason.

The business, which supplies products and services for metal and waste recycling, posted sales of €156 million (US$183 million) in 2019, when it reported an adjusted EBITA (Earnings Before Interest, Tax and Amortisation) margin of 6%.

Company president and CEO Pekka Vauramo said, "We have made a strategic decision to exit the recycling business. We have concluded that even though the circular economy and other market drivers offer attractive opportunities for developing the recycling business, it has limited synergies with the core of the new Metso Outotec, and therefore we will not be the best owner to fully leverage its opportunities."

In a series of announcements, Metso Outotec also confirmed that Vauramo will continue as president and CEO until the end of 2023.

The company's review for the first nine months of 2020 has also been published. It said that Covid-19 continued to affect end markets and customer operations between July and September, leaving the situation largely unchanged from the second quarter. It added that it expects market activity to remain at the current level, subject to a possible worsening of the pandemic.

BRAZIL

New Manitou products

Manitou Group is launching new compact telehandlers and backhoe loaders in the Brazilian and Latin American markets.

The company says it aims to gain competitiveness in the markets through the expanded product offering, including the MXT 1740 and MXT 840 P telehandlers and a new line of backhoe loaders, the TLB 844 and 818.

The MXT 1740 P telehandler has a capacity of 4,000kg and maximum lifting height of 17.4m, while maximum reach is 13.5m. The second telehandler, the MXT 840 P, is a more compact machine, with the same lifting capacity of 4,000kg. Its lifting height reaches 7.6m, and the maximum outreach is 4.23m.

The new backhoe loaders both have a 2.13m length between the axis. The weight without load differs, with 7.5 tonnes for the TLB 844 and 7.4 tonnes for the TLB 818. Both have a maximum digging depth of 4.74m.

In addition to these new models, Manitou Group will further develop the market in Brazil by strengthening its service support operations through dealers and rental companies.

"We have aggressive growth objectives for the agriculture, construction, mining and industry segments, which highlights the importance of the Brazilian market in Latin America region," said Marcelo Bracco, managing director of Manitou Brazil and Latin America region.

UK

Costs soar again for HS2

The estimated cost for phase one of the UK's High Speed 2 (HS2), Europe's largest infrastructure project, has risen by £800 million (US$1 billion), only a month after the government gave the green light for construction to proceed.

Also, within the next six months, new figures will be published, detailing additional costs associated with the impact of Covid-19.

As it stands, the proposed cost for the redevelopment of London's Euston Station alone has increased by £400 million (US$523 million).

Nevertheless, after halting work on HS2 last year, to carry out an independent inquiry, the government decided the project – which will see high-speed trains running between London in the south of England and Manchester and Leeds in the north – was an essential part of the country's low carbon transport future.

Announcing the new figures, Andrew Stephenson, the minister in charge of overseeing the project, said there had been new, "cost pressures" but said they could be managed within the project's £5.3 billion (US$6.9 billion) contingency fund.

Phase one was originally set to be completed in 2026, but has been rescheduled for between 2029 and 2033. Currently, phase one of HS2 is expected to cost in the region of £44.6 billion (US$58 billion). On phase two, Stephenson said he expected the work to be completed within a new target of £98 billion (US$128 billion).

EVENTS DIARY

2020

Concrete Xperience (Brazil)
10 to 12 November 2020
Online virtual event
www.concreteshow.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

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

2021

SaMoTer
3 to 7 March 2021
Verona, Italy
www.samoter.com

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

Intermat 2021
19 to 24 April 2021
Paris, France
www.intermatconstruction.com

World of Concrete
8 to 10 June, 2021
Las Vegas, US
www.worldofconcrete.com

Hillhead
22 June to 24 June
Buxton, UK
www.hillhead.com

International Rental Exhibition
15 to 17 June 2021
Maastricht, Netherlands
www.IREshow.com

UAE

Dubai changes building codes

The UAE has announced measures to revise its building code to reduce construction costs.

According to the Emirates News Agency, at a meeting of Dubai's Executive Council (the emirate's main legislative body) a new Dubai Building Code was approved which outlines a revised set of construction rules and standards.

The code creates a unified set of standards for construction that promotes sustainable development and innovation. One of its aims is to enhance Dubai's international investment attractiveness and its diversification of projects.

By streamlining rules it is hoped that construction costs will be reduced and it will also speed up the completion of the design phase. There will now be a 'one-stop-shop' for obtaining approval from Dubai's licensing agencies and departments, with the code easing procedures for consultants, contractors, developers, investors and owners.

The construction sector in the Middle East has been hit hard by Covid-19 with project contract awards falling.

EUROPE

Contractors estimate fall

European contractors' federation FIEC has forecast an 8.5% fall in EU construction activity in 2020 and warned that the situation could worsen in 2021.

In its annual statistics report issued in October, the association said the final months of 2020 would be critical for the industry as new projects were expected to decline during the Autumn.

"We estimate a decline in investments in total construction by 8.5%," wrote Rüdiger Otto, FIEC Vice-President Economic & Legal Affairs.

"The situation might worsen in 2021 if investments in construction, both public and private, do not recover significantly. Moreover, due to losses in equity during the health crisis, companies will find it difficult to embark on new projects."

CHINA

China's biggest TBM

CRCHI has produced a Mega Slurry TBM with a maximum excavation diameter of 16.07m

A mega slurry tunnel boring machine (TBM) with a maximum excavation diameter of 16.07m has been produced by China Railway Construction Heavy Industry (CRCHI) for use on the construction of Beijing East 6th Ring Road Tunnel in China.

The slurry TBM, named Jinghua, is 150m long, weighs 4,300 tonnes and is higher than a five-storey building.

A TBM with a diameter of 12m and above is usually classified as a mega-sized TBM. Mega TBM's integrate sophisticated technologies including mechanics, electric, hydraulic, sensing and optics.

The Beijing East 6th Ring Road Reconstruction Project is a 16km long road between the Beijing-Harbin Expressway and the North Luyuan Avenue, including a widened section and a tunnel section. There are two tunnels on the main line, totalling 9,160m, of which 7,338m is to be constructed using a mechanised shield machine.

Its geology is mainly composed of sandy soil, water-rich and high-density sand. The project faces construction difficulties, such as a large excavation diameter and distance and complicated geological conditions.

The slurry TBM is equipped with a number of core technologies including: free air cutter change, telescopic main drive, handling of heavy-duty segments, efficient and high-power slurry circulation system, and high-precision pressure balance control of the tunnel face. Innovations on the machine are said to include segment ring convergence measurement, concurrent grouting of A+B components and a slurry pipe extension system.

GERMANY

Liebherr's latest dump truck

Liebherr has launched a new version of the TA 230 Litronic, said to be the first representative of the company's new generation of articulated dump trucks. It will be available in Europe in 2021 and then worldwide from 2022 onwards.

The TA 230 Litronic is said to have been redeveloped and designed with state-of-the-art technical implements. The dump truck has a new design in the front end area to create maximum ground clearance for off-road performance.

The powershift transmission is positioned compactly under the operator's cab and the exhaust gas aftertreatment is installed behind the operator's cab in a space-saving manner, whereby a large slope angle could be generated.

The modern assist systems installed support the machine operator, thus increasing safety and comfort. Apart from a hill start assist, a speed assist is also available. With the hard stop function, the end position damping of the trough lifting cylinders can be activated or deactivated at the touch of a button.

SWEDEN

Sales recover for Volvo CE

Volvo Construction Equipment (Volvo CE) has published its figures for the third quarter of 2020, showing demand recovering.

The results show that, while the pandemic continues to restrict growth in European and North American markets, a strong rebound in China has helped the company's sales figures.

Headline Q3 figures include order intake up 40%, deliveries of machines up 20% and adjusted sales up 6%. Volvo CE's net sales for Q3 actually decreased by 2%, but grew when adjusted for currency movements.

Volvo CE said it was seeing some recovery across most markets although two of its largest markets (Europe and the US) were both down 19%, with Asia (excluding China) also down by 13%.

The strong rise in the Chinese market (with demand up 22%), was bolstered by growth from the South American and African markets.

ARGENTINA

New contract for Superior

Superior Industries, a global manufacturer and supplier of bulk material processing and handling systems, has been selected as the material handling supplier for NRG Argentina's new frac sand plant in Río Negro, Argentina.

Industrial Accessories Company, NRG's EPC contractor for the project, has previously partnered with Superior Industries on frac sand projects.

"During North America's fracking boom in the 2010s, Superior quickly became the preferred manufacturer of conveyors for unloading, transferring and stockpiling frac sand," said Roland Duer, the conveyor manufacturer's manager of business development throughout Latin America.

More than 750-meters of conveyors are en route to NRG's new frac sand plant. Argentina is currently pursuing a number of policies in a bid to achieve energy independence.

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Nov. 24-27, 2020

HIGHLIGHTS

PERU Ferreyros, Caterpillar's representative in Peru, is to implement Peru's first 100% autonomous hauling project and the largest-scale haul project in the Americas. The project will use a fleet of about 30 Caterpillar mining trucks and will begin operations in Quellaveco in 2021.

A team has been deploying Caterpillar's MineStar technology platform, which will enable the autonomous operation of Cat 794 AC trucks and their interaction with manned equipment.

UK The Kensington Forum area in London, UK is set to be redeveloped after receiving planning permission for a new 'world-class' hotel worth over £1 billion (US$1.3 billion).

The permission, granted by the Greater London Authority, has been given to Queensgate Investments and Rockwell to replace the existing hotel. The new development, designed by architectural specialists SimpsonHaugh, is intended to provide outstanding visitor accommodation.

US Rail projects in nine US states will benefit from US$291 million in grants through the Federal-State Partnership for State of Good Repair Programme. "This $291 million in federal grants will upgrade rail infrastructure and enhance railroad safety and reliability in communities across America," said US Transportation Secretary Elaine Chao.

The Partnership Programme is intended to improve intercity passenger rail performance by funding capital projects to repair, replace or rehabilitate publicly owned railroad assets.

US

Location named for Hyperloop Certification Center

West Virginia, US, has been chosen as the location for Virgin Hyperloop test track

Virgin Hyperloop has announced that the global Hyperloop Certification Center (HCC) will be located in the state of West Virginia, US.

"Today is one of the most exciting days in Virgin Hyperloop's history," said Sir Richard Branson, founder of the Virgin Group. "The Hyperloop Certification Center is the start of the hyperloop journey for West Virginia, for the United States, and for the world. We're one step closer to making hyperloop travel a reality for people everywhere."

By combining an ultra-efficient electric motor, magnetic levitation, and a low-drag environment, hyperloop systems can carry more people than a subway, at airline speeds, and with zero direct emissions.

With the goal to be safety certified by 2025 and begin commercial operations by 2030, the 100% electric Virgin Hyperloop system could play a key role in helping achieve the European Green Deal's climate-neutrality objective.

The HCC provides an opportunity for regulators, governments, companies, and universities from around the world to forge partnerships surrounding all elements of this new transportation technology.

"The Hyperloop Certification Center will be a global hub for hyperloop," says Jay Walder, CEO of Virgin Hyperloop. "Our goal is to bring together authorities from around the world to set global safety and industry standards for this new mode of ultra-fast, zero-emissions mode of transport."

SOUTH KOREA

Sales increase for Doosan

Doosan Infracore has revealed its preliminary third quarter financial results, which show that sales increased 4% compared to the same quarter last year from KRW 1.856 trillion (US$1.6 billion) to KRW1.928 trillion (US$1.7 billion), thanks to growth in China.

The results of Doosan Infracore consist of sales from Doosan Heavy Industries and Construction of which construction is only one element – the others are energy, water, castings and forgings and a new business portfolio – the company's engine division and Doosan Bobcat.

Regarding sales of construction equipment, sales in China are up by an astonishing 55% in the third quarter of the year, helped by increased infrastructure investment. The Chinese excavator market was the main driver of this increase, and Doosan expects the market to be around 275,000 units in 2020.

North America and the EU region saw encouraging growth of 16% and emerging markets and South Korea were up by 0.9%.

JAPAN

Hitachi's new EX-7 excavator

Hitachi Construction Machinery will launch its EX2000-7 ultra-large hydraulic excavator in October 2021, claiming it will consume up to 19% less fuel while maintaining the same productivity as its predecessor.

The company says the EX2000-7 achieves higher fuel efficiency due to a new hydraulic circuit, and the addition of a work mode selection function. Because of drastic cutbacks in fuel consumption, the machine contributes to reduction of environmental impact and the life-cycle cost.

When compared with its predecessor, the EX1900-6, the EX2000-7 can save as much as 417 tonnes (460 tons) of CO2 emissions per year per machine.

At an operating weight of 175 tonnes (193 tons), the EX2000-7 is one of the smaller Hitachi EX-7 ultra-large excavators.

