

GLOBAL REPORT

CONSTRUCTION EQUIPMENT 2015

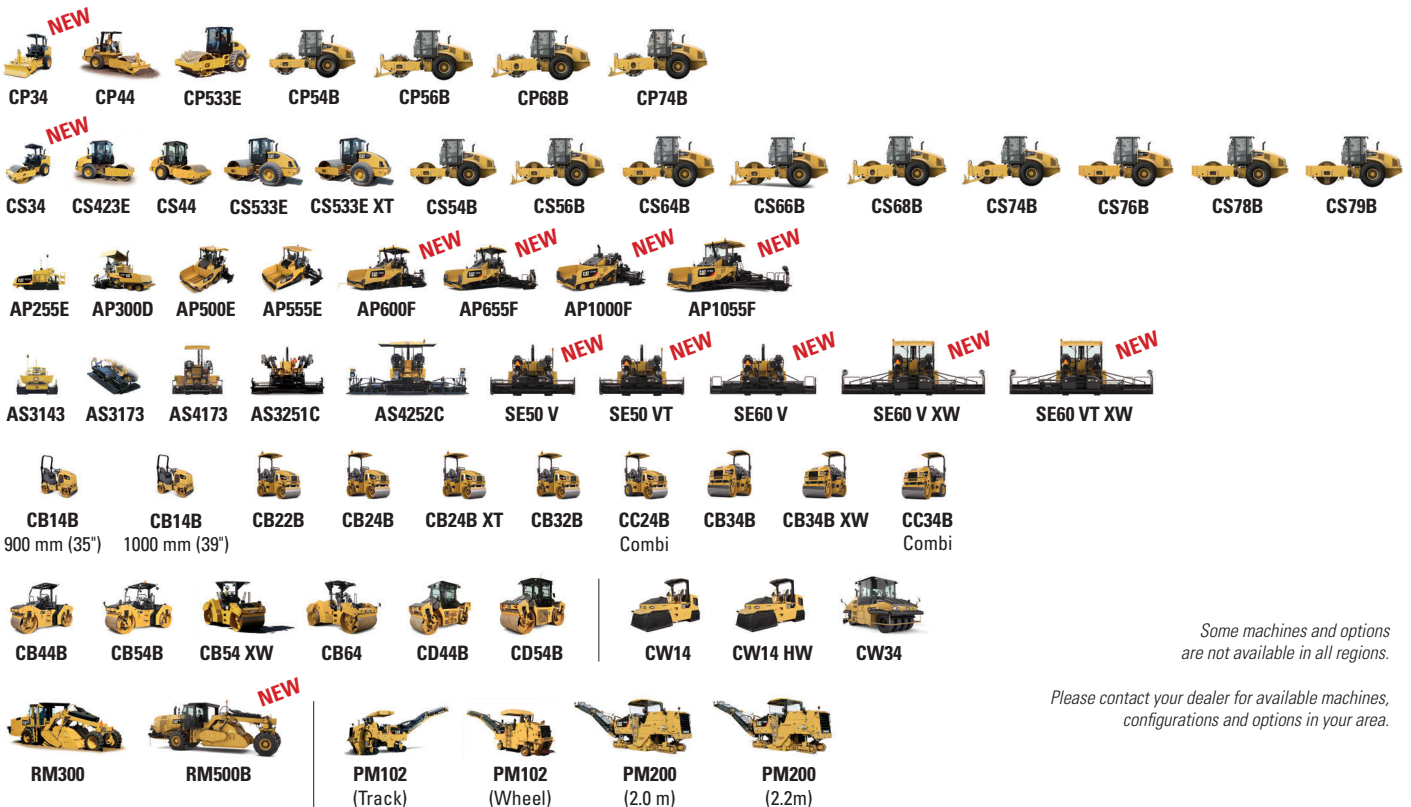
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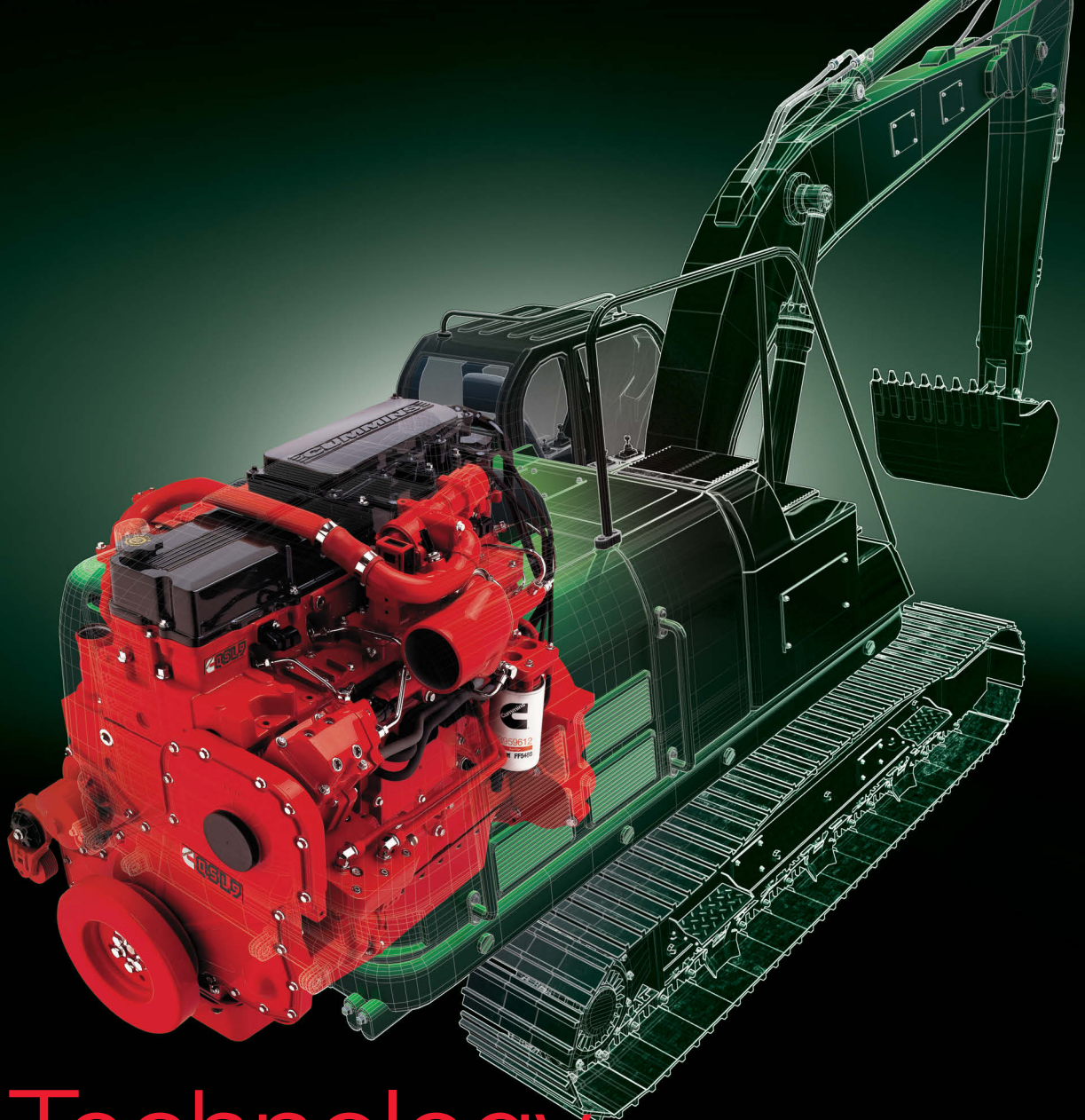
Welcome to our *Global Report Construction Equipment 2015*.

This incisive and insightful publication provides readers with extensive reporting of key topics of interest for those involved in both road construction and aggregates production. The report delves into essential issues such as key trends in machine sales or the use of materials.

Our expert writers have provided feature articles on a number of important topics, giving guidance on changing business trends as well as providing pointers to future demand. The various sections in the report focus on specific segments of construction, construction equipment and aggregates machines, and correlate these with major technological advances. And readers are at liberty to choose specific articles of particular interest.

Mike Woof

Editor, World Highways



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7. Global markets

The world we work in is getting less predictable by the day. Volatile demand patterns within the global construction equipment manufacturing industry reflect this and the market is anything but homogenous, with certain countries and sales regions significantly outperforming others. We take a look at a whole host of factors fuelling and suppressing each key market around the world.

20. China

How will Asia's biggest superpower push forward into the global construction equipment market and take on the western world's long-established machinery and technology suppliers?

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How are the leading equipment integration systems starting to make a difference, and do their benefits accrue in equal measure to large and small sites?

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In addition to helping fleets operate more efficiently, telematics are now being widely used to help individual machines, and not just new ones, perform at a consistently higher level.

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How far can we go with this hands-off approach?

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A tour of Mexico, Indonesia, Nigeria and Turkey powerhouse economies.

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Should you buy or should you rent?

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The decision to buy either new or used equipment is almost as old as the construction plant market itself. However, some of the reasons for choosing between the two might well be changing, to meet new demands from customers across the world and to cope with a changing supply base. We ask, how reliable is used equipment?

63. Bitumen & surface treatment

What are the latest trends in machinery and materials, and how is the new technology changing the way in which bitumen is used?

69. Europe

Where do CECE and CEMA think the market is heading in Europe? Will it be new regulations on the environment, emissions or safety that will push Europe ahead, and oblige contractors to renew their fleets, or does the continent still face another year of slow sales? What is the CPA saying?

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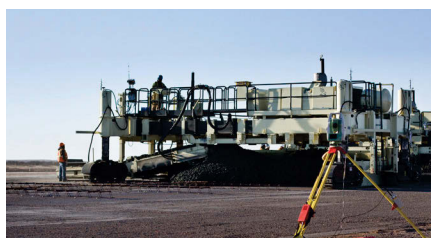
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DEMAND DIVERSITY

Demand within the global construction equipment manufacturing industry is anything but homogenous, as certain countries and sales regions significantly outperform others, with a whole host of factors fuelling and suppressing each key market - *Guy Woodford* reports



The Global Report Construction Equipment 2015 has been written by a team of top journalists from World Highways and Aggregates Business, as well as leading figures from the industry itself. In this

extended feature, on the global outlook for the world leading road construction equipment manufacturers, we have received expert advice and support from Paul Howard, a consultant with Off-Highway Research.

When 18th century Irish essayist, novelist and satirist Jonathan Swift gave the world his famous quote “There is nothing in this world constant, but inconsistency”, he wouldn’t have known at the time how well it sums up the state of the

current global construction equipment market.

Of the key regional sales markets, Europe is showing steady signs of growth, with the UK, in particular, enjoying strong sales numbers.

It’s a somewhat different tale being told in the US. With exports down, American hopes are being increasingly pinned on rising domestic plant demand.

Contrasting the US, China, the nation with the world’s biggest demand for construction equipment, has seen domestic sales dip, with many firms now looking to up their percentage of exports against total machine sales.

However, the Asia-Pacific region, with China at the forefront, is still the key region for aggregate demand due to its huge government-led investment in new transport and other vital infrastructure. In fact, leading independent research tips the region’s share of overall global aggregates demand to grow over the next

two years. Such a big demand for aggregates tends to go hand in hand with big demand for construction equipment.

The latest construction equipment unit sales forecast from Off-Highway Research (OHR), an international construction equipment industry management consultancy, also offers a positive perspective. After global sales of US\$93.5 billion in 2013, OHR tips sales of \$103.6 billion in 2018 – a rise of 10.8%.

Along with Asia-Pacific, respected industry analysts such as OHR, along with national construction-minded associations, are tipping markets such as Africa and parts of South America, especially Brazil, to continue to prosper as governments and private investors continue to invest big money on new public infrastructure works. Read on for a region-by-region view of the constantly changing global construction equipment industry world. □



EUROPE

According to Sebastian Popp, the Committee for European Construction Equipment’s (CECE) Statistical Commission Secretary, 2014 has been a year of big variants in the European construction equipment market.

“In 2014, it was well illustrated that cycles in the construction equipment industry have become faster and less predictable: an extraordinarily strong start to the year was followed by an extended summer slump that dragged down the numbers, which again was followed by a third quarter seeming to have brought back an upswing. At the moment [Dec 2014], incoming orders are close to the levels one year ago. This suggests a stabilisation of the industry rather than a reversal of the trend, although the upswing still seems rather fragile.”

Despite something of a rollercoaster ride in European demand during 2014, Popp is confident that the continent’s construction equipment market will see substantial growth over the full year. “At the moment a majority of manufacturers are expecting a sales growth of at least 10% this year, and this might be close to what the industry will finally deliver.

“A realistic forecast for 2015 is hardly possible. The extended Russia-Ukraine conflict, crises in Syria and Iraq, the Ebola challenge, and the still unsolved Euro crisis create a lot of uncertainty. The most decisive factor for the near future will probably be how the customer industries will deal with this. If they postpone investments that are not absolutely essential, the market could end up at a level below the inherent demand.



ABOVE: In Europe, Germany and the UK are strong performers in the construction sector, although Southern Europe remains depressed

But, with North America, the Middle East and maybe also the former growth engines in Far East Asia expecting a rather positive development, the basic conditions are not



→ too bad. Also, Northern and Western Europe are on a good way with the exception of France where growth seems to have come to an end.”

In terms of product groups, Popp says earthmoving equipment manufacturers are the most optimistic, whereas the road equipment industry increasingly expects a dip in sales. “This does not come as a surprise since they had been the best performer up to now,” Popp adds.

OHR offers further encouragement on European market demand. After 111,655 unit sales in 2013, the consultancy is forecasting a 7% year-on-year rise in sales to 119,070 units in 2014. OHR forecasts a further 4% year-on-

year rise in 2015 to 124,098 units.

The OHR’s 7% forecast sales growth is expected to be shared across all major product types. Only backhoe loaders and skid-steer loaders are anticipated to see a decline in sales in 2014 compared to the previous year. In volume terms, the OHR states that the 9% forecast growth in mini excavators and the 13% tipped growth in crawler excavators equates to increases in unit sales of 3,344 and 2,589 respectively.

In 2014, the UK is tipped by OHR to succeed Germany as the highest European

In 2014, the UK is tipped by OHR to succeed Germany as the highest European construction equipment sales nation

construction equipment sales nation, achieving a 20% year-on-year rise from 25,297 to 30,445 units.

Germany is expected to record the second highest number of 2014 unit sales at 29,992 units sold – up 4% on 2013. Sales in France, the third highest sales nation, are forecast to rise by 1% in 2014 to 23,470 units compared to 23,134 units in 2013. The nation with the biggest year-on-year percentage sales rise is predicted by OHR to be The Netherlands (+23% to 4,206 units), with the biggest sales drop nation tipped to be Switzerland (-14% to 3,377 units). □



UNITED STATES

The Association of Equipment Manufacturers (AEM) says that US construction machinery exports dropped 17.3% during the first half of 2014 compared with the same period in 2013. Some US\$8.93 billion in exports were shipped to global markets compared to \$10.8 billion for first-half of 2013, according to US Department of Commerce statistics.

Africa was the only world area in the US exports plus column, with an encouraging 4.3% increase. Australia/Oceania recorded the steepest decline, at 38.6%, followed by South America with a 33.1% drop. At mid-year 2014, exports of construction machinery to Europe declined 25.4% compared to H1 2013, for a total value of \$1.02 billion, and exports to Canada dropped 4.6% to total \$3.51 billion.

Exports to Asia declined 13.9% to \$1.04 billion for the first half of 2014. Mid-year exports to Central America decreased 23.7% to \$949.3 million, and exports to South America declined 33.1% to \$1.28 billion. Australia/Oceania’s construction equipment export purchases decreased 38.6% for a total \$460.7 million, while Africa took delivery of \$682.1 million worth of construction equipment, a gain of 4.3%.

The top countries buying the most US-made construction machinery during the first half of 2014 were: (1) Canada - \$3.51 billion, down 4.6%; (2) Mexico - \$770.4 million, down 24.6%; (3) Australia - \$424.7 million, down 40.6%; (4) South Africa - \$400.5 million, down 26.7%; (5) Brazil - \$358.3 million, down 30.1%; (6) Chile - \$299.8

million, down 37%; (7) Peru - \$279.4 million, down 15.1%; (8) Belgium - \$210.4 million, down 36.3%; (9) Saudi Arabia - \$206.2 million, down 43.1%; (10) China - \$189.8 million, down 21.8%; (11) Russia - \$172.1 million, down 36%.