Exchange rates: November 2020

VALUE OF 1:		AU$	BRL	UK£	CNY	€	INR	YEN	MXN	RUB	SAR	ZAR	KRW	CHF	US$
Australian Dollar	AU$		0.25	0.549	4.76	0.609	53.2	75	15.08	56.6	2.68	11.46	808	0.650	0.714
Brazilian Real	BRL	4.05		0.135	1.18	0.150	13.1	18.5	3.72	14.0	0.66	2.83	199	0.160	0.176
British Pound	UK£	1.82	7.38		8.7	1.11	97.0	136	27.5	103.2	4.88	20.9	1473	1.18	1.30
Chinese Yuan	CNY	0.210	0.850	0.115		0.128	11.17	15.7	3.16	11.89	0.562	2.406	170	0.136	0.150
Euro	€	1.64	6.65	0.90	7.82		87.3	123	24.7	92.9	4.40	18.82	1326	1.07	1.17
Indian Rupee	INR	0.019	0.076	0.010	0.090	0.011		1.4	0.283	1.064	0.050	0.215	15.2	0.012	0.013
Japanese Yen	YEN	0.013	0.054	0.007	0.064	0.008	0.711		0.202	0.757	0.036	0.153	10.8	0.009	0.010
Mexican Peso	MXN	0.066	0.269	0.036	0.316	0.040	3.53	4.96		3.76	0.178	0.760	54	0.043	0.047
Russian Ruble	RUR	0.018	0.072	0.010	0.084	0.011	0.94	1.32	0.266		0.047	0.202	14.3	0.011	0.013
Saudi Riyal	SAR	0.373	1.512	0.205	1.779	0.227	19.861	27.917	5.629	21.141		4.28	302	0.243	0.267
South African Rand	ZAR	0.087	0.353	0.048	0.416	0.053	4.640	6.523	1.315	4.940	0.234		70	0.057	0.062
South Korean Won	KRW	0.001	0.005	0.001	0.006	0.001	0.066	0.093	0.019	0.070	0.003	0.014		0.001	0.001
Swiss Franc	CHF	1.54	6.23	0.84	7.33	0.94	81.85	115.04	23.20	87.12	4.12	17.64	1243		1.099
US Dollar	US$	1.40	5.67	0.768	6.67	0.853	74.48	104.7	21.11	79.28	3.75	16.05	1131	0.91	

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HIGHLIGHTS

KOMATSU has announced the North American launch of its Smart Construction Remote application, which allows users to send new design data to machines in the field, and remotely support operators.

Customers can remotely send files from their office to target machines, search all connected assets, and log in to a machine and see what their operator is seeing. They can also pinpoint the location of machines by job site and upload or download design files at anytime from anywhere.

According to Komatsu, Smart Construction Remote's capabilities allow construction site managers to help operators troubleshoot issues in real time by viewing the same data.

China has unveiled a prototype of a high-speed locomotive that can run on any gauge of track, potentially speeding up rail travel.

The 400km/h engine has "gauge-changing bogies" that could eliminate the present need for trains to stop at a break of gauge or wait while new bogies are fitted.

The train was developed by **CRRC CHANGCHUN RAILWAY VEHICLES**, a division of state-owned CRRC Corporation, the world's largest maker of rolling stock, which was supported by a US$5.2 billion research grant from the Chinese government.

SWEROCK, a subsidiary of Sweden-based Peab AB, in collaboration with **VOLVO LASTVAGNAR**, will run an electric concrete mixer truck and a hook lift truck in daily operations within two years. The trucks have been produced to meet the growing demand for less noise and emissions.

The electric concrete mixer truck will be based at Kållered's quarry and will deliver Swerock's ECO-Betong to customers in the Gothenburg area, while the hook lift truck will do internal transportation around the quarry and to larger infrastructure projects nearby.

Using Volvo's electric trucks reduces carbon dioxide emissions by more than 8,000 tons annually per truck, calculated on 8,300 Swedish miles driven annually, compared to trucks that run on diesel.

New partnership targets autonomous construction sites

A new partnership has been announced between SafeAI, a platform for autonomous heavy equipment, and Japan-based construction group Obayashi Corporation to create autonomous construction sites, starting with a pilot program on a US test site.

Beginning in November 2020, SafeAI will operate an autonomous Caterpillar 725 articulated dump truck, demonstrating load-haul-dump cycles. The autonomous truck will operate at a construction site in California, US.

SafeAI says it has built an open and interoperable autonomy platform that can be retrofitted across an existing fleet of industrial equipment. The interoperable model allows for integration with a range of ecosystem partners, bringing the entire vehicle onto the autonomous platform.

"Our work with Obayashi paves the way for safer and more efficient construction sites across the world and reflects Obayashi's commitment to innovative, connected technologies," said Bibhrajit Halder, founder and CEO of SafeAI.

"There is a critical need for autonomy outside of on-road vehicles — the technology is ready today and we've built an ecosystem specifically for the construction and mining industries."

Bouygues invests in hydrogen energy

A Bouygues Construction investment vehicle for start-ups has signed an agreement to purchase a stake in PowiDian, a specialist in 'green' hydrogen solutions for regional energy self-sufficiency.

PowiDian operates in the energy transition sector and develops 100% renewable power generation solutions for isolated sites that are not connected to the power grid. Its generators work with all types of renewable energy.

Energy storage takes the form of green hydrogen produced by electrolysis – the energy is then restored when required through a fuel cell. PowiDian has developed the MobHylpower range of zero-emission hydrogen generators.

The investment has been made by Bouygues Construction and Bouygues Energies & Services, which operates in the energy and digital transformation of regions, industries and buildings.

Jean-Marie Bourgeais, CEO of PowiDian, said, "This investment in our equity is combined with an ambitious commercial agreement that will allow us to significantly accelerate our development."

New technologies for robot dog

Trimble and Boston Dynamics have announced an alliance to integrate a variety of construction data collection technologies with Boston Dynamics' Spot robot platform.

The robotic 'dog' is used for surveying a construction site and monitoring progress. Artificial Intelligence is then used to process the data, so that the site's progress can be tracked to give project managers a clear picture of jobsite progress on an ongoing basis.

"Robots will play a crucial role in automated construction workflows and can augment the human workforce by handling dirty, dull and dangerous tasks," said Martin Holmgren, general manager, building field solutions at Trimble.

The jointly developed solution will combine Spot's autonomous mobility with Trimble's data collection sensors and field control software to enable automation of repetitive tasks such as site scans, surveying and progress monitoring.

Mortenson, a US builder, has been piloting Spot robots with Trimble's SPS986 GNSS solutions to autonomously navigate challenging exterior construction environments to document existing site conditions.

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GDP contraction

A number of factors – most of them being exacerbated by Covid-19 – result in Sub-Saharan Africa seeing a decline in GDP for the first time since 1993, reports **Scott Hazelton**

Declines in commodity prices, tourism revenues and capital inflows have undermined Sub-Saharan African economic growth in 2020. The region's real GDP (Gross Domestic Product) is projected to decline 3.8% in 2020 – its first contraction since 1993 – with South African GDP falling 9.5%.

Public sector debt as a percentage of GDP has been rising since 2010 in response to favourable bond yields and a strong push for public investment. Global initiatives to lower Africa's debt-servicing costs include International Monetary Fund credit facilities and the G20 moratorium on bilateral government debt repayments. Even so, several countries have strong long-term growth prospects, including Ethiopia, Ghana, Kenya, Tanzania and Uganda.

Falling commodity prices

While Africa has not been hit as hard by the Covid-19 pandemic as the Americas and Europe, it has taken a direct toll the region. South Africa was hardest hit, but even so, had a death rate about half that of the US. However, the impact on global trade and commodity prices will result in real investment contraction across much of the continent in 2020.

Most countries will see a recovery next year, but the lingering impact on oil prices suggests continuing concerns for Angola and Nigeria. South Africa will also struggle due to ongoing fiscal consolidation and difficult business environment.

Foreign direct investment (FDI) inflows to sub-Saharan Africa are likely to decline during 2020–21, worsened by a further deceleration in inward investment through China's Belt and Road Initiative in the energy and transport infrastructure sectors. FDI, particularly concentrated in the energy sector, is a major source of external liquidity for sub-Saharan Africa.

IHS Markit initially expected a revival of spending on upstream oil and gas projects in 2020, mainly focused on natural gas. However, capital expenditure cuts of 20-40% announced by international oil companies, combined with Covid-19-related restrictions and supply-chain disruptions now imply a sharp decline in spending in 2020. Upstream spending is unlikely to revive to 2015's levels until after 2025.

The loss of more than US$45 billion in development spending in 2020-23 reflects publicly announced delays to final investment decisions and project start-up delays. Furthermore, the sudden changes in power demand and supply patterns caused by Covid-19 and travel restrictions, along with the oil price shock originating in collapse of the Vienna agreement between Russia and Saudi Arabia, are increasing debate on the volatility of fossil-fuel investments.

As with other infrastructure projects, there are short-term challenges to completing ongoing renewable energy projects and the changing economic landscape will delay the implementation of new projects. IHS Markit estimates that sub-Saharan Africa will invest more than US$44 billion to add around 87 gigawatts of large-scale solar and wind projects through 2050.

There is sufficient data to include some countries in our Global Construction Outlook on the following page. The vertical axis represents the five-year compound annual growth outlook. The size of the bubble reflects the 2019 size of the construction market in real US dollars. The horizontal axis reflects the risk of construction investment and the cross-hairs represent global averages for construction market growth and risk.

The impact of the pandemic has shifted the spectrum down by 150 to 200 basis points from a year ago; primarily due to weakness in 2020. Senegal offers above average growth with below average risk. Cameroon, Kenya and Nigeria offer above average growth with some higher risk exposure. South Africa performs at a below average rate with above average risk.

Cameroon's economy continues to suffer from the effects of the pandemic and weak oil prices. Additional economic growth headwinds emanate from declining oil production owing to maturing fields and Covid-19-induced challenges. Cameroon's real GDP growth is expected to contract 2.1% in 2020, with a recovery to 3.2% in 2021, given gains in oil prices.

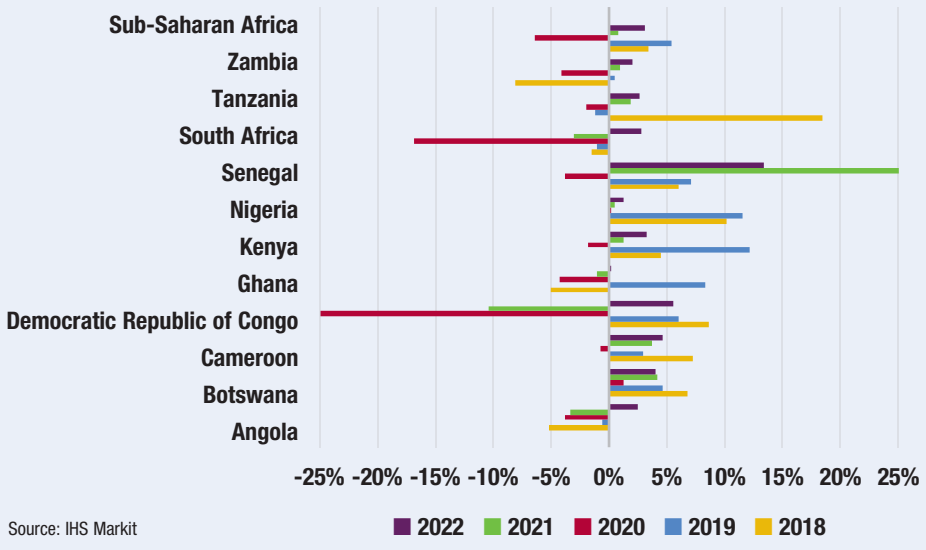
Support will come from ongoing projects linked to the Africa Cup of Nations football tournament, which was postponed to 2022, and the coming on stream of mining, transport, and energy investments. The government has pledged to maintain investment levels elevated through the short term to support growth recovery, despite a 11% drop in the revised 2020 national budget.

Nigeria also faces challenges, with real GDP likely to contract 3.6% in 2020. We expect oil sector performance, which accounts for 9% of GDP, to suffer with low prices and weak global demand. Non-oil sector performance has deteriorated. Insufficient foreign exchange supply, exchange rate pressures, inflation, low power generation, and fuel shortages limit growth. Nigeria has created a fiscal stimulus package of US$1.4 billion to address the virus outbreak.

South African construction

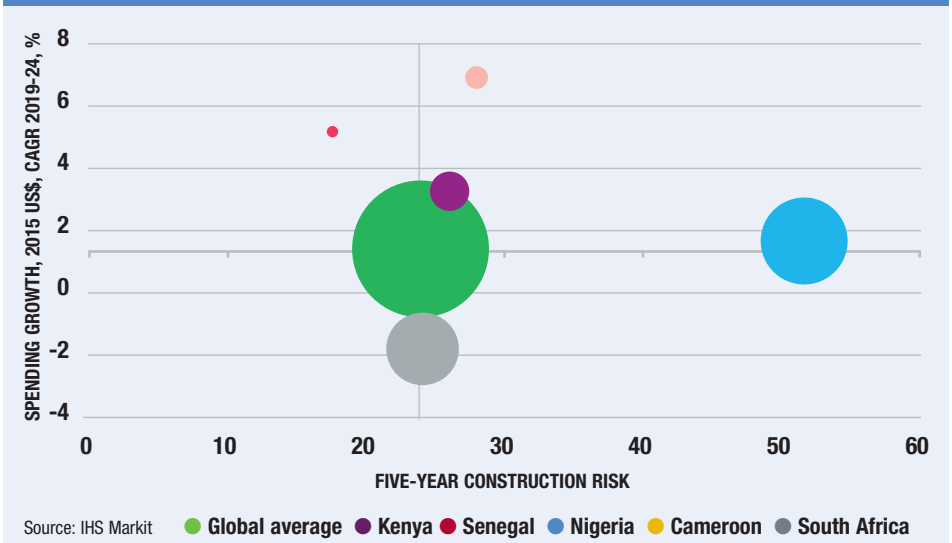
While the South African economy is expected to rebound during the third quarter of the year, the rebound will be dampened by higher unemployment and the slow return of fixed investment spending, which contracted 18.4% q/q during the second quarter. A weak pipeline of investment projects is unlikely to ensure a >

Growth in business fixed investment for major Sub-Saharan African economies (% change in real investment spending)



Source: IHS Markit

Sub-Saharan Africa: Total real construction spending, 2019



Source: IHS Markit

Global average · Kenya · Senegal · Nigeria · Cameroon · South Africa

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IHS GLOBAL INSIGHT

rebound in fixed investment spending for the remainder of 2020.

In October 2020, the South African government launched its Economic Reconstruction and Recovery Plan (ERRP), with a focus on infrastructure development, energy generation, and industrialisation. Strong political will within limited fiscal space and strong private sector participation are need for the ERRP to succeed.

Kenya's economy is predicted to contract 2.0% in 2020. Public investment will continue to support infrastructure development. However, the redirection of fiscal resources to tackle the pandemic will likely stall the government's capital expenditure plans. Securing external financing through concessional and commercial loans will remain critical to the success of the projects, and an adverse turn in global financial market conditions could slow their progression.

Despite challenges from domestic and external conditions, benefits from ongoing economic integration within the East African Community are expected to increase. Growth prospects will hinge largely on key investment projects launched under the Northern Corridor Integration Projects framework to reduce long-standing bottlenecks. Upgrades that are slated to occur include railway networks and power connectivity. Kenya's productive capacity is expected to improve as infrastructure deficits are addressed. iC

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Behold a tale of two

While the US economy and total construction struggle in the face of Covid-19, residential building flourishes, reports **Jenny Lescohier**

Headwinds due to limited building material availability is slowing some construction activity despite strong demand

It can now be viewed as darkly comical how recently economists were reporting that fears of a US recession were subsiding and predicting continued growth for the next several years. In fact, it was in February of this year that Scott Hazelton, director, construction for IHS Markit, told a roomful of businesspeople at the annual tradeshow put on by the American Rental Association, "The US economy will hold to a moderate growth path, and the risk of recession has fallen."

As everyone is now painfully aware, that's not exactly how things turned out. It was scarcely a month after his speech at the ARA Show when the world – and all of its constituent economies – essentially came to a screeching halt with the impact of the Covid-19 pandemic. Markets tumbled, work ceased, people lost their jobs, many became ill and succumbed to the virus. Construction did continue in many parts of North America, and has not been as badly impacted as other sectors, but no industry is immune to the impact of a global pandemic.

> "This is the sharpest recession in history. Gross domestic product saw a 40% loss in the second quarter, so the crawl back out of this is extensive"

The economy in North America, and for the sake of this discussion, primarily the US, is certainly challenged right now, and the outlook remains sobering. However, there are undeniable bright spots, as noted by Hazelton in his most recent report, which he delivered to attendees of KHL's own ALH Virtual Conference on 23 October.

"This is the sharpest recession in history," he states. "Gross domestic product (GDP) saw a 40% loss in the second quarter, so the crawl back out of this is extensive." That being said, the US construction market is fairing about as well as can be expected, with expectations of a 2% decline in 2020 and another 3% in 2021.

Scott Hazelton, director, construction at IHS Markit

Housing is on fire

"The good news is that, despite high unemployment, residential construction has increased back to about where it was in 2019," Hazelton states. "It's likely to increase 4% this year, then increase 2% in 2021 before declining 1% in 2022. Tight housing and low interest rates are limiting declines."

Whatever the reasons, new home and existing home sales and housing permits have risen to levels last seen in the mid 2000s, showing an increase of 8.5% in September to a 1.11-million seasonally adjusted annual rate, the highest pace since June 2007.

"This is mainly because mortgage rates and inventories of homes for sale have sunk to record lows," Hazelton explains.

Chuck Fowke, chairman of the National Association of Home Builders, states, "The housing market remains a bright spot in the US economy, and this is reflected in the positive housing starts report. Builder confidence is at an all-time high as buyer traffic is strong – another sign that housing is helping to lift the economy."

NAHB chief economist Robert Dietz provides a word of caution, adding, "Headwinds due to limited building material availability is slowing some construction activity despite strong demand, with authorised but not started single-family homes up 22.4% compared to a year ago."

building sectors

Shortages harm building

It's heartening news that US homebuilding is seeing an uptick despite the havoc Covid-19 is wreaking on other parts of the construction industry and the general economy. The challenge is in actually getting those houses built.

Lumber, for example, was so scarce over the summer it delayed projects and significantly drove up costs. Pandemic-related lockdowns in the Spring caused sawmills across the nation to close, resulting in a shortage of lumber on the market. Meanwhile, a surge in home renovations and do-it-yourself projects, coupled with a rise in new home construction, have increased demand.

News reports say the price of lumber has skyrocketed 134% year over year, and jumped to about US$800 per thousand board feet. That's up from a mid-April low of around US$320 but also is well above a pre-pandemic price of about US$425. A sheet of plywood that cost US$8 in February now costs US$20.

"Where we were spending $50,000 on lumber, we're now spending $75,000," Cris Pike, principal and chief executive officer of Baton Rouge-based custom home contractor Canebrake Builders, was quoted. "Ultimately, we have to pass the cost along to the buyer."

Meanwhile, the US Chamber of Commerce Commercial Construction Index for the third quarter reported that 41% of contractors were worried about steel prices. A total of 54% of contractors surveyed, versus 45% in the previous quarter, reported they confront shortages for at least one material.

While residential construction is a beacon on the US economic horizon, the outlook for nonresidential construction dims as it's predicted to decrease 10% in 2020 and another 10% in 2021.

"Commercial projects, especially in retail and office structures, will be hit particularly hard as vacancies increase. Industrial building construction is expected to be weak as manufacturing sees a lag in the economic recovery," Hazelton says, adding there is currently a glut of existing office and retail space.

"There's too much space and it's the wrong kind of space," he says, noting changes will need to be made to accommodate social distancing requirements for employees and customers. "There'll >

Construction strong in Mexico

Sector leads in job creation for the nation, especially in capital

Construction employment in Mexico City is showing improvement

According to data from the Ministry of Labor and Social Welfare, 113,850 formal jobs were created in Mexico during September, with construction emerging as the sector with the best performance.

Construction registered four consecutive months with positive balances: 98,053 insured workers registered with the Mexican Institute of Social Security (IMSS) in June; 28,039 in July; 33,345 in August; and 20,518 in September.

Construction has been considered an essential activity since June, and the continuation of its upward trend during September resulted from the fact that 24 entities created jobs. Mexico City was in first place with 6,334 new jobs, illustrating that the city's reactivation plan focused on this sector is already bearing its first fruits.

The capital is also at the top in the accumulated January-September figures for this industry (7,309), although its total balance in all sectors shows a reduction of 221,411 casualties.

Behind Mexico City, September figures show Nuevo León with 2,335 jobs created, Sonora with 1,386, Tabasco with 1,359, and Quintana Roo with 1,111. The greatest losses occurred in Chiapas with 779 jobs eliminated, Morelos with 195, and Puebla with 147.

Infrastructure in the US requires substantial investment

A shortage of lumber and steel have curtailed the otherwise hot US residential buiding sector

be a lot of renovation to make these spaces fit the new normal. That could be bad news if you're in concrete, steel or glass, but it's good news if you're an HVAC contractor or paint company."

Hopes pinned on infrastructure

Many observers believe a government investment in infrastructure will provide the stimulus needed to keep the economy afloat while the world recovers from the myriad blows delivered by the pandemic. Unfortunately, American politics stood in the way of any meaningful investment in the nation's roads, bridges, railways and airports, preventing any new legislation from getting passed.

As a stopgap, the US Congress passed a one-year extension of the existing five-year surface transportation law, the Fixing America's Surface Transportation (FAST) Act.

"With this one-year extension in place, we can continue work on a long-term, transformational bill that significantly boosts investment in our surface transportation network and moves our transportation systems into the 21st century," said Rep. Peter DeFazio.

Dennis Slater, president of the Associated Equipment Manufacturers (AEM), says, "As states and local governments continue to see budget shortfalls due to Covid-19, ensuring that the much-needed repair and modernisation of our surface transportation system can continue will create American jobs and boost demand for construction equipment."

Hazelton adds, "Despite the lack of an infrastructure bill, public spending is on track to actually increase 5% in 2020 and then decline 3% in 2021. Much will depend on road tax revenues and federal help for state and local projects."

Residential construction is currently the star of total US construction, which has suffered many blows amid Covid-19

The Big Apple bites back

Construction in New York the 'heartbeat' of city's economy

New York City's total construction spending for 2020 exceeds that of eight of the past ten years

Despite the ravages of the Covid-19 pandemic, total construction spending in New York City is forecast to exceed spending in eight of the past ten years, the New York Building Congress calculates.

Global Construction Review reports it should reach US$55.5 billion this year, which is an 8.5% drop – some US$4.1 billion – from 2019's US$60.6 billion outlay, but if the congress is right, it will match 2017's then-record-breaking total.

The congress predicts two further good years after 2020: It says spending should reach US$56.9 billion in 2021 and US$56.1 billion in 2022.

"While New York City was one of the hardest-hit areas in the US and is still reeling from the effects of Covid-19, the building industry is weathering the storm and remains the heartbeat of the city's economy," Carlo A. Scissura, president and chief executive of the New York Building Congress, was quoted as saying.

The congress anticipates US$17.8 billion in residential construction spending this year, down from a peak of US$19.7 billion in 2019.

From 2020 to 2022, residential construction is expected to add 50,450 new housing units, with 20,450 units in 2020 and 15,000 units in each subsequent year.

Still, compared to 2017-19, the forecasted period will likely result in 33% fewer new housing units and a 14% drop in square feet of floorspace built.

Nonresidential construction spending, including offices, institutional development, sports, entertainment and hotels, is expected to total US$16.6 billion in 2020, down from US$21.2 billion in 2019.

> "Despite high unemployment, residential construction has increased back to about where it was in 2019"

Employment echoes disparity

A useful measure of the health of the construction industry, US construction employment figures saw a modest increase in September, mostly in the housing sector, reinforcing the growing disparity between the health of American residential and nonresidential building.

According to an analysis of government data by the Associated General Contractors of America (AGC), September construction employment increased by 26,000 jobs to a total of 7,245,000, but the gains were concentrated in housing, while employment in the infrastructure and nonresidential building construction sector remained little changed.

"Construction is becoming steadily more split between a >

Will Keystone XL survive?

Politically beleaguered Canadian oil pipeline could face cancellation

Barack Obama tried to stop construction of the Keystone XL, the planned fourth phase of the contentious oil pipeline system in Canada, and Donald Trump tried to revive it. US Senator Joe Biden (who at the time of writing was favourite to win the presidential race) has pledged that if elected he will rescind a key permit granted by Trump for the pipeline, a 1,210-mile (1,950-km) project designed to take 830,000 barrels of crude oil per day from Alberta, Canada to Nebraska, US.

Commissioned in 2010 and owned by TC Energy Corp. and the Government of Alberta, Keystone XL has been on its death bed before, only to come back to life. This time, however, the politics are shifting at a moment when demand for oil is weak.

The Keystone project has been fought over since it was first proposed in 2008 by Calgary-based TC Energy. Canadian oil producers argue it will give US Gulf Coast refineries access to much-needed heavy crude to replace lost production from Venezuela and other Latin American countries. Opponents say the pipeline will allow the higher-carbon oil sands to grow, accelerating climate change.

More than 2,500 people are already working on the right-of-way for the pipeline, TC Energy spokesperson Terry Cunha is reported to have said, stating, "Keystone XL will strengthen North American energy security."

For Alberta, the cancellation of Keystone XL would be a symbolic and financial blow. The province agreed earlier this year to fund the first year of construction with a US$1.1 billion investment and to guarantee US$4.2 billion of loans, a move some say will make it harder to cancel the project.

Keystone XL is the fourth phase of a contentious oil pipeline project that spans from Canada through the US

Whoever is the next President, Biden or Trump, infrastructure in the US requires investment

> "The price of lumber has skyrocketed 134% year over year, jumping to about $800 per thousand board feet"

robust residential component and generally stagnant private nonresidential and public construction activity," said Ken Simonson, the association's chief economist, noting that in the three months between June and September, residential construction employment increased nearly 3% while nonresidential employment slipped 0.2%.

"As project cancellations mount, so too will job losses on the nonresidential side unless the federal government provides funding for infrastructure and relief for contractors," he states. **iC**

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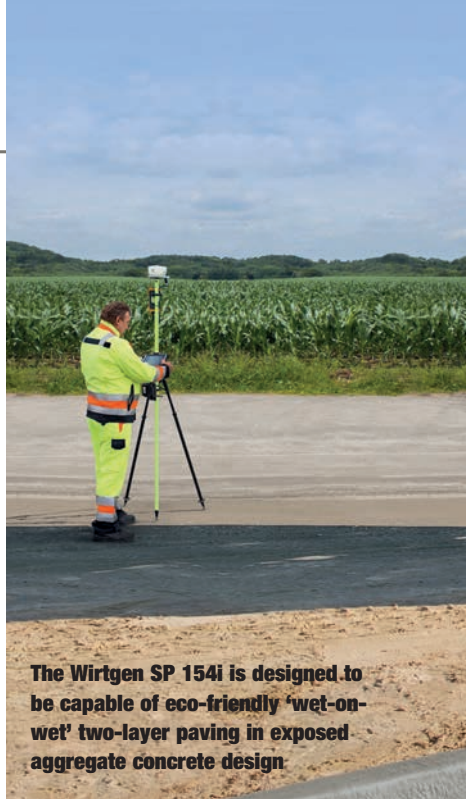
Technological innovations bring surprising advancements to today's equipment, as **Jenny Lescohier** discovers



The Wirtgen SP 154i is designed to be capable of eco-friendly 'wet-on-wet' two-layer paving in exposed aggregate concrete design

Whether it's roadways, flooring, walls or support structures, concrete has stood the test of time better than perhaps any other building material. But its timeless utility doesn't mean its application has stopped evolving. Quite the contrary, as technology knows no bounds, and concrete is no exception.