In its May 2014 report on the US construction industry, Timetric, the independent business research analysts, quoted American Society of Civil Engineers (ASCE) research claiming that one out of nine US road bridges is deficient, 42% of major urban highways are congested and 32% of major roads are in poor condition. In a bid to upgrade the country’s road transport, the Government’s 2013 budget included a Surface Transportation Reauthorization Bill, worth US\$476 billion for a period of six years, which is financing all highway, bridges

and mass transit construction projects until 2018. Furthermore, during the six-year period, the bill also includes the investment of US\$305 billion for the reconstruction of roads, bridges and an upgrade of the highway system, indicating an increase of 34% compared to the previous bill.

Timetric reports that the US construction industry recorded a nominal CAGR (Compact Annual Growth Rate) of 0.61% 2009-2013. However, the forecast is much better for 2014-2018 with a CAGR of 7.12% forecasted. The growth, says Timetric, will be driven by the recovering economy and increased government spending on public infrastructure.

The Timetric report is supported by a November 2014 report by Euromonitor International (EI), the independent business intelligence research firm. Led by a spur in →

BELOW: US road investment is required



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→ residential construction, the US construction market is said by EI to be finally showing stronger signs of recovery and recorded its first year of positive growth in 2013. As consumer confidence improves and unemployment is declining, new homes

are being constructed. In 2013 permit-issuing authorisation increased by 19%, which translated in a spur in residential construction. EI says the outlook for the construction industry coupled with positive mortgage industry measures remains positive

due to the revival in residential as well as non-residential construction, especially by the energy sector. All these positive signs are likely to create concurrent strong demand for construction equipment in one of the world's biggest single nation markets. □



SOUTH AND CENTRAL AMERICA

The Freedonia Group, a leading US-based industry market analysis firm, says previous huge demand for construction machinery in Central and South America has slowed since 2012. This, it says, is due to continue to at least 2017. Previous growth had been supported by significant investments in large mining projects in several countries in the region.

Brazil has the largest construction equipment market in its [South America] region. But it's a market facing an intriguing future post-2017, after the huge public investment in infrastructure surrounding the 2014 FIFA World Cup and the 2016 Olympics in Rio de Janeiro ends.

The Brazilian construction industry registered a CAGR of 12.31% 2009-2013, according to Timetric. As well as the big public and private investment in infrastructure, along with residential and commercial construction projects, during

this period, the government's Growth Acceleration Plan (Programa de Aceleração do Crescimento – PAC) also supported the growth, reports Timetric. The industry research firm believes growth in the construction sector is likely to continue 2014-2018, fuelled, partly, by the continuing recovery of the global economy. Timetric is forecasting a CAGR of 9.6% over this period.

Euromonitor International says Brazil's construction market saw 13% CAGR 2007-2012, in line with a booming national economy and growing mid-income group. Local providers enjoyed 13% annual revenue growth in the review period thanks to government infrastructure programmes. High profit margin, at 28% of turnover in

2012, is said by EI to be encouraging new companies to enter the industry.

Since late 2013, construction activity is said by Timetric to have been fairly weak in Argentina, contracting by 2.1% and 9.9% in real terms in Q1 2014 compared with Q1 2013 and Q4 2013 respectively.

Among the country's major ongoing transport infrastructure projects, and a key driver of infrastructure construction growth 2014-2018, is the Norte Grande III Infrastructure Program. The project to enhance, improve and rehabilitate road corridors in the Norte Grande region is being funded by a US\$300 million 25-year tenure loan to Argentina from the Inter-American Development Bank (IDB).

While Timetric says that Argentina's construction industry is set to post a CAGR of 22.53% 2014-2018, high inflation will result in the industry's output growth rate in real terms being lower over that period.

In Mexico, government initiatives to enhance transport infrastructure and high value-add industries, coupled with population expansion and an expected rise in consumer confidence will, says Timetric, lead to a construction industry CAGR rise of 4.84% 2014-2018. This is up slightly on the 4.64% CAGR of 2009-2013.

Colombia is set for big investment in road infrastructure construction projects to 2020 after the decision by four of the country's pension funds in March 2014 to invest \$12.7 billion in them. Timetric says that private investment in infrastructure has been encouraged since December 2011, →

Brazil has the largest construction equipment market in its region



LEFT: Latin America is seeing growth, with Colombia, Chile and Mexico all investing in infrastructure, while other countries such as Bolivia are also building new highways

→ when the country's parliament approved a Public Private Partnership (PPP) law providing private investors with better guarantees and a better institutional and legal framework to help improve cooperation between the private sector and government. The PPP law is expected to accelerate the country's infrastructure construction.

The growth of Chile's construction

industry is set to remain strong over the period 2014-2018 as the government ups its efforts to improve the nation's infrastructure. Timetric says Chile's construction industry output is expected to record CAGR of 8.9% 2014-2018.

Construction equipment manufacturers are sure to have noted the Chilean government's passing in 2012 of a new research and development (R&D) law to

stimulate R&D investments and establish Chile as a primary innovation hub in Latin America. Under the law, the corporate taxpayer can claim a tax credit of 35% on all R&D projects, with the remaining 65% being tax-deductible in any sector. The business friendly law also tripled the maximum amount of tax credit that companies can claim to \$1.2 million a year. □



CHINA

Although China's sales of construction equipment are predicted by OHR to fall by 13% in 2014 to 261,750 units, compared to 301,360 units in 2013, this still compares favourably to what was a 34% year-on-year sales dip 2011-2012. What's more, OHR predicts a 5% rise 2014-2015 to 274,615 units. After a 2% fall in unit sales in 2016, OHR forecasts that sales will increase by 4% 2016-2017, and by a further 3% to 288,160 unit sales 2017-2018.

By product, wheeled loaders are set to remain the biggest selling equipment line 2014-2018, although predicted sales of 116,000 in 2018 will be down 19.4% on 144,000 sales in 2014 and 3.3% on 120,000 OHR predicted sales in 2014.

The forecasted 13% decline in China's construction equipment market sales in 2014 is largely, reports OHR, due to weak demand in the excavators and wheeled loaders sectors, which between them account for 85% of total sales. If this decline materialises, demand in 2014 will equate to a 46% drop from peak sales levels in 2011.

While sales in Q1 2014 were positive, Q2 2014 sales were once again depressed, with OHR noting: "The market trend went against the expectations of many manufacturers, whose main priority is now collecting outstanding payments on past machine sales. The level of bad debts is an increasingly worrying feature of the industry, and is something that needs to be addressed as a matter of urgency."

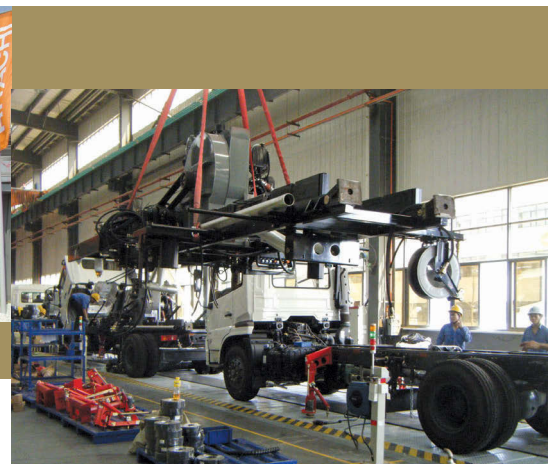
OHR's latest research also comments on another notable current trend in the China market: "To increase their competitiveness, there are now signs that some companies are offering discounts on certain machines, which is resulting in some interesting changes in market structure but is doing little to stimulate overall demand."

LiuGong secured more Chinese market



ABOVE: Attendance was strong at the recent *bauma China* exhibition in Shanghai, showing hope for the Chinese equipment market

ABOVE RIGHT: China's manufacturers have invested heavily in factory capacity in recent years, with lower demand meaning facilities have reduced output



sales of wheeled loaders in 2013 (14,500), and, although they are tipped by OHR to record a 12% year-on-year fall in wheeled loader sales (to 12,800) in 2014, they will remain the biggest selling OEM in China in this category.

Sany is tipped by OHR to remain the biggest seller of hydraulic excavators in China in 2014 (5,800 units), but this will be down 12% on the 6,600 sales by the manufacturer in 2013. Unlike in the Chinese wheeled loader market, the second and third biggest selling manufacturers in 2013, Caterpillar and Hitachi, are forecast by OHR to see their hydraulic excavator sales rise by 4% to 4,810 units and 13% to 4,690 units respectively 2013-2014.

Timetric reports that in a bid to boost trade competitiveness and cope with the rising urban population, the Chinese government is focusing more on infrastructure development. One of the most ambitious proposed projects involving China is the 13,000km China-Russia-Canada-America rail line. The vast line will start from the Northeast of China passing through Russia,

continuing underneath the Pacific Ocean, and finally connecting to the continental US via Alaska and Canada. Timetric notes that the estimated budget and time taken for the construction of the high speed rail network to the US have not been revealed, and there is said to still be some scepticism over the delivery of this project.

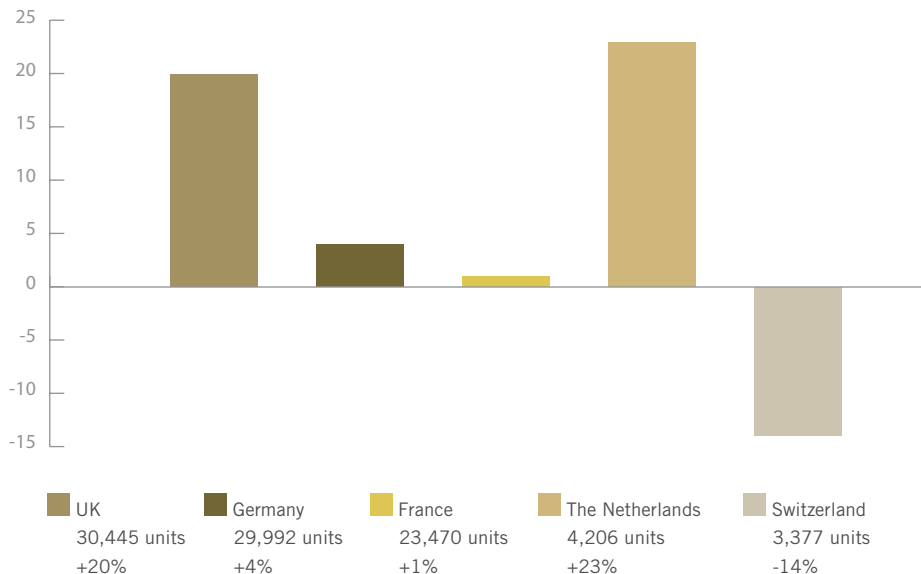
An expanding economy, coupled with increased government spending on infrastructure, is forecasted by Timetric to lead to CAGR in the Chinese construction industry of 9.72% over the period 2014-2018.

In the five years to 2017, the Freedonia Group says that production of construction machinery in China is expected to continue to grow rapidly, surpassing the US to become the largest equipment supplier globally.

Su Zimeng, vice chairman and secretary general of the China Construction Machinery Association, believes that based on the development of the Chinese construction machinery industry in recent years and the nation's macro-economy, construction machinery industry revenue in 2015 will increase by about 7% on the forecasted full-year 2014 revenue. Speaking at a pre-BICES 2015 exhibition event, Zimeng said that the country's exports will also be "slightly better" in 2015 than the previous year. □

Year-on-year European construction equipment sales (% increases/decreases)

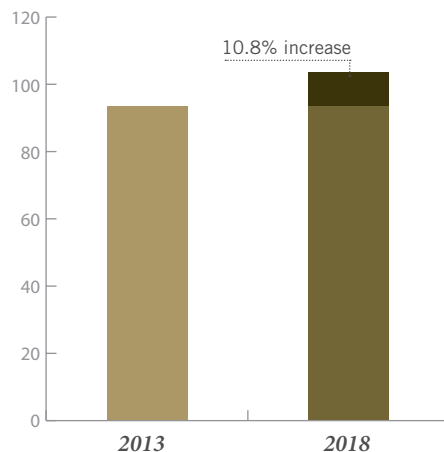
Source: Off-Highway Research



Global Equipment Sales, 2013-2018* (US\$ Billion)

Source: Off-Highway Research

*Forecast



Year-on-year European sales (units)*

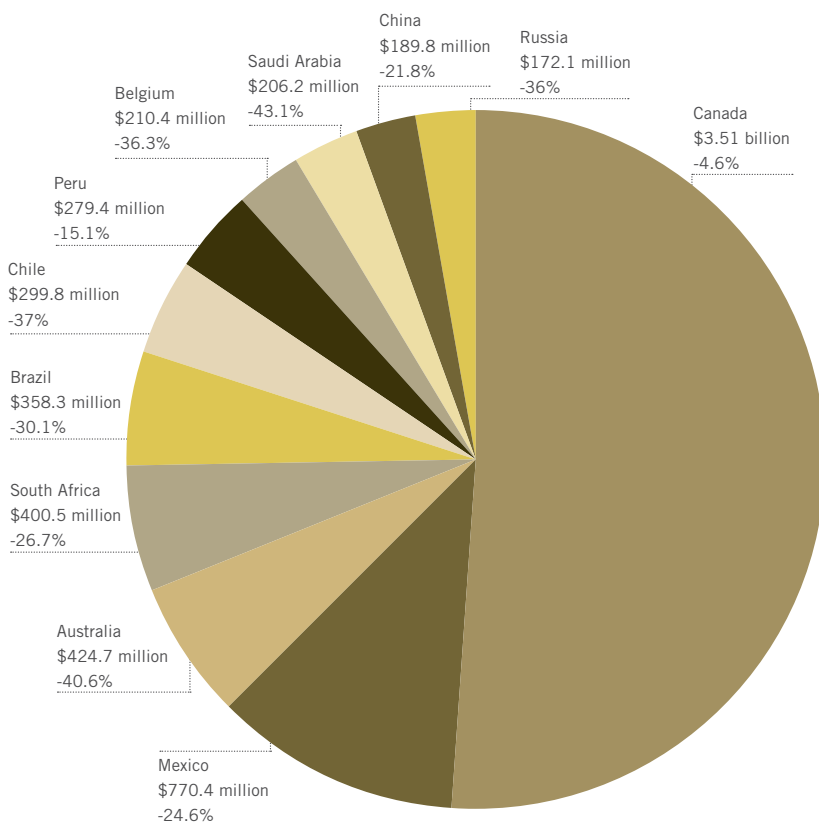
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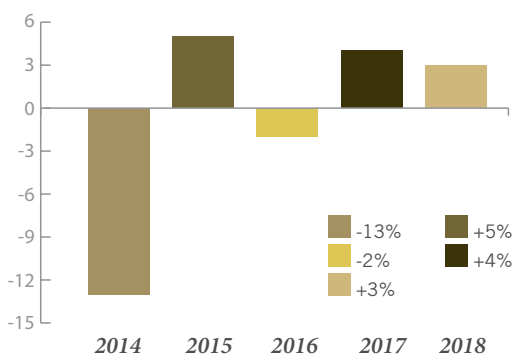
US construction machinery exports by country

Source: US Department of Commerce Statistics



Year-on-year Chinese construction equipment sales (% increases/decreases) predictions

Source: Off-Highway Research





JAPAN

Japan's construction equipment market is fighting back after it, along with all other commerce in the country, was hit by the aftermath of an earthquake, subsequent tsunami and nuclear disaster in 2011. Timetric notes that in a bid to reconstruct and revitalise the economy, the Japanese government introduced economic reforms, such as increased subsidies and tax breaks for companies investing in factories. This has led, says Timetric, to a favourable outlook for the construction sector. Quoting Japan Ministry of

Economy, Trade and Industry (METI) figures, Timetric reports that indices of national construction activity rose from 87.5 in Q4 2012 to 99.4 in Q4 2013, registering growth of 13.6%. For the period 2013-2018, Timetric forecasts a 3.19% increase in Japan's CAGR. OHR reports that the value of Japan's construction equipment sales was around \$5.7 billion in 2013, but is likely to fall to around \$4 billion in the next five years. Due to increased investment in construction investment by Shinzō Abe's

Japanese government, mirrored by a rise in committed private sector capital, the Japan Construction Equipment Manufacturers Association (Japan CEMA) says domestic market construction equipment sales have seen a single digit percentage rise in 2014 compared to 2013. Japan CEMA says that North America, Europe, and Asia, excluding China, have been strong export destinations for Japanese OEM's, with sales growth of 10% in 2014 compared to the previous year. □



REST OF ASIA

The Indonesian construction industry's healthy annual growth of 7% 2009-2013, is reckoned by Timetric to be followed by further CAGR of 15.9% 2014-2018. Fuelling this growth is said to be the government's focus on infrastructure and industrial construction, and the rollout of the multiyear Master Plan for the Acceleration and Expansion of Indonesia's Economic Development (MP3EI). The Plan is set to see spending of up to \$428 billion during 2011-2025. In a bid to improve road networks in East Java, Central Java, East Kalimantan and West Kalimantan provinces, the Indonesian

government announced its \$380.5 million 476km regional road development project in 2011. Timetric reports that the project is cofinanced by the Asian Development Bank (ADB) and the Islamic Development

Bank (IsDB), with loans of \$180 million and \$65 million respectively. The Indonesian government is contributing \$135.5 million to the project, which is due for completion by 2016. Significant investments are being made in South Korea's infrastructure in order to improve its quality, impact and coverage, says Timetric. This includes the government's 2013 announced plans to invest \$108.6 billion on various road, rail and other transport infrastructure works.