The demands on the durability and quality of road surfaces are constantly increasing. At the same time, environmental considerations are becoming more important, while cost remains a constant concern. When it comes to the concrete paving process, for example, the individual steps must be continuously optimised to increase quality and simplify the process.

One example is the Wirtgen SP 154i, which was recently introduced in Europe. "As part of the paving train, it is capable of extremely eco-friendly 'wet-on-wet' two-layer paving in exposed aggregate concrete design," explains Martin Datzert, product manager slipform paving at Wirtgen.

"The potential savings compared to the conventional method are enormous. In addition, the concrete surface's reinforcement does not have to be laid in advance, but can be laid precisely and cost-effectively during paving with the aid of the machine's built-in dowel bar and tie-bar inserter."

It starts with the mix

Often, innovation is found more readily in the electronic support for equipment than on the equipment itself. Concrete-Mate from Carmix, for example, is a load-cell electronic weighing system that weighs the concrete mix directly inside the drum.

The Carmix Load Cells weighing scale is a tailor-made product

Unlike many weighing systems where a hydraulic weighing system is installed on the bucket, the Carmix design is equipped with four electronic load cells on the drum bottom, providing accurate data on concrete quality.

Available only on the Carmix 3500 TC model, this load-cell electronic weighing system allows the operator to simultaneously dose and check all aggregates as they are loaded inside the drum, including water. This simplifies the control of each aggregate, reducing dosing error. In addition, the system can store up to 15 different Mix-Designs with up to 99 components at a time. When loading is complete, the PC in the control cabinet automatically prints a ticket with all data, which can be saved on a USB stick.

"The concept is to have a deeper and closer control of your fleet remotely," notes Manuela Galante, marketing director for Carmix. "In Europe this trend is 'forced' by the implementation of Stage 5 engines which are heavily managed by electronics and easy to control with dedicated apps."

She continues, "The load-cell weighing scale represents the perfect example of what our R&D is doing together with our partners to produce a tailor-made product that matches the trends of the market and above all, the wishes of our customers."

Liebherr's new ETM electrically driven truck mixer range answers increased requirements for reducing emissions in areas of high population density

Precise control

Controlled Frequency Vibration, or CFV, is the new buzzword in the flowable or pumpable concrete process.

While controlled frequency vibrator systems have been used in the heavy highway paving process for quite some time, CFVs are now being tested and used on vertical formed pours or where concrete is pumped to the pour. The purpose of their use is to limit patching of concrete surfaces.

"Minnich Manufacturing has a Control Speed Vibrator (CSV) with which

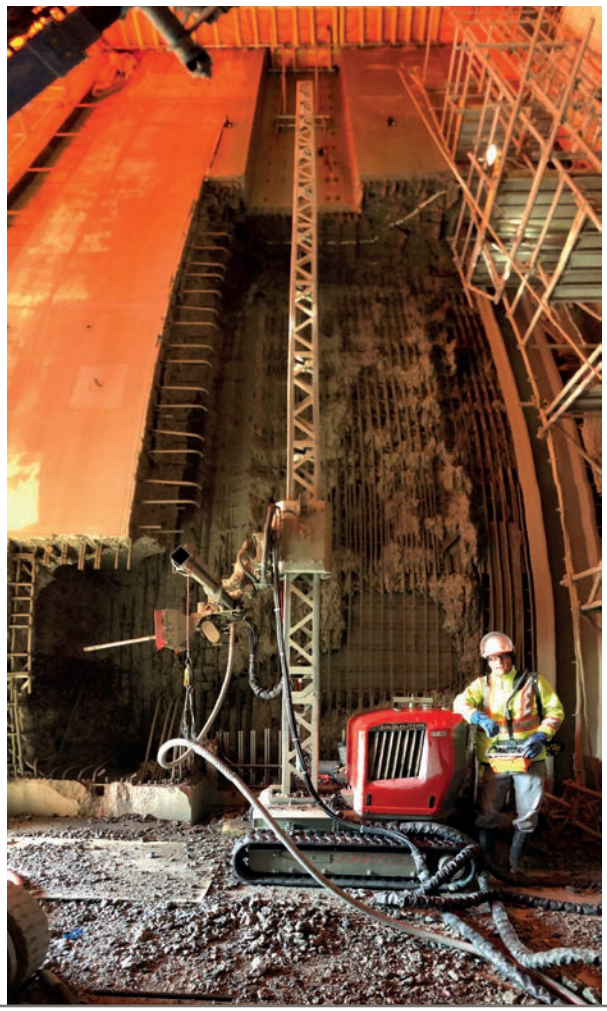
Minnich has a Control Speed Vibrator (CSV) with which contractors can choose the speed they want the vibrator to run based on the workability of the concrete

contractors can choose the speed they want the vibrator to run based on the workability of the concrete being pumped into the vertical placement application," explains Paul Jaworski, product manager at Minnich Manufacturing. "The speed is controlled via a Minnich App on an Android or Apple smartphone. The phone then records the predictable vibrator frequency data and its reaction to the variability of the concrete."

The need for precision translates into concrete demolition as well. Urban jobsites, for example, are a key concern as more and more builders find themselves working on active parking garages in the middle of town, or needing to do road and bridge repairs near hospitals or schools. These jobsites come with a number of challenges – such as noise and environmental regulations or limited space – and require innovative equipment to prevent disturbing bystanders and the environment itself.

"Perhaps the only constant in the industry is the desire to work faster and more efficiently," says Roger Simonsson, managing director of Aquajet. "Hydrodemolition robots, which use automated high-pressure water jets as powerful as 40,000 psi to precisely remove layers of deteriorated and damaged concrete, provide 25% better productivity than more traditional methods while increasing safety by removing the operator from the most dangerous situations."

Hydrodemolition robots are said to provide 25% better productivity than more traditional methods



> "Robots and automated equipment offer undeniable productivity and safety benefits over the backbreaking manual methods of yesterday"

To help contractors maximise space and streamline logistics on urban jobsites, Aquajet aims to ensure equipment has a compact footprint.

"We offer the smallest hydrodemolition robot on the market – our Aqua Cutter 410 – as well as the larger, more versatile Aqua Cutter 710," Simonsson says. "Our Ecosilence power pack and EcoClear water treatment system each fit in a transportable 20-foot shipping container. This allows operators to conserve space compared to other setups, which might involve several pieces of equipment spread across the jobsite."

Environmental focus

Many manufacturers are working to introduce greener machines that help contractors meet increasingly rigid environmental regulations. On the hydrodemolition side, Aquajet customers are primarily looking for help with noise and wastewater.

"Noise has become a major concern on many jobsites. The negative effects of sound exposure on employees and the public has led to a sound abatement practices in construction and demolition practices as contractors work to minimise noise pollution," Simonsson notes.

"However, these techniques – such as hoarding and working off-peak hours – are not always cost-effective. Solving this problem was the driving factor behind our Ecosilence 3.0. By enclosing the high-pressure pump in a 20-foot shipping container with advanced sound-absorbing cassettes and an integrated muffler system, our engineers were able to greatly reduce decibels while the machine is in operation. We were also able to employ start/stop technology to improve fuel consumption for a greener machine overall."

Less directly but just as impactful, the structure and texturing of a road surface has an enormous influence on the rolling resistance and rolling behaviour of the tyres of a vehicle passing over it and therefore, on noise emissions and fuel consumption.

From a global perspective, there are many different approaches to creating an optimal surface finish. The exposed aggregate concrete design, for example, is an excellent way to create such a texture.

"The Wirtgen TCM 180i is ideally suited for applying the dispersion, which enables the top layer of concrete slurry >

to be brushed out later," Datzert explains. "The texture curing machine can also be used to apply various textures to concrete pavements up to 18m wide made with conventional concrete.

"Our entire product range for concrete paving meets the specific national requirements of the applicable exhaust emission regulations. In addition, the machines are equipped with the environmentally friendly 'ECO Mode' engine control system, which reduces fuel consumption and, as a result, exhaust emissions."

Electric mixing trucks

Electrification is popping up everywhere in construction equipment and now it can be found in what some would consider an unlikely place: concrete mixing trucks.

To that end, Liebherr has introduced two truck mixers with electrical drum drives. With the ETM range, the company provides a complete range with various drum sizes. The ETM 905 is a fixed structure truck while the ETM 1004 T is a semitrailer with fully electrical tractor.

There are no compromises on the building site with the ETM range, the company claims, as the trucks are always at full power with low noise and create no toxic exhaust emissions. With the new ETM electrically driven truck mixer range, Liebherr says it is reacting to the increased requirements for reduced emissions in areas of high population density.

The battery capacity is sufficient for the whole working day in standard operation, according to information provided by the company, noting that the ETM range was tested comprehensively and under extreme conditions.

The electric drum drive performed up to expectations, even with very thick concrete consistencies such as F1 or F2. In difficult winter operation, the system was said to be able to keep up, thanks to the optimised thermal management of the batteries, which are recharged during the journey by a compact generator.

Alternatively, the battery can be charged at up to 22 kW using a standard type 2 plug, for example when charging on the concrete mixing plant.

The 650-volt DC system was designed for future electric HGVs (Heavy Goods Vehicles). The drum sizes and the axle load weight distribution are virtually identical to the conventional Liebherr truck mixers and therefore, driving stability is at the same level. >

Filling a key niche in Kenya

Ammann mixing plant helps Jilk Construction serve a growing market

Nairobi-based Jilk Construction recently purchased an Ammann CBT 60 SL Elba Concrete-Mixing Plant, which is compact and designed to be easy to relocate between projects. Despite its compact dimensions, the plant has the production output to support large projects; the result is a mobile plant with high production potential.

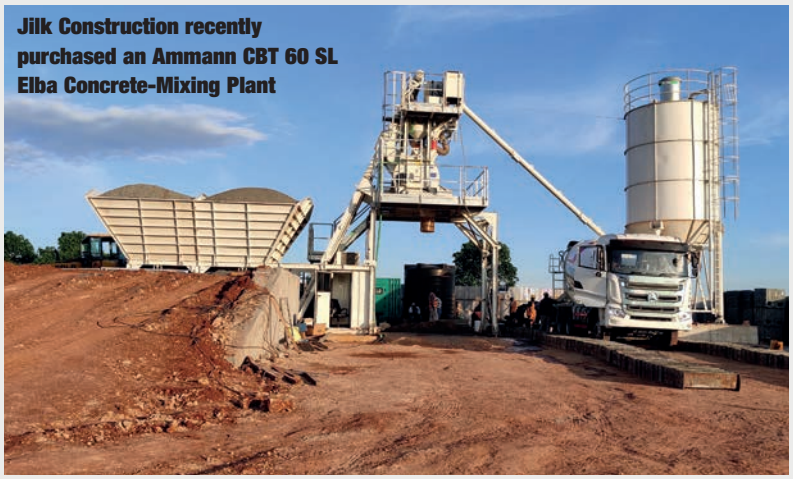
"We are in the process of obtaining the bigger projects in Nairobi and other parts of Kenya, and will use this plant on those job sites," said Sammy Maina, director of Jilk. The CBT 60 has production output of 60m3 per hour.

"Normally in Kenya, 60 cubic metres is considered a larger capacity, and the most common hourly output is 30 to 45 cubic metres," Maina said. "Our aim is to get the large projects to utilise this plant's capacity."

The mobile nature of the plant provides access to those large projects. "The compact design minimises transport requirements and results in cost savings," Maina noted. "The design also reduces the amount of land needed to install the plant.

"The plant is on steel frames – no concrete foundation is needed. There is quick setup due to the folding mechanism. Electric and pneumatic components are pre-installed, and the control system is easy to use."

Several options provide the flexibility needed to develop varied concrete types to supply mix to outside customers, too. "We also will be using the plant for selling commercial concrete," Maina added. "The plant has all the options necessary for commercial selling in targeted areas, such as additives, silica and cement."



Jilk Construction recently purchased an Ammann CBT 60 SL Elba Concrete-Mixing Plant

The drum can also be emptied without battery support by the generator (HGV engine).

Versatility is key

The GOMACO GP360 is the first of its kind, the company claims, both a slipform paver and a placer/spreader on two tracks. As a GP3 slipform paver, it's capable of slipforming up to 30 feet (10.97m) wide. Add a 60-inch (1524mm) belt and it becomes a concrete placer/spreader for up to 36 feet (19.97m) wide.

The innovation gives contractors the technology of the GOMACO GP3 slipform paver with the ability to convert the prime mover into a concrete placer/spreader. The prime mover is equipped with vibrator circuits for paving and auger drive circuits for placing.

The technology is controlled with the GOMACO-exclusive G+ digital control system. G+ is able to handle the controls conversion needed for each application while also bringing onboard M2M (Machine to Machine) communication, sonic sensors, 3D machine guidance, and more.

The GP360 is powered by a Caterpillar C7.1 Tier 4 diesel engine with 302 horsepower (225kW) to efficiently drive the conveyor belt and distribute concrete across the grade.

The 60-inch (1524mm) conveyor belt can be mounted on either the left or right-side, depending on job site conditions and the location of the haul road. It has a discharge speed of up to 492.5 feet per minute (150 mpm), while a controllable material deflector directs the flow of concrete at the discharge end of the conveyor for placement accuracy. With the concrete placed on grade, a dual-drive auger system moves the material to the center or outer areas and across the strike-off.