Timetric also reports on how the commercial construction market is being supported by a number of hotel and resort development projects. 20th Century Fox, one of America's six major film studios, is planning to build a \$3.5 billion 75-acre theme park in Changwon City, which is expected to be completed in 2018. Furthermore, the French hotel group Accor SA is said to be in the process of constructing a 300-room hotel in Seoul, due for completion in 2016.

Euromonitor International describes the South Korean construction industry as



LEFT: Indonesia is one of the most interesting Asian markets at present although other countries such as the Philippines, Thailand and Vietnam are showing encouraging signs of growth

ABOVE LEFT: South Korea's capital Seoul is one of the world's largest cities, with major business potential

heavily fragmented, with the top five players generating less than 11% of revenue. The industry is expected by EI to grow by 22% 2013-2018, receiving significant government attention, with growth opportunities in the residential and infrastructure sectors.

Thailand is said by Timetric to be investing heavily in developing rail infrastructure, and has launched several mass transit routes

in 2013 to 50% by the end of 2015. This rising trend, says Timetric, will support Malaysian construction industry growth, and construction equipment demand, over the period 2014-2018. The country is forecast by Timetric to achieve 9% CAGR over this period.

According to the Construction Industry Development Board Malaysia (CIDB Malaysia), the country's construction industry – galvanised by government and private sector investments in low cost housing and infrastructure schemes, particularly the Economic Transformation Programme (ETP) – posted rapid growth during 2011-2012. During 2011-2013, Malaysia, notes Timetric, secured 195 projects worth \$70 billion, with a further \$36.6 billion estimated to be secured in 2014. According to CIDB Malaysia, private sector participation in projects will rise from 30%

The political protests in Bangkok that began at the end of 2013 and continued into Q1 2014 are said by Timetric to have had a negative impact on Thailand's construction industry. In real value-added terms, the industry contracted by 8.5% annually in Q4 2013, following a decline of 2.2% in the previous quarter. Timetric notes that in Q1 2014, total private investments in construction declined by 7.8% from the same period in 2013, and by 4.6% during the fourth quarter of 2013. Due to political and social turbulence and a worsening business climate, Timetric reports that the

construction industry is expected to remain weak in the short term. However, the outlook for 2014-2018 remains far more positive.

Thailand is said by Timetric to be investing heavily in developing rail infrastructure, and has launched several mass transit routes. To become the regional hub of the earmarked ASEAN Economic Council (AEC) in 2015, the government is said to be focusing more on industrial construction. To promote trade and investment, the Industrial Estate Authority of Thailand (IEAT) is planning to develop four industrial parks in the country by 2015.

Vietnam's stable economic conditions and government investment in industrial and residential construction will continue to see the country's construction industry thrive, with CAGR of 11.43% in the period 2014-2018 forecast by Timetric. Expansion in the tourism and retail sectors, coupled with investments in infrastructure projects, will, says Timetric, further support construction industry growth. □



AFRICA

The South African construction industry is, reports Timetric, undergoing a period of unfavourable conditions as a result of economic indicators, which continue to disappoint the building industry. There are fewer projects in the construction market with a higher interest rate, diluting the country's growth of real estate construction schemes. Timetric notes that according to BER, the building confidence index dropped by 11 index points, going from 52 in Q1 2014 to 41 in Q2 2014. This was down to weak demand from the private sector, prolonged strike action in the platinum sector, an increased project postponement rate, increasing interest rates and declining exports.

On a more positive note, the South African government has launched a number of initiatives aimed at improving the nation's transport infrastructure. Timetric states that the National Transport Master Plan 2050 (Natmap) was approved by the government



in 2010, aiming to expand the country's rail network and ports through an investment of \$102.5 million. The government also adopted the National Infrastructure Plan in 2012, which will see \$100.7 billion invested 2013-2016 in building and upgrading infrastructure in South Africa. With the Public Transport Strategy (2007-2020), Timetric reports that the government plans to improve the country's public transport by establishing the integrated

rapid public transport network (IRPTN), and developing rail corridors and bus rapid transit systems (BRTs). For the period 2014-2018, Timetric tips South Africa's construction industry to achieve CAGR of 8.93%.

Construction is one of the most vital industries in Egypt's economy, states Timetric, contributing 7% to the nation's

RIGHT: Africa has seen some of the healthiest growth in construction equipment sales, with North African countries such as Morocco showing the best gains due to a series of infrastructure projects

RIGHT: Egypt's road programme is now moving forward once more



→ GDP. During the political turmoil in the country from 2011-2013, Egypt's construction industry recorded low growth. While the industry is expected to remain insipid in the short-term, Timetric reports that the long-term forecast for Egypt's construction industry is positive – predicting CAGR of 14.5% for the period 2014-2018.

Residential construction is expected to increase 2014-2018, says Timetric, due to a rising population and increased levels of urbanisation. One of the most populous countries in Africa and the Middle East, Timetric quotes figures from the International Monetary Fund (IMF) which shows how Egypt's population rose by 10.7%, from 75.2 million people in 2008 to 84.2 million in 2013. The country's urbanisation rate increased from 42.8% in 2001 to 43.7% in 2012.

Morocco's residential, infrastructure and commercial construction markets collectively accounted for 84.1% of the construction industry's value in 2013, according to Timetric. The contribution of these three markets will, naturally, be significant to overall industry growth, with industry output expected to record a Timetric forecast CAGR of 5.06% during 2014-2018.

Healthy growth in Morocco's infrastructure construction market will be driven, says Timetric, by investments in road, rail, and energy and communications infrastructure. A number of large transport projects to

improve and expand the country's road and rail networks are already underway. Morocco's National Railways Office is currently constructing the Tangier to Casablanca High Speed Rail project, due to be completed in Q1 2016.

According to a June 2014 research report by Construct Africa, Kenya has a "relatively developed building and construction industry with professional engineering, building, and architectural design services available in numbers with healthy competition." The industry is said by Construct Africa to be currently experiencing high growth following foreign investment interest, specifically from Eastern powers such as China, as well as the rehabilitation and reconstruction of transport infrastructure under the Kenya Urban Transport Infrastructure Programme.

The Construct Africa report adds: "With the influx of international investment, skills and interest, the construction sector has gained the necessary skills to handle projects efficiently

and effectively. The lowering of inflation and lending rates has allowed players in the local construction sector to secure financing at lower-than-ever rates, which has allowed companies to take on more ambitious projects in Kenya and the surrounding East African countries."

Construct Africa's 2014 research report also quotes a report published by the Kenyan Ministry of Devolution and Planning in April 2014 noting how the country's construction sector grew by 5.5% in 2013, up from 4.8% in 2012. Nigeria's construction industry since 2010 has enjoyed a real growth rate of 13%, reports the country's National Bureau of Statistics. Government infrastructure spending has been a major driver of this growth as well as private sector investment in both residential and non-residential construction activities. Another recent Construct Africa research report values Nigeria's current Building and Construction sector at \$12.5 billion, making it a key industry within the country. □



INDIA

According to the ICEMA (Indian Construction Equipment Manufacturers' Association), India's Earthmoving and Construction Equipment (ECE) market is expected to grow by a healthy 20-25% over the next few years to reach 330,000 to 450,000 units sold in 2020, from current levels of about 76,000 units. This would imply a US\$16 billion-\$21 billion market, up from today's \$3 billion.

An ICEMA spokesperson says: "The sector will continue to be dominated by backhoe loaders (more than 40% of total demand), but broad-based growth is expected across products, with each segment expected to see double digit growth. A rise in the use of

concrete will also create demand for concrete equipment in infrastructure and housing projects."

The ICEMA believes there are a number of fundamental drivers that will propel the ECE industry forward. Firstly, it believes demand for ECE will continue to rise as a result of growth in traditional end-user industries, including construction and mining. Such an increased use of ECE in previously traditional applications to speed up projects will, says the ICEMA, give rise to new demand in applications such as digging and soil loading, especially in time-sensitive projects. ICEMA believes demand for ECE is also expected to grow in new segments such as agriculture,

which have not historically been ECE users because of a lack of access but are slowly adopting the equipment.

Urbanisation will drive the demand for construction to meet residential, commercial, and infrastructure development needs, according to ICEMA. New players entering the market have made competition stiffer, thereby making ECE more affordable. ICEMA thinks this will further deepen the markets to cover users with ECE needs and previously low access. Finally, more financing of ECE and the increased use of rentals will, says ICEMA, create wider use by encouraging users that don't necessarily want to own equipment. The rental market is especially

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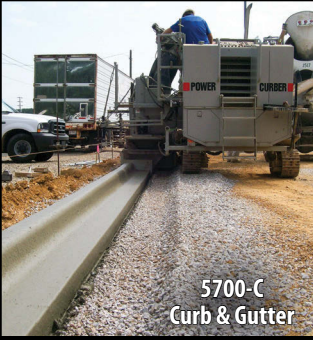
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LEFT: The Indian construction market is seeing steady progress

→ expected to pick up in tier 2 and tier 3 towns, where growth will be driven by small contractors doing construction work.

The ICEMA states that a big challenge for India's ECE industry to overcome is the lack of skilled manpower. "While we continue to put in the market increasingly sophisticated machines in greater numbers the industry will face an increasing shortage of trained manpower to operate and service these machines. Most of the machines operate in remote areas, it is important that the

customers have the accessibility to train people in these areas. While the construction equipment manufacturers do have skill training programs, unfortunately these would not be adequate to meet the expected demand."

Of OEMs ECE presence in India, the ICEMA spokesperson adds: "Most global OEMs have strengthened their presence in India, attracted by one of the world's fastest growing construction equipment markets and their need to mitigate cyclical in developed

markets. Nearly all the leading global OEMs have already entered India, while a few more are in the process of entering. All these players can be expected to increase product variety, introduce new applications and services (e.g. Rentals, financing), and hence catalyse growth by increasing supply."

OHR says that while Indian sales of construction equipment are forecast to fall by 7% in 2014 to 51,955 units, they are tipped to rise by an impressive 24% to 64,443 units in 2015. Looking further ahead, OHR forecast 94,730 unit sales in 2018 – up 11% on 85,100 sales forecast for 2017. □



MIDDLE EAST

After experiencing construction equipment oversupply issues from 2007-2012 in some of the Africa/Middle East region's wealthier nations, the Africa/Middle East market is tipped by the Freedonia Group to advance at a faster pace in the five years to 2017. The Saudi Arabian government's initiatives to transform the country from an oil-based economy to one more reliant on manufacturing and services is said by Timetric to be behind the Saudi Arabia construction industry's CAGR of 6.94% in the period 2008-2012. Further CAGR, albeit slightly less, of 5.54% in 2012-2017 will be fuelled, says Timetric, by an increase in government expenditure in infrastructure construction. Population growth and a rise in disposable income is also said to have increased demand for residential, commercial and institutional buildings.

Timetric reports that the Gulf Cooperation Council (GCC) is undertaking a \$15.5 billion railway network project that will connect GCC states in the Middle East by 2018. Saudi Arabia will be part of this eye-catching project, which involves the construction of 2,177km of rail line, covering the Gulf Coast and extending from Oman to Kuwait, passing through the United Arab Emirates (UAE), Bahrain, Qatar and Saudi Arabia. Euromonitor International says the Saudi Arabian construction industry is expected to demonstrate average growth of 8% 2013-2018, with the country continuing to have the most attractive construction market in

the Gulf region.

Winning the bid to host the World Expo 2020 proved a boon for the UAE construction industry, notes Timetric. The government is said by the independent research firm to be determined to develop the country's infrastructure and plans to speed up construction activities over the 2014-2018 period. Timetric says the 2013 United Nations Conference on Trade and Development (UNCTAD) cited UAE as the most attractive country for foreign direct investment in GCC countries.

According to the World Economic Forum's Global Competitiveness Index 2014-2015, the UAE also has the world's highest quality roads. In 2014, Dubai's Road and Transport Authority (RTA) allocated \$1.9 billion, with the largest share going on road infrastructure. The RTA has also revealed that a 2012-2016 development plan will see \$272.3 million spent on developing internal roads in residential areas.

Growth in Qatar's construction industry has been strong since Q2 2012, reports Timetric. The future outlook is also said by the same source to be positive, with the government's five-year development plan for the country supporting the construction industry by allocating \$125 billion for development projects during 2011-2016. Of this, \$65 billion will be invested in infrastructure works.

Growth in Qatar's construction industry has been strong since Q2 2012

The 2022 FIFA World Cup is expected to be a major driver for construction industry growth over the period 2014-2018. The government plans to spend \$160 billion on linked projects, representing, says Timetric, 40% of its 2012-2016 infrastructure projects budget.

Similar to Saudi Arabia, the Kuwaiti government is trying to lower Kuwait's reliance on oil revenues and approved a \$130 billion National Economic Development Plan for 2010-2014, with the aim of diversifying the country's economy. Subsequently, reports Timetric, significant investments are being made to improve the country's transport infrastructure and increase participation in the private sector; although progress is said by the independent industry research company to have slowed due to excessive bureaucracy and corruption. Nevertheless, Kuwait construction industry output is expected by Timetric to record a CAGR of 4.94% 2013-2017.

With Oman's eighth five-year (2011-2015) development plan, notes Timetric, the government intends to invest \$3.2 billion by 2015 in construction, repair and maintenance of roads and bridges across the country. The government also plans to spend \$1.3 billion in the construction, expansion and development of the nation's ports. Timetric forecasts this government spending to drive growth in the infrastructure construction market to 2018. □

CHINA'S EQUIPMENT MANUFACTURERS

Chinese construction equipment firms have been building their operations in local markets, but are now looking to develop globally - *Mike Woof* writes

In recent years Chinese construction equipment manufacturers have been able to capitalise on local demand in the home market. The rapid rate of expansion of transport infrastructure, fuelled by government spending, led to a massive need for construction machines. The country's manufacturers have grown rapidly in size, investing enormously in factory capacity while also expanding model ranges to meet a broader array of machine requirements.

In a comparatively short space of time, several Chinese construction equipment manufacturers have grown in size to rank in the top 10 largest equipment builders in the world. SANY, XCMG and Zoomlion in particular have become major players worldwide.

But with Chinese demand for equipment having peaked, the country's manufacturers are now under great pressure to increase exports of machines. For some of the smaller and weaker Chinese manufacturers, the pressures are likely to become too great. There have already been casualties too, with excavator firm Chery Heavy Industries hitting major financial problems and being bought up by Changsha-based Zoomlion.

The quality of Chinese-made construction equipment has increased significantly. However the companies still have work to do in developing their credibility with customers in international markets. Crucial to this is the need to develop dealer support and parts back-up. Another important factor is improving resale value, which is based heavily on the perception of quality of a product. High end machines from long established European, Japanese or US

producers often have good resale values. But Chinese equipment still needs to develop the perception of quality in the view of purchasers to establish good resale values, even for those premium Chinese firms where actual product quality is indeed high.

For some product segments, and most notably cranes and concrete pumps, Chinese companies are now acknowledged as amongst the world leaders. In various sectors of the crane market, Chinese manufacturers have built the largest and most powerful machines anywhere in the world. Meanwhile in concrete pumping, a series of key acquisitions of western manufacturers have seen three Chinese firms, SANY, XCMG and Zoomlion, become the global world market leaders.