The GOMACO GP360 is both a slipform paver and a placer/spreader on two tracks

The GP360's strike-off has independent vertical adjustment to control the depth of the placed concrete without having to raise or lower the entire prime mover. The strike-off height is controlled by Smart Cylinders, independent of the prime mover.

What's coming next?

Digitisation will play an increasingly important role in concrete work, and job site documentation is a key aspect. Continuously recording data during paving, for example, provides an overview of the paving parameters, such as the paved distance, the reinforcement inserted, or the vibrator intensity at different sections of the roadway.

"Paving without stringlines will play an increasingly important role in the future," explains Datzert at Wirtgen. "And we already have the right solution for this purpose today. The newly developed Wirtgen AutoPilot 2.0 can produce all manner of offset and inset profiles even more economically and precisely than ever before.

"It can be used, for example, for making concrete safety barriers, curbs, traffic islands or for road surfaces with a width of up to 3.5m. The 3D system either uses an existing data model or it creates a new, digital data model at the site."

Surveying, setup and dismantling of string lines is no longer necessary and the lines no longer get in the way of the teams working around the paver, Datzert adds.

"The concrete mixers have more space for maneuvering, which makes material transport to the slipform paver much easier. As a result, the overall process is much faster and more economical. It is no longer necessary to create a geodetic data model in advance."

Automation is a growing trend as well, notes Simonsson from Aquajet. "Across the board, industries are moving more and more toward automation. As jobsites move deeper and deeper into population centers, regulations for noise, dust, etc. will only get stricter.

"Access and space will become even more limited. Robots and automated equipment offer undeniable productivity and safety benefits over the backbreaking manual methods of yesterday."

To this end, it is clear that innovative equipment manufacturers will continue to offer advanced technologies that help customers overcome the challenges of not just today's jobsite, but tomorrow's. iC

Concrete, heal thyself

Developing technology uses bacteria to automatically repair surfaces

The use of concrete dates back thousands of years to the Roman Empire, but the Romans couldn't have predicted how the durable and versatile building material would advance in the future. Today, innovations are available to make the substance even more long-lasting and useful than ever before.

Self-healing concrete, for example, uses bacteria, sodium silicate, and even fungus, to assist concrete in repairing its own cracks, saving time and money for builders and property owners.

According to reports, self-healing concrete was invented by Henk Jonkers, a microbiologist and professor at Delft University of Technology in the Netherlands, who found the perfect healing agent – bacillus.

"You need bacteria that can survive the harsh environment of concrete," Jonkers said in an interview with CNN. "It's a rock-like, stone-like material, very dry."

Bacillus is ideal, as it will thrive in the high-alkaline conditions of concrete and produce spores that can live up to four years without any food or oxygen.

Jonkers finalised his creation by adding calcium lactate to the limestone concrete mixture in order to feed the bacillus so that they can produce limestone to repair cracks in the concrete.

"It is combining nature with construction materials," Jonkers was quoted as saying. "Nature is supplying us a lot of functionality for free. In this case, limestone-producing bacteria."

Meanwhile, an engineering student with the University of Rhode Island, Michelle Pelletier, created a similar self-healing concrete in collaboration with Arijit Bose, a professor of chemical engineering at her university. Their product is inexpensive, utilising a micro-encapsulated sodium silicate healing agent, according to reports.

As cracks form in the concrete, these capsules rupture and release the sodium silicate. The healing agent reacts with the calcium hydroxide within the concrete, forming a calcium-silica-hydrate gel that repairs the crack and hardens in about a week.

Self-healing concrete is one example of how the tried and tested building material is advancing

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WeBuild's US subsidiary Lane Construction worked on the Gerald Desmond replacement bridge in the US (inset), the first cable-stayed bridge in California, US

Bridge projects are increasing in size and scale and, with the world's population and traffic increasing, this trend is set to continue, writes **Andy Brown**

Connecting the world

Bridges are often an integral part of a country's infrastructure needs, helping to provide transport links over rivers (and even seas), railways, roads, and even between high-rise buildings. However, with the high-profile failings of a number of bridges in recent years, such as the Ponte Morandi bridge in Genoa, Italy, the spotlight has been turned onto the safety and reliability of some of these structures.

The US is badly in need of infrastructure investment and a report from the American Road & Transportation Builders Association (ARTBA) in the second quarter of 2020 analysing the US Department of Transportation's 2019 National Bridge Inventory (NBI) database revealed that nearly 231,000 US bridges need major repair work or should be replaced.

That figure represents 37% of all US bridges and if placed end-to-end, the length of these bridges would stretch over 6,300 miles – over 10,000km. More than 46,000 of those bridges are reported to be 'structurally deficient' and in poor condition and 81,000 bridges should be replaced, according to the report.

"Economic recovery from coronavirus begins with strategic road and bridge improvements," said ARTBA President Dave Bauer. "Increased transportation investments support direct job creation and retention, while putting in place capital assets that will enhance US productivity for decades to come."

ARTBA estimates the cost to make the identified repairs for all 231,000 bridges at nearly US$164 billion, based on average cost data published by the Federal Highway Administration.

Notable structurally deficient bridges include New York City's Brooklyn Bridge; Washington, D.C.'s Theodore Roosevelt bridge and the San Mateo-Hayward bridge crossing San Francisco Bay – the longest bridge in California.

Mammoet installed a 4,000 tonne bridge as part of the renewal of a railroad overpass in Germany

Construction during Covid

The Ponte Morandi bridge in Genoa, Italy is a famous and tragic example of a bridge not being, in some way, structurally correct.

The new bridge in Genoa was completed by Italian-based contractor WeBuild, who completed the project during the height of the Covid-19 crisis in the country. Another bridge project that WeBuild has been working on during the pandemic – through US subsidiary Lane Construction – is the Gerald Desmond replacement bridge, which has recently been opened to traffic.

The US$1.47-billion bridge is the first cable-stayed bridge in California, has a length of 2,700m and is the second tallest of its kind in the US, with its two towers rising 160m in height.

The bridge, for which construction was done without interrupting vehicle and shipping traffic at the port, replaces the old Gerald Desmond bridge with greater earthquake resiliency and extra lanes to handle truck traffic. At 62m, it has the highest vertical clearance for cargo ships of any cable-stayed bridge in the country.

Although the Gerald Desmond Bridge was an icon of Long Beach since it was built in 1960, it was no longer able to

sustain the heavy traffic. The new bridge will have three lanes in either direction as well as bicycle and pedestrian paths.

"If there was a monument to progress, it would be a bridge," said Webuild Chief Executive Pietro Salini. "We thank the 3,000 people along with the suppliers and other contractors who worked with such commitment despite the difficult months of the Covid-19 pandemic in order to complete the project."

Cable-stayed bridges are a popular choice as they have similar advantages to suspension bridges but at a lower cost as they require less steel cable, are faster to build and incorporate more precast concrete sections. From a cable-stayed bridge in the US to one in Germany, with the news that German contractor Hochtief has won a €500 million (US$590 million) contract to build Germany's longest free-spanning cable-stayed bridge.

Hochtief will act as technical leader of a joint venture to build the 802m-long replacement Bridge, set to span the river Rhine in Duisburg-Neuenkamp. The project will be delivered under the auspices of the state-owned planning and construction company Deutsche Einheit Fernstraßenplanungs- und -bau.

The bridge's construction will be challenging, with the structure's two pylons to be set 380m apart. The contract also calls for Hochtief to construct sections of the connecting A40 highway at either end of the bridge.

Hochtief's CEO, Marcelion Fernández Verdes, said, "With this project, we make an important contribution to renewing the transportation infrastructure on a main traffic artery in Germany."

The company expects to break ground on the project early next month, with completion planned for 2026.

Hochtief will act as technical leader of a joint venture to build the 802m long replacement Bridge, set to span the river Rhine in Germany

Corpus Christi in Texas commissioned the new US 181 Harbor Bridge to meet up with increased traffic demand

Modular solutions

In the construction industry, modular building is one of the biggest trends to have emerged recently and modular construction certainly offers a host of advantages. Acrow has a full line of modular steel bridging solutions for vehicle, rail, military and pedestrian use and has been involved in the implementation of bridge infrastructure projects in over 150 countries.

Talking about the benefits of modular bridges, Paul Sullivan, Acrow's president - international business, says, "Prefabricated modular bridges offer great versatility in a wide range of applications. They can be easily lengthened, widened and strengthened to address multiple vehicular needs and load requirements and can be designed for permanent and temporary applications, in infrastructure and construction."

Modular bridges are often used in remote locations where site access is limited and projects that have challenging environmental conditions, such as extreme weather or difficult ground conditions. Sullivan adds that they have seen an increase in the robustness being demanded of their bridges.

"More recently, we have also seen an increase in the need for stronger yet longer structures, as customers look to procure bridges which are not only climate and seismic-resilient, but also feature longer spans to minimise sub-structure requirements and thereby reduce environmental impact. The availability of high-quality, sustainable, climate-resilient solutions, which are durable and robust, to serve all these requirements is paramount."

Each bridge comes with its own set of challenges and there was certainly some hurdles to overcome when heavy lift specialists Mammoet were recently tasked with installing a 4,000 tonne bridge as part of the renewal of a railroad overpass in Germany,

To keep the track closure as short as possible, the new bridge was prefabricated just 16m from the installation site. The plan was to push the bridge into position as a complete structure after demolition of the existing bridge. To the side of the Oker riverbed, five parallel excavation pits were excavated in which the Novarka Skid System, with a total of 15 skid shoes with an average capacity of 700 tons each, was installed.

The construction site was in the middle of a nature reserve, so protective measures had to be taken. Due to this the project's storage area was located 400m away from the construction site and transport of the equipment parts – weighing around 320 tonnes – had to be carried out.

To move the bridge safely, the skidding as well as the lifting of the structure had to be smooth and even. For this, it was necessary to completely synchronise the skid shoes. This meant that only a computer-controlled skidding system could be used, ensuring the >

The Sabah Al Ahmad Corridor infrastructure project in Qatar features more than 10km of bridges

synchronised and controlled skidding of the bridge via sensor technology.

The new bridge structure was lifted using 30 climbing jacks and set down on the skidding system. Afterwards, the bridge was skidded under constant supervision, over a total distance of more than 16m.

Cable-stayed

Around the world road traffic from cars has increased heavily over the last few decades – it has been estimated that in the US it has increased by 38% in the last 25 years – and it is not just roads that are bearing the brunt of this, but bridges.

It was due to this reason that the city of Corpus Christi in Texas commissioned the new US 181 Harbor Bridge, which will have a considerably higher capacity than the structure it is replacing. Doka's formwork expertise was called in to help build the 164m high pylons and over 100 piers.

With six traffic lanes, plus pedestrian and cycle lanes, the new bridge will be better equipped for future traffic levels. It also has greater clearance for ships than the existing bridge, which it is hoped will open up new economic development possibilities.

Once completed, the Harbor Bridge, including connecting roadways, will be 10.36km long, making it the longest cable-stayed bridge in the US and the third longest bridge of its kind in the world. Doka was chosen for the formwork engineering due to its integrated solution covering all phases of the project.

The scope of Doka's part of the project includes two pylons and over 100 piers (with foundations) for the approach roads to the main span. The piers have overall heights of up to 45m and approximately 4.50m pouring height. There are five different types of piers, varying in their external appearance and their execution – solid or hollow cross-sections.

In order to be able to operate the formwork efficiently, the Doka engineers designed a customised steel formwork for each one of the piers. The elements were combined on the outside using the Xclimb 60 automatic climbing formwork and on the inside with the Doka shaft platform. The formwork and platforms were moved as a single unit using the crane.

Once completed the new bridge is expected to enjoy a service life of more than 170 years.

World cup ready

The timetable for completion of the Sabah Al Ahmad Corridor infrastructure project in Qatar is demanding: Construction of the transport corridor, which will feature the largest intersection, longest bridge and deepest and longest bidirectional tunnel in Qatar, must be completed in time for the start of the 2022 Football World Cup.

Acrow's modular bridge solutions are used around the world, such as this one in Puerto Rico

By then, a total of four roads featuring multi-lane motorway bridges will connect the five football stadiums of Doha to the northern and southern areas of the city.

The Al Bustan Street South construction project is one of four parts that make up the infrastructure project and features bridges with a total length of more than 10km. The existing road, which consists of three lanes in each direction, will be extended by one to two lanes on each side, meaning that around 20,000 vehicles will be able to use the corridor every hour compared to 12,000.

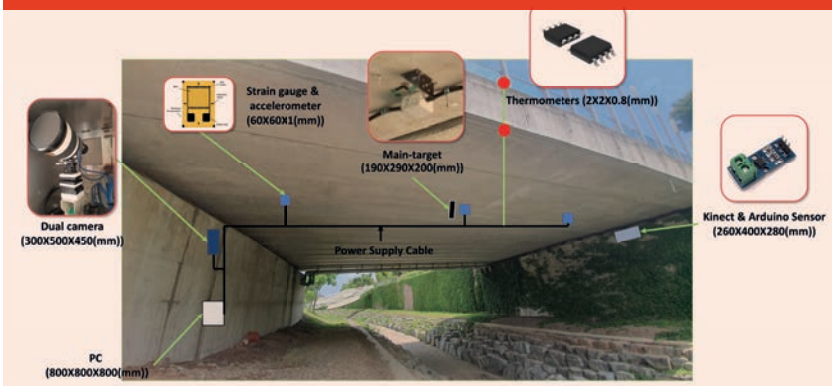
As part of a partnership-based cooperation, Hyundai and Peri developed a time-saving engineering solution that could be supplied from a single source using coordinated formwork and scaffolding systems.

They used around 150,000m³ of shoring, 13,000m³ of working scaffold, 13,000m² of formwork and VST heavy-duty shoring towers to achieve a bridge that consists of an in-situ concrete bridge with 37 piers and a prefabricated concrete bridge with 81 piers. Carrying out the bridge construction work with traffic in full flow posed a significant challenge.

The modular VARIOKIT and PD 8 systems were combined >

Award winner for digital project

Project called a 'smartwatch' on a bridge recognised with award



Measurement system layout of the Test-bed Bridge

A bridge project conducted by the Ulsan National Institute of Science and Technology (UNIST) in Ulsan, South Korea, has won an award at Bentley's Year in Infrastructure 2020 Awards.

Inspired by smartwatch sensors that collect health data, UNIST developed a platform to improve bridge safety management. They wanted to automatically identify unusual patterns based on recorded data. However, they needed to find software that would help them overcome the high cost of sensors, the difficulty of producing reliable anomaly detection, and the link to bridge safety.

With OpenBridge Modeler and RM Bridge, UNIST constructed a finite element model. With this model, UNIST can provide real-time condition monitoring and bridge performance assessment. They applied the platform to a 25m bridge for US$10,000: a fraction of the cost compared to other modelling systems.

Out with the old

Timetable for deconstruction of Samuel-De-Champlain Bridge

Jacques Cartier and Champlain Bridges Incorporated (JCCBI) has announced the timetable for the deconstruction of the city's old Samuel-De-Champlain Bridge.

The Champlain Bridge connects the Island of Montreal to the city's South Shore area. The deconstruction works will be carried out by Nouvel Horizon St-Laurent Consortium (NHSL), a joint venture between construction engineering company Pomerleau and demolition contractor Delsan-AIM. NHSL will undertake the works in three phases.

The first phase will see the structures along the river's shoreline deconstructed in sections using a system of platforms and high-capacity lifting towers secured on a catarmaran barge.

Phase two includes the dismantling of the cantilever sections and anchor spans, while the last phase will see NHSL use high-capacity excavators to deconstruct the bridge's piers.

The deconstruction of the old Champlain Bridge, which is due to be completed in 2023, is part of a major upgrade to Montreal's infrastructure. A 3.4 km-long replacement bridge – known as the New Champlain Bridge – has already been built.

The old and new bridges side by side in Montreal, Canada

to establish the superstructure formwork for the in-situ concrete bridge.

This was the first deployment of the VARIOKIT VST heavy-duty towers in the Middle East. These were used for the erection of the main bridge and the bridge access roads using prefabricated concrete elements. Using mobile hydraulics, the VST heavy-duty shoring towers were also adjusted steplessly to account for the special geometry of the bridge to transfer the extremely high loads. This helped the formwork process and quickened the construction process.

Bridge projects all around the world are being conceived of and executed that are bigger, will last longer and accommodate more traffic than ever before. Digital tools are being used to visualise such projects before they get the green light and these tools also mean all stakeholders can view real-time progress and see any issues before they arise.

Talking about the impact of technology on bridges, Acrow's Sullivan says, "Digital transformation in the industry is driving the increased need for real-time collaboration and enhanced automation to enable quicker, safer, more cost-efficient project delivery. Our clients are looking for us to help them define, design, specify and procure more efficiently and cost-effectively.

"In the future, we expect to see technology continue to contribute to improving bridging attributes such as decreased weight and increased length and strength, and we expect further refined digital monitoring technology, allowing precision measurement of bridge performance in real time. We also predict an increased use of data analytics to better inform bridge design and engineering and to continue to drive the need for high-quality, high-performance modular bridging." iC

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Structural engineering company Cleveland Bridge says future bridges must last longer and cost less

The changing face of bridge construction

Concern over sustainability has never been greater. Many people and institutions are looking to construction and engineering to ensure structures become greener and more sustainable than structures of the past.

When it comes to discussing sustainability in construction, the conversation inevitably turns green – that is, environmental factors are often pulled into the foreground. But there are many more sustainable elements that are shaping construction, and in particular, bridge construction.

True sustainability revolves around three 'pillars', each of which contribute towards creating a process that is workable on all fronts. These include social, environment, and economic measures.

Cleveland Bridge employed two 800-tonne, 20-axle SPMTs to move a pedestrian and cycle bridge into position in Manchester, England

> "The best way for bridge fabrication and construction to further itself in sustainability is through extending the life span of bridges"

A quick look online for sustainable bridge construction shows the heavy-handed environmental approach as posed 'solutions' to this conundrum. While green materials and habitat protection are vitally important in bridge construction, greener moves alone will not achieve true sustainability.

The build must consider the environment, but it must also balance or improve the economy it is built within, and balance or improve the social situation of the area it is built in.

Bridge construction will inevitably consume resources through raw material and manpower. This, says Man-Chung Tang, a bridge engineer who writes extensively on sustainability, must be balanced in order to develop sustainable construction processes. Tang illustrates this with a simple equation: Balance = Supply - Demand. So long as the 'Balance' remains neutral or positive, sustainability has been achieved. This varies, of course, depending on unique factors that exist from city to city, country to country, and bridge to bridge.

Social, environment, and economic pillars

Social

Every bridge project needs to be designed for the society is it serving. Though it seems like a basic concept, in terms of sustainability, taking into account all the factors of the areas the bridge is connecting is a complex task. Once, it may have been enough to simply be of use – now, bridge construction does not only serve the current population, but aims to be built in such a way that it can serve future generations and meet their needs too.

Environmental

This pillar has been spotlighted heavily in recent years, and for good reason. Every industry has been guilty of using more resources than they produce, though the construction sector has been making huge strides in correcting and improving its environmental processes. >

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How to make a bridge sustainable (Nuenergy)

The changing face of bridge construction

But as Tang points out: "The term 'greening' represents reducing consumption and encouraging the replacement of conventional fuels with renewable energy. Even though greening may help us to be more environmentally responsible, it cannot solve the fundamental problem of sustainability. As long as the Balance B [in the equation] is negative, we cannot achieve sustainability."

It is important, therefore, that we do not simply equate environmental practices with true sustainability.

Economical

In terms of a bridge or structure's economic 'pillar', the outcome of the project must be equal or higher in value than the cost it took to make it. Of course, a structure's value versus its raw material costs is certainly addressed in the early stages of developments – few companies would agree to build a structure that could not be sold for profit!

Sustainable bridges

In truth, the bridge fabrication sector has already adopted as many sustainable processes as it can in terms of its supply chain, raw materials, and social impacts. Experts suggest that the best way for bridge fabrication and construction to further itself in sustainability is through extending the life span of bridges. As Tang points out in his research paper: "A bridge that lasts 300 years instead of 100 years is equivalent to a reduction in environmental impacts by 66%."

There are over 50,000 bridges on the UK's local highway network, and they are covered by a limited maintenance budget of £6 billion (US$7.8 billion) for six years (up until 2021).

A long life span

Bridge maintenance is in the foreground for the future of sustainable bridge construction. No longer will a 50-year life span be considered adequate for a bridge's duration of service – with improved rehabilitation and repair, bridges will be expected to keep on providing a safe and valuable service socially, environmentally, and economically, for many more years.

But there is one area that Paul Gauvreau, professor of civil engineering at the University of Toronto, suggests has been overlooked by the three-pillar method – particularly when it comes to bridge construction. That hidden, fourth pillar is education.

> "These bridges will be capable of performing their practical function for less money than currently available solutions"

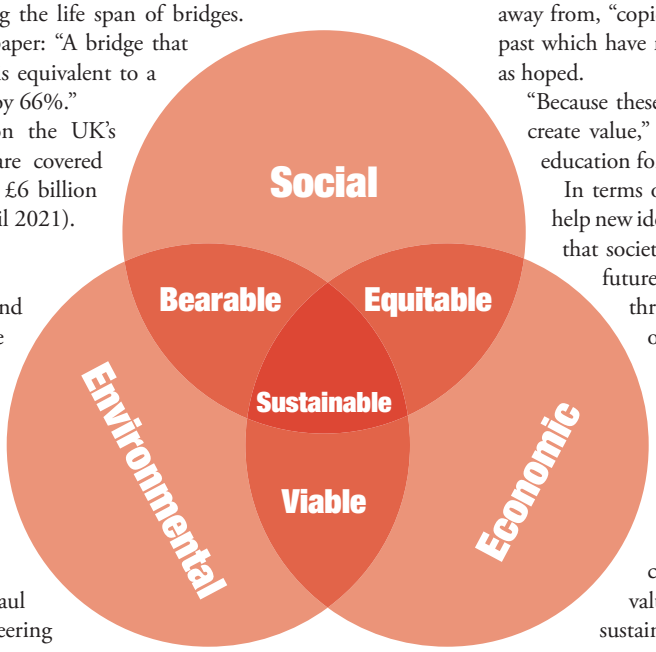
Gauvreau argues that sustainability in bridge construction must be shaped by improving education for engineers. In doing so, future engineers will be better equipped to come up with new ideas that will push bridge design and construction away from, "copies of standard designs"; standard designs of the past which have not been, it can be argued, quite as sustainable as hoped.

"Because these works incorporate no new ideas, they do not create value," the professor said in his study on sustainable education for bridge engineers.

In terms of educating bridge engineers in such a way to help new ideas flourish, Gauvreau says: "The primary benefit that society can reasonably expect from the education of future bridge engineers are bridges that create value through new ideas. These bridges will be capable of performing their practical function for less money than currently available solutions."

By balancing the three pillars of social, environment, and economic value, construction can certainly achieve a new level of sustainability.

However, by also acknowledging the fourth, hidden pillar of improved education, bridge construction can benefit from new ideas, new value, and as a result, a new understanding of sustainability. iC



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With the impact of Covid-19 still being felt around the world, **Joachim Strobel**, MD Liebherr-EMtec GmbH tells **Andy Brown** how Liebherr is dealing with it, plans for increasing sales to lower regulated countries and why electric power is not the only answer for the construction industry

Targeted growth

In approaching 25 years working for Liebherr Joachim Strobel has seen a lot of change. For instance, two decades ago the size of the Chinese construction market compared to now was miniscule, and the idea that major OEMs would be releasing wheeled loaders and excavators powered by anything other than diesel would have been viewed as far-fetched.

Strobel may have been at Liebherr for more than two decades but says that this is 'normal' for the company and shares with us a company saying: "After ten years at Liebherr you have done your training and then you start doing serious work." Despite his years of experience Strobel – who as managing director of Liebherr-EMtec GmbH is responsible for worldwide sales of earthmoving equipment – has never seen anything quite like Covid-19 before.

He says that he returned from the Conexpo show in Las Vegas, US, and shortly afterwards the company had to lockdown one of its factory's in Colmar, France. Within a week four factories in Europe were locked down. Strobel says that, "Of course we started immediately after the lockdown to prepare for the restart of the factories, but there was a lot of work to do. We had to fix the warning signs, prepare working areas so that people are able to keep their distance indoors.

"We organised groups so not all of them are working to the same time, so that if there is an infection in one team you still have the possibility to let the other team do the work and the other stay at home."

Liebherr sells equipment globally and splits markets into the categories of high and low regulated

After two weeks of lockdown the factories reopened and have stayed open, although due to social distancing they are not yet operating at 100% of production – Strobel estimates that they have dropped capacity by around 15%, which is also, roughly, in line with the reduced market demand.

Future equipment sales

Regarding the million dollar – or billion dollar – question of what construction equipment sales will look like in 2021 he says that, "This is the most important question, it is what we are asking ourselves every day."

He adds that at the beginning of the pandemic he was optimistic as the economy in most of the markets where Liebherr operates were in good shape, and sales in 2020 were shaping up to be even better than 2019. This optimism has slowly faded away due to how long the pandemic has lasted.

"The pandemic lasts much longer than it was expected in the beginning and this creates more uncertainty; this is poison for the economy. A lot of investors have the position of 'let's wait and see how it develops' and then shift investment. If they start to shift investments then the economy goes down and then it ends up being a self-fulfilling prophecy."

Construction is certainly better placed than many other industries during the pandemic – spare a thought for industries such as those involved in air travel or cinemas and the theatre – with many governments around the world investing in infrastructure projects to boost their economies.

Strobel makes an interesting point though that the money is often available for such projects; what is holding things up is that the administration is not.

"The order intake is also slowing down for our customers. Why? They tell us that the administration of projects, even from the government side is slowing down. The governments have put a lot of money on the table and said, 'we will help to keep the economy up' but if nobody is there to administrate that money then the projects stop." He adds that projects in the past that might have had only had one or two contractors bidding on them can now have as many as 15 to 20.

Speculating on future sales, he says that he expects 2021 to be a "side movement" of the market, so for sales to be roughly similar to this year. He predicts that the market could take three or four years to recover to the level of what Liebherr forecasted they would sell in 2020, before the pandemic.

Strobel says that before Covid-19 Liebherr predicted that sales in 2020 for earthmoving equipment would be strong

Approach to global markets

Liebherr is one of the biggest construction equipment manufacturers in the world, consistently placing in the top ten of *International Construction's* Yellow Table – the ranking of the world's biggest construction OEMs by sales. As such they have a global footprint, but Strobel is keen to point out that Germany is the company's home market and their biggest market, saying, "We are one of the biggest construction machinery manufacturer in Germany. That is our home market and traditionally the most important market for us."