In the earthmoving equipment sector, Chinese companies face more

competition. LiuGong is one of the leading Chinese firms, with significant shares of the home markets for wheeled loaders and excavators, and is using a strategic plan to build its profile outside of the country. One of its important moves has been to recruit western employees in key roles, in engineering posts and also in senior executive positions. At the same time, the company has also bought the well-recognised Dressta bulldozer range and its production facility in Poland.

Using the Polish plant, LiuGong is now gearing up production of European-built excavators for the global market. At the same time, the firm has also invested heavily in a major research and development operation in China, where it intends to work on new construction machine projects in coming years. This facility has been spearheaded by Dave Beatenbough, vice president at LiuGong

The quality of Chinese made construction equipment has increased significantly



RIGHT: SANY's new dump truck models help broaden the earthmoving offering



LEFT: Zoomlion is further widening its concrete machine segment to include aggregate equipment

three years ago to hire people to work in the R&D labs.”

The research and development facility is central to LiuGong’s future plans with regard to its global operations. Through this facility the firm intends to boost both the quality of the products and the perception of quality in the view of customers. These issues work together and are crucial to developing positive factors such as strong product resale value. Beatenbough said, “Anybody can bolt parts together and make an excavator. For better fuel economy you have to integrate the engine and the hydraulics.” And he added that the sophisticated electronics and software that will facilitate this machine integration will be developed by LiuGong itself.

Meanwhile Shanghai-based Lonking is another of China’s leading producers of wheeled loaders and has developed a healthy share of this market segment. Wheeled loaders have traditionally accounted for a major portion of construction equipment sales in China, but this is changing with demand for excavators now growing. The company has followed a path of diversification in recent years and Lonking is gearing up its excavator production. Chen Chao, executive director and vice president of Lonking said, “The excavator is a new area for us. We were not very active in this market before.”

The company already sells its machines outside of China through a network of distributors. The company has developed strong sales into Latin America, Russia, Mid-east, Africa and parts of Asia. Brazil has been a key market in the past and the company is looking to set up new parts and distribution operations there in a bid to boost customer support. Meanwhile Chile and Colombia are also seen by Lonking as having major growth potential for sales. Elsewhere the firm is also developing sales in Indonesia and Nigeria. “We are confident because we have a big potential,” he said.

One strategy by Lonking in boosting its presence outside of China is to match or even beat the performance of western-made wheeled loaders. The company is in the process of developing a new wheeled loader generation that will feature external styling on a par with those from major western firms. Perhaps more importantly, these

sophisticated machines will also feature highly advanced hydraulics under the covers.

Unlike some of the other Chinese manufacturers, Lonking makes a high percentage of the parts it uses in its own machines. In its wheeled loaders for example, Lonking makes around 69% of the components, including major parts such as axles, transmissions and hydraulic rams. This strategy is to ensure that all components Lonking uses meet its high quality standards, while the approach also ensures that the firm has regular supplies of the parts it needs for the production when required. The tyres and engines are now amongst the few major items Lonking has to buy-in from external companies.

Lonking has taken this process of self-reliance further in recent times too, by investing in the manufacture of components. Perhaps unusually, Lonking now even supplies parts to other manufacturers of construction OEMs machines. The parts being sold to OEMs include hydraulic cylinders, radiators and hydraulic parts.

The new hydraulics component operation is a particularly important strategic move for Lonking. This project was initiated when Japanese hydraulic component suppliers proved unable to cope with the high levels of demand from Chinese manufacturers. As supplies of imported hydraulics components were insufficient to satisfy production, Lonking spotted an opportunity to redress the balance. Chao said, “We have invested a lot in hydraulic parts.”

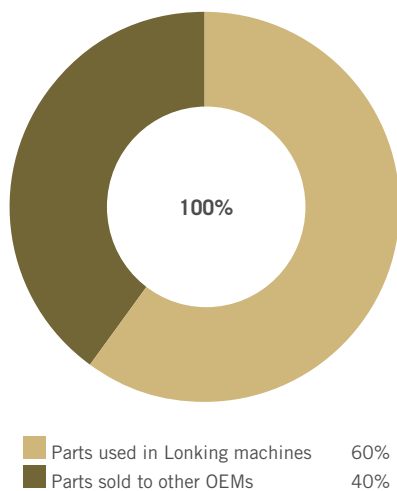
Constructed alongside Lonking’s wheeled loader and excavator production facilities in Shanghai, the new hydraulic components operation represents a substantial investment for the firm. The brand new facility now produces a wide range of parts such as track motors, valve blocks, pumps, joysticks and all the necessary internal components.

The efficiency of Lonking’s components manufacturing operation is of note, with the operations delivering a strong focus on quality and the close machining tolerances are being carried out to extremely high standards. These high precision products are made under strict controls, with critical parts made in clean room conditions. As a result, Lonking claims its product quality matches the well-established Japanese competition. Quality testing of the hydraulics components has in itself been a major investment, with the firm spending some US\$7.8 million (48 million RMB) on this alone. Chao said that all the parts are tested before assembly, with items such as pumps then being bench tested. →

and with many years experience in the construction equipment sector at major US manufacturers.

In excess of US\$64 million (400 million RMB) has been invested by LiuGong into research and development in recent years and the company will continue this trend with the completion of its new facility in China. This project will employ large numbers of engineers when it is fully commissioned and Beatenbough said, “We started as early as

Lonking’s components manufacturing



RIGHT: Lonking is developing high specification products for export markets

→ With this investment now underway, Lonking is becoming a major supplier to other Chinese OEMs. Around 60% of the output is now being used for its own machines and 40% being sold to other manufacturers. Understandably, the company's hydraulics components business looks set to account for a substantial portion of Lonking's turnover over time.

SANY is another of China's major manufacturers and the firm also has a high profile in export markets. A major manufacturer of concrete pumps in its own right, the company raised its profile further when it purchased the German Putzmeister brand some years ago.

Owning a premium German brand like Putzmeister has given SANY a tremendous advantage. SANY has been able to capitalise on the strength of the Putzmeister name, as well as on its equally strong record in product development. Similarly, the knowledge gained from the way Putzmeister's operations are run is helping SANY in developing dealer and parts support for the company's other machine ranges.

This is forming a key component in SANY's drive to reinforce its position as a quality brand from China. Wenbo Xiang is president of SANY and said, "Low price companies can have large sales but they earn little, and that's a dangerous position to be in." He added, "You need to balance profits and if you focus too much on technology, you will not survive."

Last year, SANY exported around 20% of its production, with the firm looking to increase this figure. Xiang said, "I think 20% is not good enough. Yes, we need to get into the international market and it's quite different from China. Customer demand is different and the machines might look the same but are quite different."

SANY has a strong position in the Chinese market and while its products are cheaper than those from Japanese, European and US manufacturers, they are more costly than those from South Korean companies. In terms of value for money, he said that SANY machines also offer a good option, "The price is cheaper but the quality is better than from our local competitors."

South America, South East Asia and Africa are all strong potential markets and Xiang said that for South East Asia and Africa in particular, these territories do not have



"I think 20% is not good enough. Yes, we need to get into the international market and it's quite different from China. Customer demand is different and the machines might look the same but are quite different"

Wenbo Xiang

local equipment suppliers. SANY recognises however that business operations vary around the world, depending on the territory and Xiang said, "The relationship with the customer is also different in the international market compared with China." The engine emissions standards vary also by territory and he said, "It's really different so we need to learn more and accumulate knowledge step by step."

SANY has several divisions and is also looking to develop sales for its earthmoving equipment and road machinery outside of China. The earthmoving machines have been available in a range of emergent and developed markets for some time, with the company also now looking to develop export sales of the road machines.

Excavators have also seen a particularly

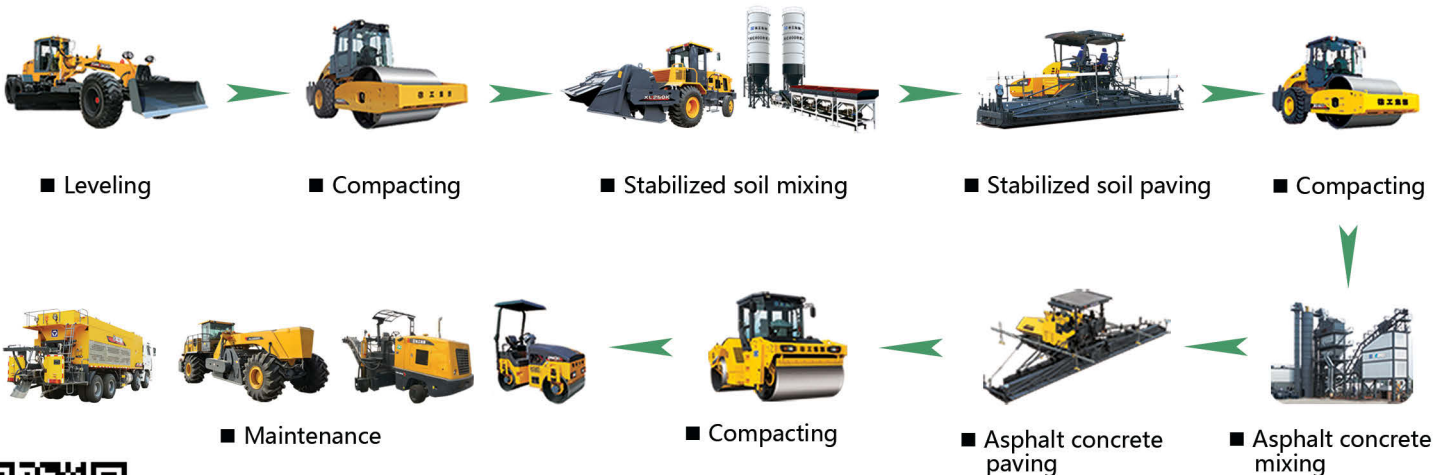
rapid growth in importance for SANY and Xiang said, "We achieved good sales in excavators and they're more popular in the Chinese market than before."

With its worldwide operation, SANY recognises the need for different products to suit local demands and the firm is adapting its products to meet the requirements of the international market. Xiang said, "I visited India and I think we need to develop a different type of excavator for that market."

Xiang continued, "We may produce three different excavators for high, medium and low technology needs." And he explained that the company is considering producing excavators in North and South America for those markets, while there is a possibility of a plant being established in Turkey to supply Europe, with another in India for that →



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→ territory. Specific changes to machines are likely due to the local market, with excavators in South America often being used in the mining industry for example, meaning that they work in a tougher environment and work longer hours so they are required to be more rugged and durable.

Xiang still sees strong potential for conventional distributor and dealer networks and online sales are not a major business segment for SANY, although the company is looking to the future. He said that this suits the trade in secondhand machines and added, "We do some small efforts online. We know a lot about e-commerce. It is quite different from traditional sales."

XCMG is another Chinese firm with a strong foothold in the crane and concrete pump markets. A key move made in 2012 was XCMG's acquisition of 60% of the Schwing concrete pump business, crucial to the company's plans to become a major force worldwide. Following this deal, XCMG and Schwing established a joint venture in 2013 for the Chinese market, while the Schwing brand remains the focus for sales into developed markets.

Exports are increasingly important for XCMG, with strong sales into Latin America, Africa, the Middle East and other parts of Asia. And in the emerging markets XCMG is seen as a first choice for many customers, according to the firm. Zhang Yanmei is vice president and said, "We offer complete

construction solutions in the emerging markets." He added, "For the moment Latin America, Africa and the Middle East are XCMG's main export markets."

Although headquartered in Xuzhou where its manufacturing output is also concentrated, XCMG also has a number of production facilities in other major Chinese cities. Outside of China, XCMG also has manufacturing operations in Brazil, Poland, Malaysia, Iran, Argentina and Uzbekistan.

International coverage is strong and XCMG has a major presence in over 40 countries, while the company has also ensured it gives good support with 30 components centres, 10 training facilities and eight call centres located around the world. In all XCMG has seen exports to 169 countries around the world, including the US and a number of countries in Europe.

Looking ahead, XCMG will increase its presence both in North America and Europe, with a long-term plan to boost its operations in developed markets. In the US, XCMG already has a substantial presence in Minneapolis, as well as service centres in New York and Orlando. In addition, the company is establishing a service centre in Houston, while XCMG set up a European research and development centre in 2013

and as it already has a substantial presence in Minneapolis, its US research and development facility will be situated close at hand.

The US and European research and development facilities work closely with the company's Chinese headquarters as XCMG is keen to continue developing its technology so that its products will meet the demands of customers in North America and Europe. The company has also managed to integrate operations between the research institute at its headquarters in China and the Brazilian and US technical centres, as well as its European research and development facility.

For North America XCMG is working hard to raise the profile of its products and also prove to customers that the machines offer high performance and reliability. In addition, the company is considering whether to start manufacturing in the US at some point in the future, most likely in Minneapolis. XCMG has already committed to entering the North American market, showing cranes as well as soil compactor models and excavators that meet US requirements at Conexpo in Las Vegas early in 2014.

The company recently held a worldwide dealer meeting in China with a view to developing its support strategy on a global basis. Crucially, the company's internationalisation strategy includes developing service and spare parts support

Exports are increasingly important for XCMG, with strong sales into Latin America, Africa, the Middle East and other parts of Asia.



BELOW: XCMG is now developing the product range beyond its crane and concrete pump range

"We offer complete construction solutions in the emerging markets. For the moment Latin America, Africa and the Middle East are XCMG's main export markets"

Zhang Yanmei

RIGHT: LiuGong hopes to gain from its new research and development facility



→ and a credit insurance policy and overseas e-commerce platform, which was explained to the dealers at the meeting.

In recent years, XCMG says it has been adjusting its operations to meet the needs of overseas markets, paying more attention to the quality of its operations and internal management efficiency. This process has seen the firm develop the network of its overseas offices, as well as the service and spare parts centres, providing stronger support to dealers in technical back-up, maintenance and credit financing.

XCMG has now set up an overseas e-commerce operation by joining with Chinese e-commerce enterprise Alibaba to build the XCMG Alibaba cross-border platform. This sells XCMG's machinery and spare parts to over 190 countries. The platform's construction is said to be a breakthrough in cross-border e-commerce. Using the platform, XCMG can present products comprehensively and in detail, communicate with overseas customers rapidly and effectively.

The third Chinese manufacturer with a leading position in cranes and concrete pumping is Changsha-based Zoomlion. The firm makes some of the largest cranes anywhere in the world, with crawler crane, truck crane and tower crane models that have all broken an array of capacity records. The company's presence in the tower crane segment was further strengthened when it bought the rights to the Jost flat top crane designs. Following this acquisition, the firm switched to making the more modern flat top tower cranes, replacing its earlier designs.

The flat top crane technology has had a significant benefit to the company, which says that since this was introduced to the range, the tower crane business has seen revenue increase by 45%. Sales are widespread too with a customer base in the Middle East, Russia, Hong Kong and Singapore, as well as the US and Germany. In mobile cranes Zoomlion has yet to develop the same sales strength as for its tower cranes where it holds a major share of the global market, but the company believes its new lifting division is a step in the right direction. Rough terrain cranes are machines the firm sees particular

Looking ahead, it is clear that several of the key Chinese companies will grow their operations globally.

potential for worldwide, including the US.

Geoffrey Tao is vice general manager of Zoomlion Overseas Branch Company and he explained, "We have a long history of making tower cranes. It makes us stronger if we combine the tower crane, mobile crane and crawler crane business in one division. We've decided to share research and development and manufacturing and we think it will make the business more efficient."

The concrete division however remains Zoomlion's largest operation. And Zoomlion's acquisition of the Italian CIFA concrete pump business was a key stage in the firm's growth, bringing with it a wealth of western technology as well as expertise in international distribution. From Cifa's perspective too, the move was entirely positive, freeing up massive resources for further research and development. A key development from this has been the launch of highly advanced concrete pumps that use lightweight carbon fibre boom sections.

These offer significant performance benefits as the lightweight carbon fibre permits the use of shorter truck chassis than would normally be required. Meanwhile the recent acquisition of the German M-TEC dry-mix mortar range has further boosted Zoomlion's presence in the concrete equipment sector.

International manufacturing operations for Zoomlion took a further step when the group opened a production site at Indaiatuba in Brazil. This site is used to make concrete equipment and the products will include truck mixers,

batching plants and concrete pumps.

Zoomlion is still undecided as to when it will re-enter the North American market with its concrete pumps, but given the sophisticated Cifa technology and the growing awareness of the brand's quality cranes, this offers a strong potential for the future.

Zoomlion has also now fully integrated the Chery excavator models it acquired recently into its product range. Currently, Zoomlion has sales networks in 80 countries and regions in the world, with production in India, Brazil and Europe as well as arrangements with major financial leasing companies in the world. It is of note too that remanufacturing is an increasing focus for the firm. This helps extend product life and improves the cost performance for clients.

However, it is worth noting that Chinese manufacturers are also facing strong competition in their home market from western manufacturers. In the road machinery segment, companies such as Atlas Copco Dynapac, the Fayat Group and the Wirtgen Group all have increased manufacturing capacity in their Chinese plants in recent times. These companies have managed to take advantage of lower cost production in China, while selling high quality machines for the Chinese and other emergent markets.

Similarly in earthmoving, firms such as Caterpillar, Hyundai, Komatsu and Volvo CE (through its ownership of SDLG) also have a major manufacturing presence in China, particularly in the earthmoving equipment segment.

Looking ahead, it is clear that several of the key Chinese companies will grow their operations globally. □

UNDER CONTROL

Machine control technologies are revolutionising construction – *Dan Gilkes* writes

Electronic control of engines, transmissions and hydraulic systems, primarily to reduce exhaust emissions and boost productivity, is also providing manufacturers with an opportunity to incorporate increasingly complex machine control into their equipment. This in turn has the potential to make the machinery more productive, further cutting fuel consumption as part of a virtuous operational circle.

Integrated machine control is set to become increasingly popular, as the benefits of a factory-built set-up become clear to contractors and rental companies, and the necessary electronics more commonplace in machine control systems. Machine guidance technology, from the likes of Trimble, Topcon and Leica, has been used with a range of earthmoving machinery for some time, providing operators with increasingly accurate data and boosting accuracy and productivity.

That data has been used to provide in-cab graphic representation of the material to be moved and the contours to be created, allowing operators to work accurately and rapidly without constantly referring to marking timbers set out by engineers. In many cases it also prevents over-digging, reducing time spent reworking the same area.

Machine guidance is an accepted method of communicating with multiple machines on site, reducing the need for engineers to constantly check grades and depths. Indeed machine guidance electronics and hydraulic control systems can be built-in to many machines at the factory, ready for on-site installation of GNSS antennas.

Integral machine control however, takes this a step further. Rather than guiding the operator's hand, to move dozer blades and bucket edges to create the desired grade, machine control actually takes over the machine's hydraulic system, leaving the operator free to manoeuvre the dozer or excavator.

Komatsu was the first to market a full Intelligent Machine Control (IMC) system, with the Topcon-developed technology included as part of the machine at the

factory. The first model to benefit from this technology was the D61PXi/EXi-23 dozer, launched in 2013.

This has since been joined by additional dozer models, such as the D37EXi/PXi-23, the D85EXi/PXi-23 and the D155AXi-8. The firm is also expanding the technology brief, with the introduction of the first crawler excavator to feature IMC - Komatsu's PC210LCi-10.

The dozers have an inertial measurement unit (IMU) built into the

bottom of the main frame, basically a pitch and yaw sensor, to record the machine's orientation and operating angle. A single Global Navigation Satellite System (GNSS) receiver is positioned inside a protective steel dome on the roof of the cab. This is far safer than using two antennas mounted on the blade itself, as there is no need for operators to climb onto the machine to fit the antenna on a daily basis and less chance of damaging the →

Komatsu was the first to market a full Intelligent Machine Control (IMC) system



ABOVE: The huge screen in the excavator delivers a range of data

RIGHT: By preventing over-digging there is no chance of hitting services below the desired dig level



→ antennas on a daily basis.

The big advance however has come with Komatsu's stroke-sensing hydraulic cylinders, which use a roller sensor in the cylinder cap to register accurately the ram extension.

By bringing together the exact position of the machine and the position of each hydraulic ram, the system can automatically tell exactly where the dozer blade is in relation to the machine. As the dozer travels forwards, the system constantly computes corrections and sends them to the machine's hydraulic controls, to position the blade's elevation and cross-slope angle. The operator simply drives the machine back and forwards, leaving the IMC to work the blade.

Where many plug-and-play guidance systems are only really of use for final fine grade work, leaving the operator to initially strip larger amounts of material, the IMC dozer can rough cut or fine grade, greatly reducing the time taken to reach the desired final contour and material height. Komatsu claims that the IMC dozer can be up to 40% more productive than a conventionally-controlled machine, virtually eliminating the need for marking out and stakes on site.

With the PC210LCi-10, Komatsu has transferred the IMC technology, including the stroke-sensing hydraulic rams, to its popular 21tonne excavator. As with the dozers, the excavator is capable of rough digging and fine grading work while under the system's control.

However, as the excavator has a much wider range of movement, it is not yet possible for the IMC system to fully control all boom and slew functions. Instead IMC takes control of the main lift cylinders.

The machine has two small GNSS antennas that do have to be mounted by the operator before use. However, as they sit on

RIGHT: IMC provides machine control for rough cut and load and carry work as well as fine grading

BELOW: The system allows the operator to concentrate on driving the machine, with the blade controlled by the IMC system



the safety handrails on the upper structure, they are easily and safely reached.

The PC210LCi-10 has a 30cm full colour monitor in the cab that shows the desired grade and finish contour in 3D for the operator. It also allows the operator to set a number of parameters before digging commences. This includes a maximum depth, either for trench work or for a slope grade.

With the bucket just above the ground the operator engages the system and simply pulls in the dipper arm lever. The IMC system calculates the bucket's position in relation to the dipper arm and raises the main boom to keep the bucket at the desired height, preventing over-digging.

This is particularly important in a trench operation where there are services below ground, as the operator can ensure that the machine will not dig down to the pipes or cables hidden beneath.

For batter or slope work, IMC automatically lifts or lowers the boom as the operator pulls in the dipper arm, to create the desired slope angle. The driver simply takes over when the time comes to crowd the bucket and lift away the spoil. This can be achieved with the machine at the top or the bottom of the slope, adding to the system's versatility.

For a more experienced operator, the IMC control reduces fatigue and will help increase productivity and reduce fuel consumption. The benefits for a less experienced operator are even greater,



CONTROL OPTIONS

Of course Komatsu is not alone in working with machine guidance and control system manufacturers. Caterpillar has for some time offered pre-wiring for its Grade Control system and the firm is now taking that a stage further with the availability of integrated Grade Control 3D on a growing

number of its dozers.

The Cat system has dual GNSS antennas mounted on the cab, rather than on the dozer blade. The firm claims that the dual antenna approach adjusts for steep slope work to provide accurate data.

Integrated joystick buttons

enable operators to make quick grade adjustments and are said to reduce manual inputs by up to 80 per cent. Grade Control 3D was first seen on the D8T and D9T dozers as far back as 2011, but will be available for the first time on the D6T by mid-2015.



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“The margins in road construction have become so small that customers are starting to talk to us concerning machine control”

Dirk Legrand

LEFT: *The upper screen provides the operator with a visual representation of the desired grade*

offers its own Sitelink 3D Enterprise site management tool. Sitelink 3D provides complete access to machine data, allowing a two-way transfer of information. This can be used to provide engineers on site with as-built data from the machine, reducing the need for final engineer checking of grades on site. The system can be used to report daily volumes and for various task management functions, including quality assurance.

At present Sitelink 3D will only work fully with Topcon IMC-equipped machinery. However the company is cooperating with a number of machine manufacturers, including Ammann, Bomag and several haul truck manufacturers, to expand the coverage of the system.

Once the system can be applied to a

broader range of machines, all connected through the internet, IMC will lead to faster job completion, reduced fuel consumption, increased safety and recordable accuracy. It will allow managers to more accurately monitor progress on site, moving machines to maintain work when necessary and ensuring maximum productivity across the fleet.

Indeed with SiteLink 3D site managers and engineers can remotely take over the in-cab screen, to solve problems and update the site specification as needed without having to leave the office.

Mr Legrand says that up to 20% of construction costs are due to errors in planning, quantities of materials, poor communications or repair work due to over-digging.

“The future is a linked environment: hardware, software, new ways of operating, new technologies and seamless integration,” he said.

“The market will go drastically in this direction in the coming years.” □

RIGHT & BELOW: *The operator simply pulls in the dipper arm lever and the machine lifts the main boom to create the slope grade*



→ allowing the driver to rapidly gain the confidence to work to finish grades without over-digging.

“The market today is very open to listening to us about this. Job site management in the future is where customers will make money,” said Komatsu Europe’s deputy general manager Dirk Legrand.

“The margins in road construction have become so small that customers are starting to talk to us concerning machine control.”

Certainly the system is finding interested customers, with Komatsu having sold around 50 of the D61PXi dozers in Europe since the launch last year and more than 500 of the machines working worldwide. Those customers that take up IMC have complete access to the machine through Komatsu’s client support and the Komtrax telematic system, both of which can be integrated to some extent with other proprietary site management systems to deliver daily work tasks to the excavator.

However for those looking to take the system to the next stage, Topcon also

TELEMATICS IN CONSTRUCTION

Demand for telematics technology is growing, as equipment users begin to lean the value of these systems – *Alan Dron* reports

With construction projects increasingly operating to wafer-thin profit margins, any technological assistance that can keep the accounts in the black is welcome.

This is particularly the case with those projects where contractors can share a larger slice of the profits if they complete their work ahead of schedule. The downside, of course, is that they also share the pain if the contract goes awry and incurs losses.

For a decade or more now telematics have been installed in construction vehicles. Today, their presence is not only becoming more widespread, but the information they can gather is becoming increasingly rich and varied. However, is their use based simply on optimising the mechanical productivity of the vehicles, or can the data being gathered really be used to drive behavioural change in personnel? And how much further can information derived from the sensors now routinely placed on construction vehicles be developed?

Today, telematics are increasingly being installed on smaller construction vehicles as well as those at the top of the size range. While they are usually standard on the latter group, they are still classed as options on smaller vehicles by some manufacturers. And in many

cases, although the telematics are usually present, they may not always be active.

“It’s standard on all our machines, although we don’t activate it as long as the customer doesn’t want it, [as] he has to pay for it,” commented Marc Blondeel, sales promotion coordinator at Komatsu’s European Market Development Department.

Caterpillar has installed telematics on some 250,000 vehicles over the past decade, says the company’s marketing and strategy manager, Construction Technology & Solutions Group, John Thomas. Most of their vehicles now come with them factory-installed; some work by cellular communication, others by satellite – something that depends on customer preference and the regulations surrounding radio usage in different countries.

“Any Cat machine can have it added as an option, unless those radio usage regulations

prevent it. The company’s medium to large machines such as excavators, graders and trucks have it as standard, the smaller ones, such as backhoe loaders, as an option.”

Caterpillar initially decided to get into the telematics market as a result of impetus from two different sources, says Thomas. “They were added due to a combination of customer ‘pull’ from some of the larger fleet owners, but also as a result of ‘push’ from our internal engineering community, who wanted information to help them to better design future machines.”

Volvo fits the equipment as standard on vehicles of 14tonnes and above and as an option on smaller vehicles, such as compact loaders, noted Martyn Brawn, engineering manager, Volvo Construction Equipment. The telematics on the smaller machines generally send back less information – mainly mapping and tracking functionality – than on larger ones.

The functionality of telematics has expanded considerably

RIGHT: Telematics technologies allows customers to keep a firm view of machine operation



Two versions of the company's CareTrack system – basic and advanced – are fitted. Basic is found in the smaller machines. On larger, more expensive vehicles, there is considerably greater functionality, with owners able to see everything that the OEM sees. The customer gets an initial six-year subscription to view this data, after which a fee is applicable.

JCB's LiveLink telematic fleet management system, meanwhile, is now standard on all of the company's heavy and mid-range machines.

The functionality of telematics has expanded considerably since the first systems were added more than a decade ago, but certain basic functions are still as valid as ever. Knowing the location and movements of an individual vehicle is still important, but this has expanded into the areas of monitoring machine health and giving warning of potential faults.

Komatsu's Komtrax system, for example, provides a working record of operational information as well as daily and monthly reports that enable a contractor to monitor machine health and schedule preventative maintenance. It also transmits error codes for problems such as overheating. The daily report shows the machine's location and working status information from the previous day. It also shows fuel levels and water temperature graphs.

"There is a huge list of items that comes off the machines," said Caterpillar's Thomas, "but the key ones are GPS location, number of hours worked and using that to determine preventative maintenance.

"It also measures current fuel levels and the amount of fuel burned over a certain period, the amount of idling time that is occurring, plus fault and event codes."

Fault codes are generated when the sensors on the engine, transmission and drivetrain detect a pressure or temperature that they feel are indicative of a fault. Event codes are operator-driven – for example, a driver's action that could cause damage to the machine, such as leaving the parking brake engaged while moving.

Alternatively, a brake over-temperature alarm may indicate that an operator is relying solely on the brakes rather than the machine's retarders to slow it. That helps a company protect its investment in their equipment – and points out a possible requirement for

training or reminding personnel of operating procedures.

However, if a pattern is discerned, such as several vehicles regularly generating braking event codes at certain times, it may indicate that a part of the worksite has excessive slope and requires work to remediate the problem.

Many construction vehicles designed to carry payloads will also have weight or counting systems installed to provide data on the amount of material moved or number of trips made each day, measuring

"I was demonstrating to a customer last week that they had almost 50% idling time on a machine"

Martyn Brawn

this against the amount of fuel burned. They can also record how long it takes an individual vehicle to make a trip – for example between a quarry's working face and the crusher. Information can be transmitted to a site office or remote HQ and can also be made available through a web portal to a manager in a remote site, who can pull up the day's readings on a laptop.

One particular bugbear that can be picked up quickly by telematics, is excessive idling. "If we notice that, we can give that information to the customer and say, 'Guys, what are you doing with the machines?'" says Komatsu's Blondeel.

Idling is a habit that many construction companies work hard to curb. Not only is the machine burning fuel without performing useful work, but as vehicle warranties are based on the time an engine is run, idling means that hours of warranty are simply ticking away to no purpose.

"I was demonstrating to a customer last week that they had almost 50% idling time on a machine," says Volvo's Brawn. "The customer had a 24/7 operation but at night the machine was just sitting said, engine running. It does very minimal work during the night shift. The clock was being wound

up. We're getting service work from the fact the machine has been doing nothing. It's good money for us, but it's not efficient."

Volvo can look at data from its Eco Operator system to determine the quality of an employee's driving technique. "One of the things we preach is that we use the power and torque in the engine the way it's designed to be used – it's not designed to be used flat-out. We can educate customers and operators into working more efficiently," said Brawn.

While telematics can point out operating problems, they can also be used to make longer-term changes, he adds. "We can certainly make a difference in behaviour with telematics. If the customers want to drill down into it, they can see fairly quickly the situation with the machine – with excessive idling, you're burning 3-4 litres of fuel an hour."

Monitoring problems such as idling can be used to modify behaviour in a more subtle, positive way, rather than just bluntly telling staff to curb bad habits, said Caterpillar's Thomas.

"Customers that are capturing the most value [from telematics] are the ones that are really driving a process change at a site. If a customer has a telematics device on a vehicle and he takes a monthly fuel burn figure, he will get a certain amount of value from that. But some people do it weekly, or even daily." They may post the results in break rooms and tell staff, for example, that the driver with the lowest idling time over the course of a month will get a gift voucher for a local restaurant. That gives personnel an incentive and, as a result, they are more likely to change their behaviour of their own volition.

The destination of data produced by the onboard telematics varies. Some manufacturers will send it direct to owners, or make it available via a web portal. Others will either transmit it to the dealers who sold the vehicle or keep it themselves. In both the latter cases, the vehicle owners will normally have the option to view this, but may have to pay a fee to do so.

Volvo, for example, makes certain parameters from its Machine Tracking and Information System freely available to customers. Users can see some data, but have to subscribe to software to see all the available information. Not many do, according to Brawn.

Typically, the manufacturer will offer an initial no-cost period but introduce a charge after a certain number of years, in the hope that the owners has by then appreciated the value of the information. This →

The destination of data produced by the onboard telematics varies.

→ can be integrated into many common fleet management software packages.