Europe is a major focus for the company – and a traditional strength – but of course the company do have their eye on other global markets and on increasing their presence and sales in certain key areas. Stroblel says that Liebherr earthmoving divide markets into high and low regulated countries and that they have a strong focus on the largest high regulated market outside of Europe.

"If you look outside of Europe, what is the biggest high regulated market? It's the US market where we can go with the same type of machines, the same system, the same strategy. This is a very important focus, we would like to get a better position in the US. We have implemented a complete new dealer network there so we are very well positioned; we've had a fantastic development there in the last two and three years."

It makes sense for Liebherr to divide markets into high and low regulated ones – low regulated markets tend to be more concerned with the initial price point rather than higher quality products and aftercare. It is often the brands that sell their products for less that perform better.

China is, by some distance, the world's biggest low-regulated market and Strobel says that although Liebherr has a presence there it is not so large that the earthmoving division as a whole is affected by the fluctuations in the market. Liebherr's approach to China, and other lower-regulated markets such as India, is (as you would expect) well thought out.

Using China as an example, Strobel says that Liebherr produce certain machines there, such as crawler excavators and wheeled loaders in order to build up a well-organised service and sales network with partners and dealers. With a strong network they can focus on selling 'specialised' equipment like material handlers, demolition and tunnelling equipment where the products aren't as price-focused as, for example, a 20 tonne excavator.

New technology focus

One of the biggest industry trends in earthmoving equipment in recent years has been the rise in electric-powered equipment. This is something which Strobel says makes sense for compact machines, but not for larger machines.

"We cannot see, at the moment, that the battery solution will be a final solution for construction machinery and not for the whole range. The investment for such a machine is far higher than for a diesel engine or any other and it doesn't make us say we decide that the battery is the solution and we go with all our machine fleet in this direction.

"We are active in R&D in all the available technologies; if it's a fuel cell, if it's a hybrid, or whatever is possible, we are doing our homework at the moment to be prepared. We keep our options open in all directions."

Despite keeping their options open, Strobel says that Liebherr see real potential with synthetic fuels and adds that, "We have tested all engines and we are close to the time where we can certificate our machines, that they are allowed to run by a synthetic fuel."

A benefit of synthetic fuel is that it doesn't require new infrastructure to be built and, depending on how the technology develops, could produce a lot less CO2 than batteries. As Strobel comments, "Synthetic fuel is something that we can do immediately. Within two years, you can fit the whole existing machine field worldwide with that. There is logic behind it that this could be a global working solution. And this is something where we see our preference, but I'm not saying that we don't do anything else. We are ready when the market is ready."

Operator assistance

Technology is becoming increasing engrained into earthmoving equipment, with semi-automation, dig assist features and an ever-increasing amount of telematics. Liebherr's INTUSI system, a new driver operator organisation in the cab, is scheduled to be ready for Bauma 2022 and through artificial intelligence bring together many aspects of new technology to make the operator's job easier and more efficient.

Technology is exciting – it offers great possibilities. However, the company working on a project to a tight schedule typically aren't that concerned with possibilities, they want to do the job as quickly and productively as they can. When it comes down to it, customers are interested in technology if it makes their life easier.

Talking about INTUSI, Strobel says, "It will not be efficient if an operator cannot understand, if he can not use a feature as it should be. That is the idea behind this INTUSI system, where we have a self-learning system, which analyses exactly what this operator needs now. It must help the operator in his work, makes things easier in the working process. I think that the customer is only happy if it pays off, then he is prepared to pay money for it." iC

INTUSI is described as an innovative, adaptive and intuitive new operating concept

> "We are active in R&D in all the available technologies; if it's a fuel cell, if it's a hybrid, or whatever is possible, we are doing our homework at the moment to be prepared"
>
> **JOACHIM STROBEL, MD Liebherr-EMtec GmbH**

In the demanding sector of foundations, options for equipment and technology are varied as no job is exactly the same, reports **Andy Brown**

Digging deep

Foundations work is one of the most time-consuming elements of a project, and vital to ensure a smooth start to construction works – if this element of the job is not right then there's a good chance that the project will fail.

Specialised equipment highlights any potential issues, giving a clear vision of what contractors are working with and dictates which equipment is needed to execute the foundations strategy that is most suitable for the specific demands of individual projects – for no two projects are quite the same.

One project not lacking in size and scope occurred in India, with the construction of 13,500 bored piles for the development of a ground-breaking oil refinery in Rajasthan by Keller India. The refinery, which will be one of the country's largest, is the first of its kind in the State and will create tens of thousands of jobs.

After years of delays, construction of the US$6 billion Barmer refinery and petrochemical complex is underway. Scheduled for completion in 2022, the refinery will have a nine million tonne capacity, making it one of the largest in India

The project is being developed as a joint venture between the Hindustan Petroleum Corporation and the Government of Rajasthan, and will provide an economic boost to the region, prioritising local people for around 40,000 jobs. Shashikant Kunvar, site manager, said, "This was a big project for us, involving over 400 workers. The client was looking for us to construct bored cast-in-situ piles to depths of around 15m-17m.

"The refinery is being built in the desert in western Rajasthan, and although we didn't have any difficulties with the ground conditions, the temperatures were very high – around 50ºC – with no greenery or cover at all. We also faced regular sandstorms, so a big concern was looking after the team."

As the project progressed successfully, Keller was asked by the client to extend the original contracted works by an additional 2,200 piles – taking the total to around 13,500. The works took around eight months to complete and Shashikant says the customer has awarded an additional scope of 10,000 piles for this year.

Epiroc Office TeleREMOTE enables an operator to remotely control drill rigs

Research and development

As the use of drilled foundations continues to increase manufacturers look for ways to optimise these foundation elements. Pile Dynamics (PDI) says that their research and development team recognise areas of concern in drilled foundations practices that can impact a project's performance and have developed improvements in several quality control methods.

One of the desired improvements in borehole quality control was the verticality, volume and radius measurement of the excavation. With no testing method or data to reassure these measures, the performance of the structure can be compromised.

Bauer is helping to create an underground car park in the center of Copenhagen next to a world-famous opera house

The construction of 13,500 bored piles for the development of an oil refinery in Rajasthan, India

Klemm Bohrtechnik's new KR 806-4GM drilling rig

In a bid to increase the current collection and assessment data from drilled excavations, PDI created the Shaft Area Profile Evaluator (SHAPE).

This technology offers measured 3-dimentional visualisation of the drilled excavation. The SHAPE is lowered into the water, polymer or mineral slurry-filled borehole via attachment to the Kelly bar or a winch system at an advancement rate of approximately one foot per second (300mm/sec), identifying irregularities that may affect shaft performance.

SHAPE has eight ultra-sonic signals to scan the sides of an excavation, providing a quick view of the shaft verticality, radius, shape, and drilled hole volume, prior to placing concrete in wet conditions. The built-in wireless capability allows for data to be sent to the field tablet immediately upon exiting the excavation.

PDI also found that improvement for better base cleanliness measurements and quality control testing of bored pile construction were needed. Quantitatively verifying the condition at the base of a drilled excavation can be challenging, but the PDI design team created the Shaft Quantitative Inspection Device, also known as SQUID, to help verify these measurements.

SQUID is lowered into the excavation via attachment to the Kelly bar and provides accurate measurements of force vs displacement of the debris located at the base, as well as resistance to penetration in the bearing material. These results are sent wirelessly from the drilled location to the SQUID tablet, allowing for quick testing.

"We felt the market needed a modern and rugged device where we eliminate common points of failure such as electronic cables running from the surface to the device to provide increased accuracy and performance," stated George Piscsalko, President of PDI.

"Both SHAPE and SQUID's wireless capabilities allow shaft integrity discussions to happen in real time, at the jobsite or remotely via PDI's SiteLink technology, saving time and money."

Product launch

At the ConExpo exhibition in Las Vegas in March – back when large gatherings of people was still allowed – Klemm Bohrtechnik launched its new KR 806-4GM drilling rig. Since then, a number of rigs have been used on major US-based projects.

The first time the rig was used in Europe was in the port city of Bilbao, Spain, when Tecimasa brought one for a new building project, which included an underground car park. Anchor holes were required with a casing diameter of 152mm and a depth of between 9 and 12m.

Conditions are often difficult for machines working on tough projects, but with an ambient temperature of around 40 degrees Celsius in a Bilbao summer, the operators were also feeling the heat. The Klemm rig was equipped with a manipulator and its revolving magazine (Mag 6.1) and drilled rods into the ground with a down-the-hole hammer.

The new 806 can handle casings with a maximum diameter of 178mm and the usable length of the pipe pairs is 3,000mm. It allows the installation of heavy double heads for drilling in rotary/rotary-percussion mode and in rotary/rotary mode. Powerful hydraulic hammers can also be used.

The hydraulic system uses two load-sensing primary pumps, each with a flow rate of 240 litres per minute and operates at pressures of up to 350 bar.

The rig has a newly-developed kinematics system and, with a net weight of approximately 2.19 tonnes (without its pipes), it allows for a maximum magazine load of 1.1 tonnes.

The Mag 6.1, says Klemm, is an upgrade of the Mag 7.0, and features a rotatable drum, ensuring the operator always has a view of the drill rod to be positioned.

As with the previous model, the new 806 boasts a Volvo-Penta diesel engine with an output of 160kW.

The Shaft Quantitative Inspection Device, also known as SQUID

Remote operation

New technology is infiltrating all aspects of the construction industry, with foundations no exception. Epiroc recently launched the Office TeleREMOTE – which is designed so an operator can remotely control SmartROC DTH drill >

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rigs, MK I (based on RCS 4 platform) and increases safety, efficiency and productivity.

The product enables the operator to access and run multiple rigs from a control centre located inside an office. There is the option to select the stand-alone TeleREMOTE solution or to update any existing BenchREMOTE to a TeleREMOTE by connecting it to a Wireless Local Area Network.

"With Office TeleREMOTE, a single person can control multiple drills in a productive and efficient manner," says Mayya Popova, product manager automation, Epiroc. "Office TeleREMOTE increases efficiency as it improves how the work site utilizes the equipment. For many customers, the balance between capital investments and any expected return is critical."

One of the biggest benefits of Office TeleREMOTE is said to be its ability to increase the number of productive hours in a day. It optimises time as it reduces operator transports and idle time due to shift changes. Remote drilling, together with AutoDrill and Auto-Rod Handling System features, boost productivity as the drill rigs can work almost continuously without breaks.

Safety is also increased as the rig can be run without taking any risks thanks to multiple onboard systems. The operator uses the Hole Navigation System for accurate positioning and a geofence function ensures that the rig stays within the predefined area. The remote rigs are also fitted with multiple cameras which provides the operator with a 360° view all around the machine.

Office TeleREMOTE consists of a work desk with adjustable height and operator controls mounted on it. The two controls and operator display are the same as in the drill rig cabin, so the operator will immediately feel familiar with this setup. The product also includes a server rack with Epiroc Automation Common Machine Server (ACMS), a video system and a safety system capable of handling one remote drill rig, with an option to be extended up to nine drill rigs, in increments of one, if required.

In other foundation news, it was announced earlier this year that Treviicos, the North American subsidiary of Trevi, had been awarded an additional Task Order from the US Army Corps of Engineers for the rehabilitation of the Herbert Hoover Dike in the US.

Continuation of the several projects previously completed or currently being carried out by Treviicos along HHD, the MATOC (Multiple Award Task Order Contract) TO number 4 consists in the installation of a cutoff wall (for water cutoff) which extends for about 4 miles (6.3km) along the dike with depths reaching 30m.

The methodology used, a combination of mechanical clamshell bucket and cutter under self-hardening mixture (Self Hardening Slurry), was developed and implemented by Treviicos for the first time in the industry during the first phase of the rehabilitation of the banks of HHD.

Treviicos, the North American subsidiary of Trevi, has been awarded additional work in the Herbert Hoover dike in the US

Specialist work

From a dike to something more cultural: The Royal Opera House in Copenhagen, on the island of Holme, is one of the most modern stages in the world and so a project to create underground car park in the center of Copenhagen and in the immediate vicinity of the opera house is one that has to be handled with great care.

There will also be access to the opera house and a special feature: The underground car park will have its own park and it will be built on its own island.

Bauer DK A/S, the Danish subsidiary of Bauer Spezialtiefbau GmbH, was commissioned by client A.P. Møller to execute a two-layer anchored diaphragm wall as part of the 'Operaparken' project, which will later form the permanent exterior wall of the underground garage.

Bauer – as a subcontractor to main contractor Hoffmann – previously worked on the new headquarters of A.P. Møller, creating a secant pile wall as retaining structure. In total, 6,600 m² of diaphragm wall will be built for the 'Operaparken' project.

A Bauer MC 96 equipped with a BC 48 cutter and a Bauer MC 76 equipped with a rope grab were used. Two anchor drilling rigs will then insert 189 anchors into the completed diaphragm wall.

The works began in March 2020. Despite the coronavirus pandemic and associated challenges, the project progress is on schedule. As the construction site is also located in the direct vicinity of Copenhagen's most expensive residential area, noise and dust emission is subject to strict requirements. Work by Bauer is expected to be completed in March 2021. **iC**

Luxury work for Liebherr

Drilling rig LB 24 used for deep foundation work at luxury resort

The Bay of Kotor in Montenegro

At the southernmost fjord in Europe, the Bay of Kotor in Montenegro, a luxury resort is being built at a former base for naval aircraft and divers. Briv Construction is using the Liebherr drilling rig LB 24 for the deep foundation work.