Dealers who have access to the data can schedule planned maintenance and offer advice if one or more machines is returning fault codes or poorer than average performance. Main areas of interest for many owners are fuel consumption, CO₂ emissions and travel times between work areas.

In JCB's case, electronic cautions – if water is detected in a fuel tank, for instance – can be sent to both the owner and the local dealer. This allows action to be taken to prevent damage to the machine.

Traditionally, the sheer size of many construction vehicles was no deterrent to them being stolen. The installation of sensors such as GPS may not remove the risk of theft, but certainly make it easier to track down if it disappears.

Owners now have the capability to set 'geo-fences' or 'time fences' on telematics-equipped vehicles, switching off the engine and alerting the owner if it leaves a predetermined area or preventing it from being switched on outside certain hours, such as over a weekend when a worksite is deserted.

With time fences, while a machine may not shut down automatically at the start of the time-barred period, once it is shut down, it will not be able to be restarted until the curfew ends. Even these precautions may not be a deterrent to thieves removing a vehicle, perhaps by lifting it on to a trailer without starting its engine.

"It won't prevent theft but there have been numerous occasions where it's helped us

Telematics in the construction vehicle sector will only become more comprehensive



recover a machine," said Thomas. "We can go on the map and say 'It's here.' Usually the equipment is large enough that it's difficult to hide!"

Similarly, Hitachi's tracking and E-Guard systems will alert the owner if the vehicle is loaded on to a truck even without the engine being switched on, with its position being transmitted every 5km. "We had one case of tracking a machine to the Polish border after it had been stolen in Germany," recalled Hitachi service development engineer Yemi Onabiyi.

Features such as JCB's LiveLink location system can also alert rental companies to continued use of equipment that has supposedly completed its hire period. If a machine comes to the end of its rental period too late on a Friday afternoon to be returned to the plant hire company, for example, it is not unknown for it to be clandestinely hired out to a third party for profit while nominally off-hire and awaiting collection the following Monday. Having systems such as LiveLink on a machine can also lead to reduced insurance premiums, as it is integrated with the machine's immobiliser.

ABOVE LEFT: Using telematics allows equipment users to optimise maintenance schedules

BELOW RIGHT: Geofencing and geolocation systems can make machines more secure and help address theft

"I think machines are going to get smarter and smarter in the future and we are going to see more information coming off them"

John Thomas

LiveLink can be paired with the machine's electronic control unit (ECU) – on JCB's Loadall telescopic handler range, for example. If the LiveLink system is disabled, prior to an attempted theft of the machine, the ECU will prevent the machine from starting. This system is due to be expanded to other JCB machines.

Telematics in the construction vehicle sector will only become more comprehensive, their manufacturers believe.

"I think machines are going to get smarter and smarter in the future and we are going to see more information coming off them," said Thomas. "There are a couple of reasons for this: the machines will have more sensors and collect more information. Additionally, more information can be compressed into available bandwidth." The company's engineers would find more ways

to make use of that added capacity. "I think the challenging thing for our customers is how we present that to them, so it's useful and actionable and not just completely overwhelming.

"A lot of information that comes off our machines today is focused on machine health. We're seeing customers ask more and more how they remotely track productivity?"

Volvo's Brawn agreed on the likely future quantities of data produced. Where the company's telematics today report on 40-50 parameters, which could easily be expanded to three or four times that figure with a bolt-on package.

Due to be introduced, for example, is a weighing system on articulated dump trucks that will show customers how productive their machines are.

Manufacturers such as Hitachi are

constantly asking dealers and customers for feedback on their experience with the onboard telematics and what they would like to have improved. Over the years this has been increasingly used to customise the system to reflect users' needs, a trend likely to continue.

With more than 57,000 machines currently registered and tens of thousands of users regularly logging on to use LiveLink, the system already fundamental to many businesses, says JCB spokesman Ben Brookes. The company is constantly extending the functionality of LiveLink and will soon be offering remote PIN code services. This will permit fleet managers to remotely set the immobiliser PIN for different operators and levels of access to the machine, further raising security. This, too, will prevent hire customers from continuing to utilise equipment that has been declared off-hire, as the rental company will be able to change the access PIN code once the machine has been securely parked. □

The functionality of telematics has expanded considerably



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SEPARATING MAN AND MACHINE

Autonomous and remote control machines are not about to take over the world, but they can provide efficiency gains and savings in some operations – *Colin Sowman* writes

The thought of autonomous machines may conjure up visions of an Orwellian future where society works for the ‘common good’ defined by an all-powerful being and in which people are insignificant in terms of their needs, aspirations and physical wellbeing; of machines that relentlessly carry out their task regardless of anybody or anything that is in their way. Mercifully the reality, and it is reality, could not be more different.

Caterpillar is already marketing autonomous mining trucks which are fitted with its MineStar Command – a system that utilises the advances in remote sensing and guidance including the firm’s proximity awareness technology (known as Detect). This offers three levels of operator and administrator awareness: Vision; Object Detection; and Proximity Awareness. The development programme for this system commenced back in the 1990s, although the computer hardware available at the time limited performance as well as increasing cost. The first public demonstration of Caterpillar’s autonomous surface trucks was as far back as 1996, with the technology having undergone considerable development to make it reliable and cost-effective since that time.

Vision uses multiple cameras to allow operators to select the views, via an in-cab display, to assess objects and activity around their machines. Object Detection adds multiple radar sensors to the Vision capability, in order that the combined systems can identify hazards within various critical zones around the machine. It will then display that hazard on the screen along with a graphic ‘proximity bar’ to provide the operator with perspective. Proximity Awareness adds a further dimension to Vision and Object Detection by using global navigation satellite system (GNSS) receivers and data radios. These report their positions



in real-time to a central office and to other instrumented machines in order that the system can detect machines on a collision course and provide adequate warning to relevant operators.

For particular sectors, such as mining and quarrying, Caterpillar has used this technology within its Command system as the basis of fully autonomous machines, enabling them to work safely and seamlessly with and around other mine site activities, equipment and personnel. Command gathers and processes data from the machine itself and from all MineStar System equipped assets and can be configured to provide automation on a single machine or on multiple types of equipment across a fleet.

The system is application specific, and the version for mining trucks is MineStar Command for hauling. There were some initial trials of the technology at Tinaja Hills, Arizona, and at a coal mine in New Mexico in the US after which small fleets of autonomous mining trucks were installed at two iron ore



ABOVE LEFT: Caterpillar’s automated LHD machines offer increased productivity as well as reduced wear and tear compared with conventional machines

ABOVE: Brokk’s remotely controlled machines are designed to be versatile

mines in Australia: Fortescue Metals Group and BHP Billiton. Both are expanding their autonomous fleets and BHPB has expanded its trials to three mines.

Such technology is perfect for repetitious production jobs such as hauling where, for instance, the machine is loaded at point A and tips the contents into a hopper at point

B before returning to point A for another load. That route need not be straightforward as Caterpillar states: “Our autonomous haul trucks can negotiate complex haul roads, manoeuvre through mine site traffic and navigate efficiently to and between loading points and dump sites.”

According to the company, the on-cost for automation is high and only justified when high volumes of material are being moved (especially at remote mines) or in dangerous situations. However, it said mines that have invested in putting autonomous technologies to work have experienced a number of other benefits, including increased productivity, higher equipment utilisation and less machine damage. Some sites have reported speed and efficiency increases that shorten cycle times and increase production by up to 25% while sidewall impact damage has been eliminated.

For the majority of applications full machine autonomy is some way off

Drilling is another area where full autonomy is possible. There are some operational gains such as precise hole location, spacing and depth to provide maximum production from each blast, but the overwhelming benefit is keeping operators away from potentially dangerous areas such as unstable cliff edges.

Indeed the original desire to remove the operators from cabs was precisely to allow machines to work in potentially dangerous areas - be those military or civilian. In particular specialist applications such as the repair and decommissioning of nuclear power plants, remote control (rather than autonomous machines) are almost a prerequisite because of the danger even entering certain areas would pose to human operators.

However, for the majority of applications full machine autonomy is some way off and will not be achieved in a single step but as a succession of automated functions and remote operations – some of which are already evident.

LEFT: A single operator can monitor the operation of two of Caterpillar's underground LHDs, allowing the tramming functions to be carried out autonomously and only taking control for loading or dumping

BELOW: Brokk machines have long been used under remote control for dangerous jobs in demolition as well as tunnelling

One long-standing example is Brokk which employs line-of-sight remote control technology to enable operators to control its electrically-powered demolition machines from a safe distance. Such technology has been employed on build-down and hollow-out projects or where the façade of a listed building has to be retained while the rest of the building is demolished and a new one constructed. If there is a collapse during delicate operations like these, the machine may be hit by falling material or fall a floor or more - but the operator will still be safe.

One of the reasons that remote control technology is more likely to readily find wider use than full automation is because much

HITACHI

Hitachi Construction Machinery's mining business has announced its intention to develop an autonomous rigid dump truck and an autonomous excavator for the surface mining industry by 2017. The company plans to build upon existing synergies such as the ac drive and trolley system for its dump trucks that has been trialled in Zambia.

OUT OF THIS WORLD

Remote control of machines is a key technology in American space agency NASA's plans to build a landing strip on the moon or Mars and to mine minerals that could be brought back to Earth. At the 2011 Conexpo exhibition the company said it was working with NASA to develop a remotely controlled motor grader that could be used to create a level landing strip on another world.

Furthermore, Caterpillar continues to sponsor NASA's Robotic Mining Competition. Now in its sixth year the competition is for university-level students to design and build a mining robot that can traverse the simulated Martian chaotic terrain, excavate Martian regolith (the top layer of dust, soil, broken rock, and other related materials) and deposit it into a collector bin within 10 minutes.

This is perhaps the ultimate testament to Caterpillar's mantra of 'Wherever there's mining, we're there.'



→ of the work carried out by roadbuilding, construction and waste handling machinery has (currently) nonautomated elements. These include: the filling of a bucket because the stockpile changes as each load is extracted or fresh material added; demolition; collecting and delivering material to various ad-hoc stockpiles; backfilling trenches; sorting waste for recycling... the list goes on.

To cater for these types of applications Caterpillar has both remotely operated and line-of-sight control options on some machines which employ a higher or lower level of automation. For instance there are several dozen Caterpillar semi-autonomous underground loaders and load-haul-dump machines being operated commercially in underground hard rock mines using its Command for underground system. Rival firm Sandvik also has a number of autonomous/remotely operated LHD and truck fleets operating in underground hard rock mines around the world.

The technology used by both firms is broadly similar and allows a human operator to view proceedings via closed-circuit television and to use tele-remote control (from a distant location) to load the bucket. From that point on the system then controls the machine autonomously as it trams to the dump point, dumps the load and returns to the loading area. Using this system one operator can control more than one machine depending on the length of the haul and the time needed for the round trip.

Having removed the need for a person to sit in a cab, the operator can be hundreds of kilometres away and still be able to control the machine with the same ease and precision they would have if they were sitting in the



cab. This is particularly beneficial in mining applications, sometimes because the mine is in a remote location but mainly because the operator can stay above ground saving travelling time at the beginning and end of shifts and evacuation delays encountered before and after blasting.

A variation of this remote control technology is employed in Caterpillar's line-of-sight remote control system for large dozers - Command for dozing.

The partial automation of machine processes is not new as return to dig and travel modes on wheeled and backhoe loaders has become a standard feature on many models as has 'auto dump' on articulated dump trucks. Not only can the technology be

used to automate repetitive functions across a whole range of machines, it can also be used for precision work through the use of machine control. Komatsu's fully auto blade control, which references the digital site plan with GPS positioning to calculate the required grade, is a good example.

When rough dozing the operator only needs to operate the traction control lever as the system will not only cut close to grade, it will also control the blade loading and reduce the cut where necessary. As the work progresses, the blade control system automatically changes to finish grading mode for an automated fine finishing cut/fill operation for high levels of precision and productivity.

Each successive introduction of technology to automate an operation, reduce potential accidents or increase productivity is another piece of the jigsaw which could, at some time in the future, be joined together to provide autonomous machine operation in particular operations.

Volvo Construction Equipment (Volvo CE) is exploring a variety of emerging technologies and advanced engineering such as hybrids, continuously variable transmission (CVT) and electrification to drive product development. It is already employing many automated functions in its current generation of machines and is exploring the potential for fully autonomous machines. Anders Larsson, the company's executive vice president of technology, said: "Volvo CE is working on technology to support focus areas which we believe

CRANES & CONCRETE

Crane operations and concrete placement are natural applications of line-of-sight remote control as instead of relying on a signaller, the operator can be right on the spot and see exactly what is required to complete the task. For this reason remote control has always been a standard feature of self-erecting tower cranes (albeit initially a 'wander lead') and have

of late become a feature on many concrete pumps. However, with bigger cranes where heavy loads often hang many metres below jibs extended to their maximum reach, the early remote control systems did not have the necessary finesse and sensitivity. There were also concerns about taking the operator out of the cab in case they did not hear an overload or other alarm.

Now, however, the crane manufacturers have overcome these problems by building the technology into the machine's control circuits and using two-way communications to ensure the operator does not miss any alarms or other information even if they are not in the cab.

Remote control is now an option (or even standard) on many new cranes.



“Reaching forward and working on futuristic technology such as autonomous machines drives the development of new innovations”

Anders P Larsson

LEFT: Large surface machines such as Caterpillar bulldozers can also be operated remotely for use in danger areas

ABOVE: Caterpillar has several fleets of autonomous haul trucks operating in mining operations around the world, such as at this facility in Australia

represent the future of the industry. This vision has the potential to drastically reduce the cost of machine usage and increase safety in hazardous environments.”

He highlights the prospect and potential of intelligent machines on all fronts; be that in active safety or fully autonomous and said increased machine intelligence will bring numerous advantages. Furthermore, he also envisages the use of automation outside of the high production mining environment and sees it as a way of increasing safety in construction equipment. Indeed a research project at the company has developed a wheeled loader and an excavator that can demonstrate simple loading and digging tasks without an operator on board.

“Reaching forward and working on futuristic technology such as autonomous machines drives the development of new innovations – such as semi-automated or automated functions which support short- and mid-term developments before it is possible to realise the ultimate goal much further down the line. This will not only increase safety in hazardous working environments, but also eliminate the possibility of accidents caused by human error,” he said.

That human error is the cause of many accidents in the workplace is undeniable although in the case of machinery-related accidents, many of the errors are made by other site workers rather than the machine operator.

This is one example of how the inclusion of technology like proximity sensors can improve worksite safety over the next few years without waiting for fully autonomous machines, as Larsson explains: “This technology may still be decades away from production but the progress being made is exciting. In the future we will see systems that detect obstacles and humans in the vicinity of the machine and this technology will not only help to avoid collisions but also facilitate an efficient flow of equipment.”

This ties in with the company’s stated goal of zero accidents with Volvo Group products – and Larsson said “future technology like autonomous machines will play a major part in achieving this ambition.”

Safety considerations dictate that there is a communication channel between autonomous machines and those in control of the worksite and ultimately controlling the machines.

Such channels offer two-way communications, not only allowing the machine’s operation to be monitored but also enabling information about the health of the machine to be transmitted back to the site office and shared with the machine supplier and maintenance provider. This combination of machine intelligence and improved communications leads Larsson to predict

zero unplanned stops: “A world without machine breakdowns where equipment can predict and plan its own maintenance – making unplanned stops a thing of the past.”

To these benefits has to be added the increased productivity through machines being able to work almost non-stop and not requiring meal breaks, sleep or shift changes. There will also be the ability to optimise autonomous and semi-autonomous machines to suit the particular application which, along with the expected electrification of construction equipment and site improvements, will lead to a dramatic reduction in energy consumption. Larsson is predicting a ten-fold increase in machine efficiency which will result in a massive reduction in operating costs.

Other potential savings and operational advantages associated with autonomous machines would come from only fitting a rudimentary (and potentially roof-less) ‘operators cab’ for occasions when they have to be hands-on. The lower machine height would be particularly useful in mining applications with shallow seams where the ceiling has to be higher than necessary for extraction purposes to allow access for the machinery.

As Larsson puts it: “Every technology option comes with a price tag so it needs to offer a benefit that outweighs the increased product cost, such as fuel efficiency. The big question for us is ‘will it add value for our customers?’”