The biggest challenge for the deep foundation company is reported to be the stabilisation of the beach section. Briv is relying on the Liebherr machine LB 24 and is drilling the piles required in the bay from a barge.

The first pile for this project was drilled by Briv in 2014. Since then the company has installed 70km of piles using 22,000m³ of concrete and 3,400 tonnes of reinforcements. The piles are 32m deep, have a diameter of up to 800mm and are fully cased. The tools used are rock drilling augers and buckets. Briv had calculated with the installation of one pile per day. However, due to the performance of the LB 24, latterly even three to four piles were installed.

Briv is also installing drilled piles for the luxury hotel's pier and breakwaters are being built in the harbour area for protection. In addition to the LB 24, Briv is using two drilling rigs type LB 28, the piling and drilling rig LRB 125, the duty cycle crawler crane HS 873 HD, and the mobile crane LTM 1100, all from Liebherr, for the project.

Green Machine will take current Bobcat models, remove the engines, and install its battery and battery management systems as well as sourcing and installing electric motors to drive the hydraulics

Bobcat's early electrification steps

Compact excavators and track loaders to be evaluated for electrification potential, writes **Mike Osenga**

Doosan Bobcat North America, the well-known manufacturer of compact off-highway machines, is taking its initial step into the world of electrification. It is actually a two-step approach to sizing up the potential for electric drives for Bobcat equipment, initially with select compact excavators and compact track loaders.

The first step finds Doosan Bobcat entering into a partnership with Green Machine Equipment, based in Buffalo, New York, to produce electric Bobcat compact excavators.

Green Machine will custom retrofit four Bobcat excavator models with its proprietary battery and battery management technology to replace the diesel power source. Green Machine will sell the converted machines in select markets beginning in 2021, said Joel Honeyman, vice president of Global Innovation at Doosan Bobcat.

"We viewed Green Machine as a way for us to enter the electrification market with our current equipment, converted over to electric. With this agreement we have a partner that is able to provide that expertise," Honeyman said.

> "This is our way into the market and gives us the opportunity to review the feedback, the technical challenges and then assess how might we produce these machines ourselves"

Four compact excavators

The programme, which currently covers select North American markets, will include four Bobcat compact excavator models, the E10, E20, E35, and E50. The four machines range from the 10 hp/2593 lb. operating weight model E10 to the 50 hp/11,357 lb. E50. "These models provide us with a good platform and a good model mix with the compact excavator line," Honeyman said.

The second step is somewhat further from going to market. At ConExpo-Con/Agg earlier this year, Doosan Bobcat showed an all-electric model of its 74 hp T76 compact track loader. Honeyman said the electric T76 is more of a concept vehicle.

"In this case, there are no hydraulics. We took all the hydraulics off and are using electric motors," Honeyman said. He added that Green Machine is also providing the battery and the battery management systems for that program as well. "It is a concept vehicle, more in the development phase. But we are actively working on loaders as well as excavators."

With the four compact excavators, Green Machine will take current Bobcat models, remove the engines, and install its battery and battery management systems at its Buffalo operations. Green Machine will also source and install the electric motors to drive the hydraulics.

The resulting machines will be sold by Green Machine but will be Bobcat-branded. Founded in 2010, Green Machine is a wholly owned subsidiary of alternative energy company Viridi Parente, Inc. Viridi Parente manufactures battery packs that the company said are being used in an array of markets.

Green Machine has converted and rented, sold, or leased other types of electric drive compact construction equipment both under its own brand name, as well as having development programs with other equipment OEMs. Currently the Green Machine electric lineup includes compact excavators, an mini-skid-steer loader, a light tower and a mini-backhoe loader.

Green Machine, in collaboration with WhisperDrive, uses a proprietary lithium-ion battery technology. For its own machines, the company lists 12.8kWh, 14kW and 56kW lithium-ion battery packs as the power source.

Honeyman refers to the Bobcat partnership with Green Machine as a limited launch initiative. "We're going to go into select markets where there have been requests by customers and there has been interest in this kind of technology. Whether that's working indoors, on job sites where noise is an issue, or where people are more environmentally conscious and are looking for an electric machine," he said.

"We have had a number of conversations with large contractors and utilities that are very interested in this technology. So those are the ones we're going to work with in select markets."

> "Does it perform the same as a diesel machine? What are the reliability characteristics? How long does the battery last? You have to sit in and operate the machine"

"Everyone has questions," he said. "Does it perform the same as a diesel machine? What are the reliability characteristics? How long does the battery last? You have to sit in and operate the machine to experience it."

From there, Honeyman said, as this potentially ramps up over the next year or two, Bobcat would look at how it would scale up production of the electric machines in its own facilities.

"Part of this is a learning process for our dealers and customers. It's a new type of product, so starting on a smaller scale really helps us to do this. At some point we will produce a diesel version of the product and an electric version. The question is, when do you do that, and how do you do that, within the current platforms and facilities." iC

This interview first appeared in *Diesel Progress* magazine, the global voice of engine-powered equipment markets since 1935. It is used with thanks to them.

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Stimulus hopes

The coronavirus pandemic is expected to reduce North American equipment sales by 25% this year, but there will be a rebound in 2021 and any stimulus spending could provide an even bigger boost

Like most markets around the world, North America will see a fall in construction equipment sales this year due to the impact of the Covid-19 pandemic. Off-Highway Research expects demand to be down about 25% on the total achieved in 2019.

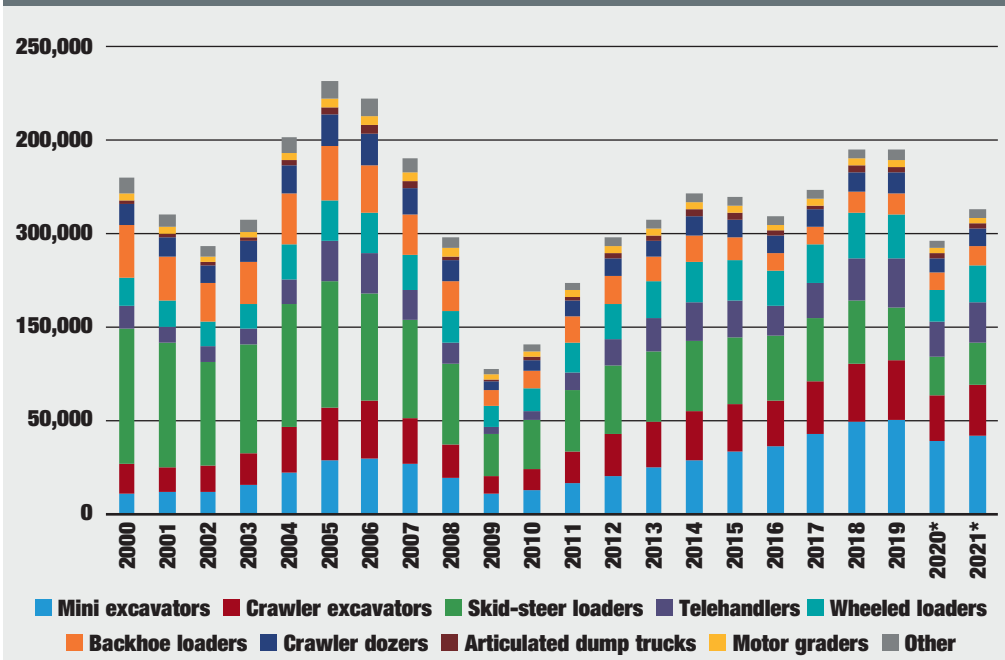
This is, of course, in line with the downturns being seen in other corners of the globe. Almost every country in the world is seeing its construction equipment sales decline this year.

A decline of 15% is at the milder end of the spectrum, most are in the 20-30% range, and the particularly badly affected countries will see downturns of 30-35%.

The exceptions to the rule are China, where large monetary stimulus has been in place since April, and Brazil, where a buoyant infrastructure market is spurring demand despite the pandemic.

> "In terms of the product mix, buyers in the region continue to embrace mini and crawler excavators, and their share of the market is expected to increase further in the coming years"

North American construction equipment sales (units)
Source: Off-Highway Research



Hope for 2021

Like most other countries where sales are falling this year, the North American market is expected to see a rebound in sales in 2021. This is expected to be around a 10% increase on the low point this year, which would take volumes back to the kind of levels which were seen in the first half of the 2010s.

In terms of the product mix, buyers in the region continue to embrace mini and crawler excavators, and their share of the market is expected to increase further in the coming years.

Their growth is at the expense of backhoe loaders, although the latter are more under pressure from compact tracked loaders. This equipment type is not currently part of Off-Highway Research's coverage, but will be added in the future to reflect this increased popularity.

Stimulus

However, what happens to the North American market in 2021 and beyond was shrouded in uncertainty at the time of writing. The US presidential election, which will have just taken place by the time this issue of the magazine has been published and is with you, will be the crucial deciding factor.

The issue is not so much which candidate wins, but how effective their policy making can be. This will depend on whether majorities in Congress – which has the power to effectively block, or at least hold up – Presidential policy are held by the same party as the President's. That would allow much quicker and more decisive policy making, and it is speed and decisiveness which will be desperately needed to stimulate the economy.

A stimulus bill would be likely to include elements of construction and infrastructure investment – the US is desperately in need of infrastructure investment for its roads, bridges and public buildings. A stimulus bill could potentially be very positive for the construction equipment industry in the early 2020s and provide a boost to sales. iC

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Off-Highway Research is the world's leading provider of market intelligence and forecasts for the global construction equipment industry. With offices in the UK, China, India, the US and Japan, it offers unrivalled market insights, helping its clients to set their global strategies, and plan and invest for profitable growth.

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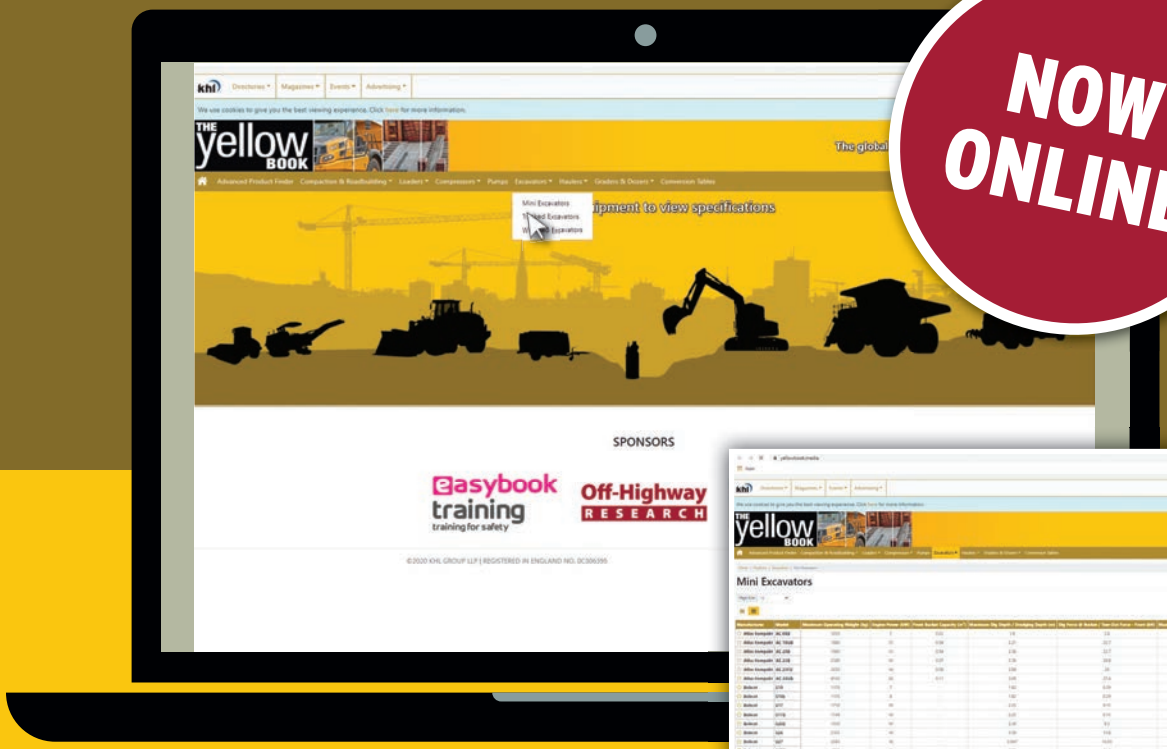

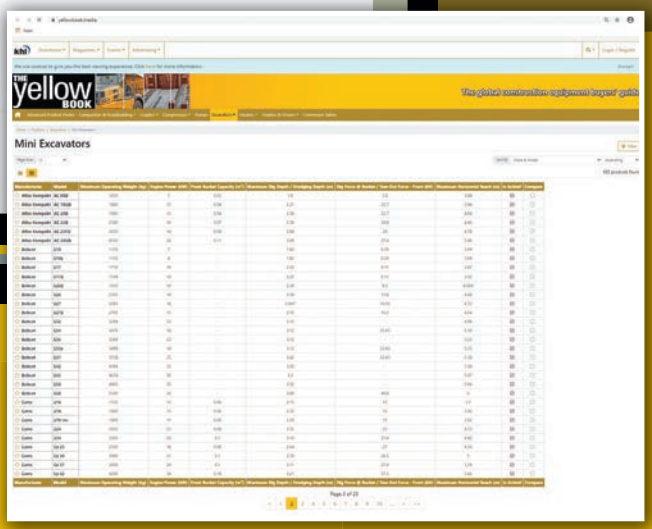

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