With an increasing number of applications, the answer will be ‘yes.’ □

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SOFTWARE GAINS

Innovations in construction software are helping boost project efficiency and optimising project operations – *Clive Davidson* writes

Over the past decade, while construction engineers have been putting up buildings or infrastructure, software engineers have been developing a parallel universe where virtual buildings or infrastructure can be created in ever increasing detail. What started with 2D architectural drawings in computer-aided design (CAD) systems, has become a multi-dimensional world, with 3D geometric representations of structures and components modelled down to the smallest detail, plus the ability to track developments through time, and additional layers of information on things like materials, construction processes, costs and operation.

Initially, the virtual models were confined to the design and engineering stage as a way to present designs and make calculations, or do checks such as clash detection. As the dimensions of the models have increased to incorporate more information, they have become more relevant for the construction process. As a result, managing a project and a construction site is no longer just about organising materials, machinery and crews, but is now as much about managing software and data.

THE BIM BOOM

The creation of the virtual construction site has been driven by developments in building information modelling (BIM). Initially conceived as a design tool, BIM's potential to be a store and presentation mechanism for engineering and construction data was quickly recognised. Since then, effort has focused on extending the dimensions of information within the BIM model, and linking it to all the various applications and data sources that contribute to the life cycle of a construction project.

In many cases, these applications and data sources have already been gathered under the umbrella of a common data environment (CDE) – a single source of information for a project, with facilities to collect, manage

and share documents and other data. Now firms and their technology vendors are looking to integrate BIM within a CDE that includes project management tools to create a communication and collaboration platform for all the various disciplines and stakeholders across all stages of a project.

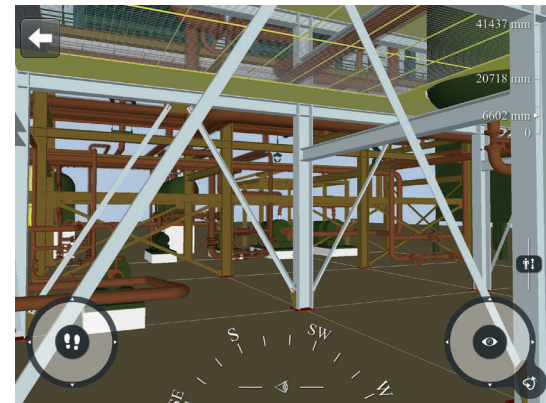
“Initially, BIM focused on construction planning and engineering. Today, BIM is being extended to include construction execution, driven by the need to bring together all relevant data, such as materials, equipment, crew, and safety data, in an interoperable environment,” said Harry Vitelli, vice president, construction and field products, at Bentley Systems.

The collaborative BIM-based approach to the design-build-operate life cycle

brings with it new demands. “The number one challenge on site today in terms of technology is the increasing volumes of data that are being generated, particularly by the BIM way of working,” said Nathan Doughty, chief operating officer at London-based Asite. To give an example, in the last five years a model for a supermarket has gone from typically 2D and 20-30 Mbytes

RIGHT: Better integration of systems is now being offered by the latest Bentley tools

BELOW: The Bentley Navigator product offers major efficiency benefits



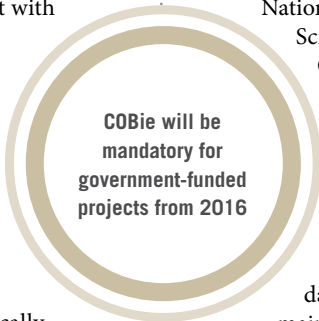


LEFT: UAVs offer fast and efficient survey from the air, at low cost

STANDARDS

Many of the individual software packages used across a construction project will have their own proprietary data formats. Often these formats have long histories and are deeply embedded in the functioning of the packages themselves. However, the integration and interoperability of construction software to create federated models or connected work sites require common formats and the ability to exchange data. One of the first initiatives in this area was the development of the Industry Foundation Classes (IFC) in the 1990s, which have since been adopted as international ISO standards and are now maintained by the buildingSMART organisation. IFC formats have been mandated by a number of countries for government building projects, and many modelling packages now include the option to output data as IFC files as well as their proprietary formats.

A federated BIM model provides a centralised resource from which the various players in a project will want to extract information relevant to their role. The requirement to extract subsets of data, especially non-geometric data, from BIM environments led to the development of the Construction Operations Building information exchange (COBie) format in 2007. In the US, where COBie was developed, it has been endorsed by the National Institute of Building Sciences, and in the UK



COBie will be mandatory for government-funded projects from 2016 – a decision other countries are likely to follow. COBie is a spreadsheet-based data exchange format for things like equipment lists, product data sheets, and warranty and maintenance information, as well as a checking tool for the design process.

Other more traditional software packages relevant to construction are able to make use of the mainstream XML data format originally developed for the web for exchanging information. This includes software for things like procurement, asset management and accounting, which are often grouped as a suite of modules

→ in volume to 3D and 1.5 Gbytes or more. “And that is just for the architectural model, leaving aside the electrical, mechanical and all the other associated models. All of that information has to be accessible on-site,” says Doughty.

A number of BIM platforms now enable the models of the various disciplines to be merged into a central federated model. Where an architect might create a design in Autodesk’s Revit package, a structural engineer might use Tekla Structures, while a mechanical engineer produces a model in Bentley’s AECOsim, platforms such as Asite’s Adoddle, Bentley’s Connect Edition or California-based Trimble’s Trimble Connect enable these to be integrated. This allows the interaction of the models to be checked and the merged model to be interrogated for construction information. “A contractor can take the merged models and do clash detection, or they can run a query across all the models to extract a door schedule to look at the architectural specifications,” says Doughty.

BIM LEVELS

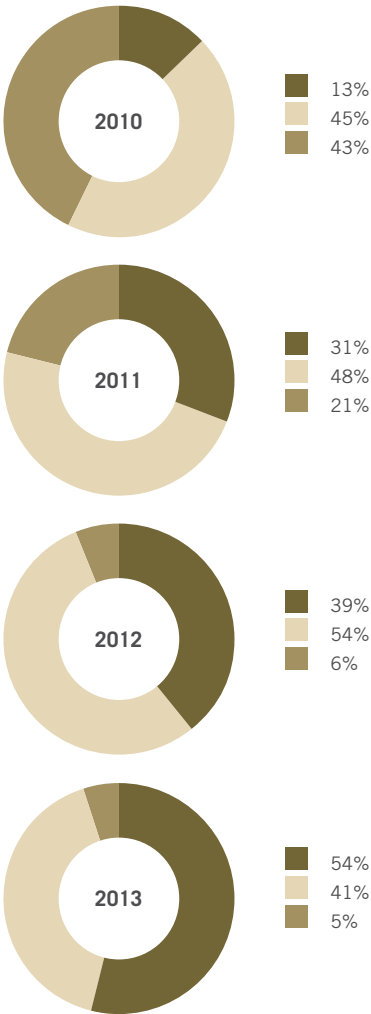
BIM is an evolving practice with clear goals, but where there are many steps and paths to the end point. To clarify the

process, in 2011 the UK’s BIM Industry Working Group identified four levels of BIM maturity ranging from Level 0, which is the traditional CAD approach, to Level 3 where there is a single online project model with construction sequencing, cost and life cycle management information. The UK’s Government Construction Strategy requires a minimum of Level 2 – a managed 3D environment with data attached, but created in separate discipline models – for public projects by 2016. The US has been following a similar trajectory, with the BIM Forum developing the Level of Development (LOD) Specification in 2013. This has five levels, ranging from LOD 100 (where the model element may be graphically represented in the model with a symbol or other generic representation, and related information such as cost per square foot can be derived from other model elements) to LOD 500 (where the model element is a field verified representation in terms of size, shape, location, quantity, and orientation, and non-graphic information may be attached to the model elements).

BIM usage and awareness over time

Source: NBS National BIM Report 2014*

Aware and currently using BIM
 Just aware of BIM
 Neither aware nor using

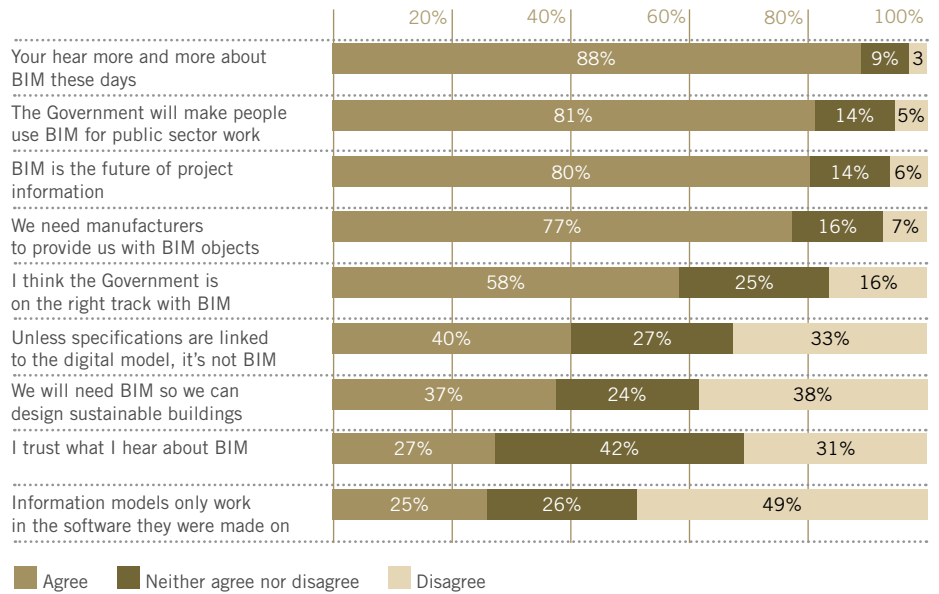


in an enterprise resource planning (ERP) system supplied by vendors such as Oracle or SAP. Construction software vendors are increasingly adopting XML as the format for sharing data among owners, general contractors and subcontractors and integrating their applications in common data environments.

Toronto-based CMiC's Real Time Integration tool uses XML across internet connections to flow data entered into a general contractor's system to an owner's system and vice versa. An IFC-XML format has also been developed for exchange of data

How strongly do you agree or disagree with the following statements?

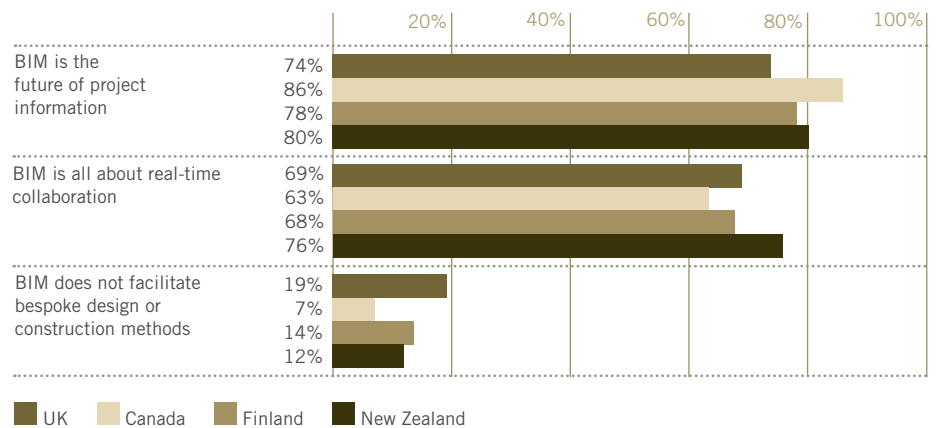
Source: NBS National BIM Report 2014*



*figures may not total 100 due to rounding

Agreement with statements

Source: NBS National BIM Report 2014*



with modelling applications.

Although standard data formats make integration of models and software easier, they are no silver bullet. They can add a layer of complexity to IT environments, often requiring considerable expertise to apply, and do not necessarily yield 100% error-free results first time round. However, over time as the standards are embedded in the industry, they are likely to be refined and become easier to use.

In the meantime, technology vendors such as Asite, Bentley and CMiC see the task of managing data formats and making

disparate applications share data with one another a key role and selling point of their software.

Bentley calls its integration technology 'i-model'. "We spent a lot of time and capital bringing the various data formats and standards together into a neutral format we call an i-model," said Vitelli. "As a result, CAD data, schedule data, materials data, cost data, and so on can all be brought into our collaboration and engineering content management environment to be managed, accessed and shared among multiple disciplines."

→ **CLOUD**

The enormous increase in data relevant to the construction site, plus the need to communicate and share information between owners, contractors and site crew creates new technology challenges. The solution to data storage and access that vendors are increasingly turning to is cloud and software-as-a-service (SaaS). In this approach, the vendor provides the hardware, usually in a distributed set of datacentres, and operates the software and manages the data on behalf of the client, delivering the functionality and information online. The approach has advantages for both parties. The vendor deals with all the technology issues, including providing adequate hardware to meet performance and storage requirements and dealing with maintenance and upgrades. Instead of a large initial license fee, there is a periodic rental fee, or even a pay-as-you-go option. These factors mean that even smaller firms with limited financial and/or IT resources can access high end software. From the vendor's point of view, it has only one version of its software to maintain and can optimise its operation across its data centres.

In some cases, such as Asite with Adoddle and Budapest-based GraphiSoft with its BIMcloud, the vendor creates its own private cloud. Others use one of the public cloud providers, such as Amazon, Microsoft and Google. Bentley, for example, uses Microsoft's Azure and Amazon Web Services clouds. However, the company also recognises that a number of construction firms will have significant investment in installed systems, which they may have transformed into an in-house version of cloud – in which case Bentley will create a link between its cloud services and the firm's cloud. "We create a hybrid computing environment by connecting on premise data with ProjectWise Connect Edition, enabling project teams to share data," said Vitelli.

MOBILITY

The ubiquity of mobile devices and their usefulness on the construction site means that it is now essential for project management systems, BIM platforms and many other construction software packages to run on tablets, smartphones or other handhelds. Although many of these devices can run browsers, it does not mean that any web-based software will automatically be suitable to run on a tablet or smartphone. Applications must be tailored for the screen and device type – converted into 'apps' in the modern jargon. For example, an application

“Mobile devices are a sea change in the industry. With them, and the right apps, a contractor can readily access a drawing, model, or other data right in the field”

Harry Vitelli

programmed to interact with a mouse and keyboard must be adapted for touchscreens. Then there are the various proprietary operating systems and data formats, such as Apple or Android, that are likely to be different from those of the platform hosting the software. With user expectation now that BIM and construction software should be able to run on mobiles as a matter of course, and it has become an integral part of vendors' development programmes to deal with the mobile formatting and interface issues of making it happen. In addition, some vendors such as CMiC, offer specific software toolkits and platforms to enable firms to migrate their applications to handheld devices.

“Mobile devices are a sea change in the industry. With them, and the right apps, a contractor can readily access a drawing, model, or other data right in the field, resulting in a crew that is more informed and, thus safer. These devices can also be used to provide real-time status and feedback to the planning and execution teams on site or back in the office,” said Vitelli.

A key function of a mobile platform is resynchronisation when devices go offline. It is critical that site workers always have access to the most up to date versions of models and other information. An urban site in a modern city could have an office with a broadband connection, but often contractors are reliant on mobile devices using 3G communications, or in remote sites, there may be no connectivity at all. Therefore, when a device loses connection

or returns to base after being outside a communication zone, there should be automatic resynchronising of the device with the central software and database. Similarly, there should be facilities for uploading data from the handheld to the database. “So the challenge is the volume of data and dealing with it on disparate sites where connectivity is variable,” said Doughty.

A discussion of construction and mobile communications would not be complete today without a mention of unmanned aerial vehicles (UAVs) or drones. Although the terms are often used interchangeably, many in construction and other industries, where such devices are proving increasingly useful, emphasise a difference between the two: drones can operate autonomously, whereas UAVs are always controlled by a remote pilot. Because of drones' autonomous operation and association with the military and social intrusion, construction firms tend to prefer the term UAV.

UAVs' natural role is in surveying, particularly in difficult terrain or hazardous sites. However, as the devices become more common, firms are finding new uses for them as inspection and monitoring tools during the construction process. Again, access and health and safety issues have been an initial driver, but UAVs can also be useful where there are concerns about manual

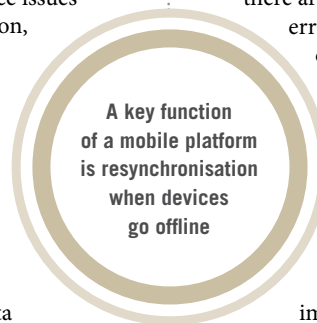
errors or efficiency, for example in counting elements such as lines on a road or guard rails.

Trimble offers the UX5 drone, which will autonomously capture high-resolution images of a site which can be fed into the company's photogrammetry software to generate 2D and 3D images. Other UAV and drone

vendors include California-based Topcon Positioning Systems and China's DJI. UAVs producing still images or video are an additional data source that must now be linked into site management, BIM or other construction software platforms.

WORKFLOW AUTOMATION AND AUDIT

Another advantage of digitising all the non-physical elements of construction – the design, communication, management, – is that enables regular processes to be easily automated. In IT terminology, a set of related actions is called a workflow. As the software vendors create ever broader platforms and link more disparate applications, it becomes possible to define and automate more





ABOVE: Demonstrations at the latest Trimble Dimensions event highlighted the capabilities of machine control systems

workflows, or provide tools for users to do this themselves. For example, a firm might create a workflow of the actions that follow the submission of a revision of a design, automating the notification and approvals process.

Multi-dimensional BIM models are the most eye-catching feature of current construction software, with their 360 degree rotation and virtual reality fly-through capabilities, but the origins of the platforms go back to a more fundamental requirement that is perhaps even more relevant in today's environment of collaboration, clouds and mobile devices.

"What we have always done since we started out with our platform in 2001 and were dealing with scanned paper documents and 2D designs is give the user the ability to see everything that happened over the course of a project, including when it happened, the tasks that have been completed or not, and by whom. That audibility and audit trail is still the core of what we deliver today even with all the technological advances such as BIM and 3D working – it's what people pay for," said Doughty of Asite.

THE CONNECTED SITE

California-based Trimble is among the vendors making use of the industry standards to link its applications. It recently launched a cloud-based collaboration platform called Trimble Connect that

"Users are at the heart of this strategy – we are providing the engineering-to-construction workflow on behalf of the users"

Harry Vitelli

uses IFC for integrating BIM models. The platform also extends beyond integrated modelling to connect a number of the company's other applications, including software for estimating, scheduling, production control, project management, cost control and asset management.

"If you look at the building industry, it is very complex with a fragmented set of stakeholders and our idea is to create a work space where the players can get out of their silos and work more holistically together on projects," said Rob Painter, general manager, Trimble Buildings, speaking at the Trimble Dimensions users conference in Las Vegas in November 2014. "Trimble Connect is a collaborative platform for bringing the various players together and connecting the data flows from the various software packages that are used throughout the

process of making a building." The benefits of such connectivity and collaboration can be powerful, and include improved efficiency and productivity and reductions in rework and waste, claims Painter.

In addition, Trimble has extended the connectivity and collaboration concept to the construction site itself with its Trimble Connected Site platform. This aims to link the office, surveyors, engineers, foremen and machines across a project using wireless and internet communications. The real-time interchange of information enables contractors to monitor and manage their machines and crews, as well as report back on progress and receive the latest updates on design changes without wasteful time delays. As a result, machines can be operated more efficiently, crews deployed more effectively, mistakes and rework avoided, and time spent waiting for information reduced, claims the company. "Trimble Connected Site connects people in the office to the people and machines in the field and drives workflow improvements and productivity across the whole project," said Roz Buick, general manager, Trimble Heavy Construction, also speaking at Trimble Dimensions 2014.

Taking the connected site concept even further, Trimble has also formed a partnership with Bentley to make their companies' software and hardware interoperable and share data with one another. "We have a lot of common users who want to see our products work together," said Vitelli. He gives the example of a contractor that has created road designs in the Bentley OpenRoads design package and wants to pass the data to Caterpillar earthmoving machines on site that are fitted with Trimble GPS and control devices. "Users are at the heart of this strategy – we are providing the engineering-to-construction workflow on behalf of the users," said Vitelli.

The BIM and connected site approach not only help bridge the construction planning, engineering and execution stages, but the models and associated data can also be carried through to completion and handover. So the virtual building continues to exist in parallel with its physical counterpart, stored in the cloud but accessible on the ground – a library of historical and current information for operation, maintenance and, perhaps, eventual demolition. □

Virtual building continues to exist in parallel with its physical counterpart



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WE HAD BRIC, NOW GET A TASTE OF MINT

Mexico, Indonesia, Nigeria, Turkey – *Global Report* offers up some food for thought about where smart money might be headed within the next several years.

– *David Arminas* writes

China's rate of growth may be slowing down, but other South East Asian companies are being quick to offer alternate investment opportunities, notably Indonesia.

Nigeria, too, has had issues with security of investment. But there are signs that the

government may be getting serious at last about tightening up rules and regulations to attract more money into one of Africa's largest and most dynamic economies.

Turkey has long been a favoured place for foreign capital investment, as well as a dynamic staging post for investment by

Turkish subsidiaries further afield in the Middle East.

Despite the war raging across its border into Syria, Turkey's economy remains stable, a good sign for continued investment in a region where security is often a deciding factor for foreign companies. □



MEXICO

Mexico recently kicked off a major transportation infrastructure construction programme with the announcement of a new airport for the capital Mexico City. The \$9.2 billion three-runway airport - expandable to six runways - will handle up to 50 million passengers annually, well above the current airport that handles around 32 million a year.

The announcement was greeted with enthusiasm by the construction industry. "The fact that the government is talking about projects of this size is good news. It means public investment is going to go up," Alonso Quintana, chief executive officer of Empresas ICA SAB, Mexico's largest construction company, told Bloomberg news agency.

President Enrique Peña Nieto, who made the announcement last year, indicated that his government priority is building infrastructure "so that the benefits can be seen and felt in the daily lives of Mexicans".

When it comes to infrastructure development, Mexico lags behind other parts of the world and even some Latin American countries. A World Economic Forum competitiveness index ranked Mexico 61 out of 144

A lot is already planned or in the construction phase, especially around Mexico City



countries. Puerto Rico was ranked 32, Chile was 33, Panama was ranked 48, Costa Rica was 51 and Brazil was 57.

The airport is only the tip of the construction iceberg expected to result from the government's four-year plan to invest \$590 billion in infrastructure. Poor infrastructure has held back the economy and the programme's 743 projects in areas such as energy, land development, transport and communications, health and tourism should correct this deficiency, according to the US-based industry think tank Council of the Americas.

A lot is already planned or in the construction phase, especially around Mexico City.

ABOVE: Mexico City is one of the world's largest and most congested cities

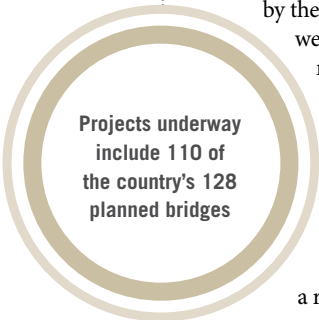
The capital will also get a second 13.3km level to the Mexico-Puebla highway, due for completion in July 2016. A second 7.7km level to the highway to Cuernavaca should be finished in 2018.

Rail projects include a Mexico City-Querétaro high-speed train along a 210km track where trains will touch around 300kph – a price tag of \$3.3 billion. A Mexico City-Toluca interurban train project involves nearly 58km of new track from Mexico City to Toluca, at a cost of \$2.9 billion. A yet-to-be planned trans-peninsular train will run from Merida to Playa del Carmen via Cancún, costing around \$2.4 billion to build. →

→ According to the infrastructure plan, the government will cover 63% of the costs and the rest will come from private investment. A federal public-private partnership law was enacted in December 2013 that was designed to boost investor confidence that their investment is safe and payback times are not simply pie in the sky.

A major market for heavy construction equipment purchases and rentals has been, and will continue to be, the mining sector, according to the analysts MarketIntelligence. The mining sector in Mexico generates 328,000 direct jobs and around 1.5 million indirect jobs. Despite the weak global economy, Mexican and foreign investors are confident that the mining activity in the country will continue.

The Mexican mining industries have increased imports of highly specialised exploration equipment, heavy truck and machinery, material handling machinery and their parts. Caterpillar recently capitalised on this optimism in the mining sector by investing \$500 million in a new plant at Cienega de Flores in Nuevo Leon, producing components for off-highway trucks, excavators and bulldozers.



According to business analysts Timetric, commercial construction has a positive outlook, supported by tourism-related construction and heightened demand for office space, particularly class-A buildings. Timetric's report Road Infrastructure Construction in Mexico to 2018: Market Databook suggests that rising income and a growing young population will also incentivise retail space expansion. The industrial sector has grown in part due to access to the United States, prompting the emergence of industrial parks in the north and central regions.

But future investment, both foreign and domestic, hinges on Mexico's new public-private partnership law, according to a report by the international law firm White & Case. "It is likely that Mexico will become a significant infrastructure market in the next five years," the report says. "Any uncertainties around this untested federal PPP framework are balanced

by the fact that the framework is well-structured, based on proven models from other jurisdictions and there is momentum and appetite to ensure the success of this new regime."

The maximum term of a PPP is 40 years. The law stipulates that the project company is entitled to request a revision of the PPP contract if



ABOVE: A series of new road links will help boost transportation right across Mexico

there is an anticipated substantial increase in project costs or a substantial reduction of the benefits of the project.

A big change is the move toward the project company having the right to arbitration or judicial review if contracting authority terminates. This was not set out in law before. Also, in the case of a dispute, a neutral country may be selected to host the arbitration.

Projects underway include 110 of the country's 128 planned bridges. Other projects on schedule include construction of the 90km Ayutla-Colotlipa road, the Acapulco-Zihuatanejo road and the 43km Libramiento Nor-Poniente ring road in Acapulco, all due for completion in 2017. Construction of the Izucar de Matamoros-Tlapa road will start this year, as will work on the 300km Camino Filo Mayor road. □



INDONESIA

Within Asia, China remains a massive market for equipment manufacturers but there are concerns over the slowing growth rate of its economy. Indonesia, on the other hand, is fast becoming a major focus for global construction companies, although with some rejoinders.

The latest Asia region review by consultancy AECOM shows the largest Asian economies grew by around 6% in 2013, but this was slightly less than 2012.

Over the longer term, AECOM's research showed the strongest construction spending growth will continue to be in China but include India, Vietnam and Indonesia to at least the end of the decade. Importantly, "the near term focus is on Indonesia and China," the report noted.

Construction spending in Asia accounted for 44% of global spend in 2013. Within Asia, China was the giant, spending \$1,800 billion. Second was Japan at \$742 billion, with India

third at \$427 billion. Indonesia had the fourth largest spend, at \$267 billion, having moved past Korea whose \$154 billion makes it the fifth largest by spend.

Indonesia is among the countries whose construction spending is forecast to grow at above the regional average of 4.4%. The other countries are China, Vietnam, India, Bangladesh and Thailand over the coming five years. But throughout the region there is an increasing investment risk because of rising debt levels at government and corporate level. Projects could stall and payments delayed if there is a withdrawal of credit facilities, nationally or regionally, warns AECOM.

There has also been some concern over the profitability of operating within Indonesia's high-inflation economy, as well as that of Thailand, during 2014. Indonesia's central bank, Bank of Indonesia, had targeted an inflation rate of 4.5%, with a 1% deviation for 2013. But

the actual rate was almost 8.4%. The target for 2014 also was 4.5% and again, this could be missed. In November 2014 it was 6.3%, which could be the average for the year, according to figures from Statistics Indonesia.

But a closer look at Indonesia's economy shows exchange rate issues. According to Indonesia Investments, part of financial consultancy Van der Schaar Investments in Delft, the Netherlands, the Indonesian rupiah exchange rate devalued to break through the "psychological boundary" of 12,000 per US dollar in mid-2013.

Significantly in 2014, the new Indonesian government shelved construction of the 30km Sunda Strait Bridge that would have connected the islands of Sumatra and Java – a \$23 billion project. The structure, a dream of Indonesia's political elite since the 1960s, was to have had three lanes of traffic in each direction, twin rail tracks and cabling for telecommunications and

telecommunications and electricity. Recently elected President Joko Widodo reportedly said that a Sunda Bridge would benefit only middle class Indonesians. Other options to better connect the two islands will be explored, including buying more ferry ships and upgrading shipping freight ports.

The production of heavy equipment in Indonesia in the first half of 2014 fell by 25% year-on-year to 2,292 units, Indonesian Investments reported last July. The drop is due to the still weak state of the mining and construction sectors. Main reasons being the implementation of the mineral ore export ban in January 2014 and low commodity prices, for example coal.

Limited construction projects have been undertaken in the first half of 2014 as investors wanted to wait for the results of Indonesia's legislative and presidential elections first. Most of the heavy equipment sold in the first half of 2014 was bought by companies engaged in forestry.

Komatsu sole distributor United Tractors, Indonesia's largest distributor of heavy equipment, controls a market share between 40-45%. In September the company revised its annual sales target from 4,500 units down to 4,000, a decline of 5% on 2013 numbers. In 2011, United sold nearly 8,500 units.

A report by the Nikkei Asian Review said United blamed the continuing slump on the weak demand from mining

The crawler excavator has traditionally been the machine of choice as an all-purpose vehicle

companies, the main buyers of dump trucks and excavators. Coal mines in particular, who saw their profits plunge due to declining selling prices, cut back on equipment orders. The new mining law implemented by the Indonesian government in January, which banned nickel and iron ore exports, also slowed sales, United said.

The market for heavy equipment in Indonesia has never been driven by public sector infrastructure investment. Many of the machines operate in the resources sectors of coal mining, forestry, plantation agriculture, especially that for palm oil, according to UK-based Off Highway Research. Before 2011, public works were noticeable by their absence, with the exception of some housing and commercial office development.

The crawler excavator has traditionally been the machine of choice as an all-purpose vehicle. In 2011 they accounted for 56% of all heavy equipment units sold. Crawler dozers were in second place, accounting for nearly 70% of all mobile construction equipment sold that year.

But mini excavators sales are miniscule, thanks to the country's abundance of cheap labour, Off Highway reported. Crawler dozer sales are linked to demand within the coal mining industry, notably on the island of Sumatra and Kalimantan, the Indonesian area of the island of Borneo.

Also, the humble agriculture tractor is making inroads as agricultural prices rise and owners of established plantations need reliable but strong all-round maintenance vehicles for often rough terrain.

Import tariffs have declined to around 5% on most items but global manufacturers continue to expand production within Indonesia. Among them are Komatsu, Caterpillar, Hitachi, Sakai and Sumitomo.

Chinese manufacturers, while not yet producing in Indonesia, continue to be highly competitive. However, last September Chinese heavy equipment maker SANY Group said it has earmarked around \$200 million to build an Indonesian plant in an effort to crack the South East Asian market, including Australia and Japan. SANY will work through its Indonesian subsidiary SANY Heavy Industry to build the plant in the Cikarang Industrial Zone in West Java. SANY would produce up to 1,000 heavy equipment units a year. □

BELOW: Construction activity is strong in Thailand, fuelling demand for locally sourced aggregates



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NIGERIA

Nigeria is Africa's most populous country, accounting for approximately one-fifth of its people and 2.4% of world population.

Nigeria's road network, nearly 195,000km, is the largest in West Africa and the second largest south of the Sahara. Around a third, 64,000km, are federal and state roads, while two thirds are local and rural.

Road transportation accounts for more than 80% of passenger and freight movement in the country. However, "a huge proportion of this network is buckling under the strain", according to the Nigerian Investment Promotion Commission, a federal government agency that promotes and coordinates investment in Nigeria. The agency also grants business entry permits, licenses and authorisations.

To manage private public partnership projects – a major investment opportunity for road construction and maintenance – the government also set up the Infrastructure Concession and Regulatory Commission. There also is a heavy emphasis on the building of toll roads, notes the Nigerian Investment Promotion Commission.

PPP is also being used to construct and upgrade rail, maritime and air transport infrastructure. Financial investment is encouraged by allowing 20% of the cost of providing basic infrastructures such as roads, water, electricity, where they do not exist, as tax deductible.

For manufactures, including heavy equipment makers, there is a 10% tax concession for five years to encourage local fabrication rather than just assembly of imported parts. A further 2% tax concession for five years is allowed for in-plant training of employees. For some manufacturing companies, given a "Pioneer" status, there is a tax holiday of three to five years.

Nigeria also set up the Lekki Free Trade Zone programme in 2004, a series of low tax areas for businesses in the sectors of manufacturing, real estate and tourism. The largest zone, next to the port city of Lagos, is home to a \$9 billion Dangote Group refinery.

Nigeria's imports are already dominated

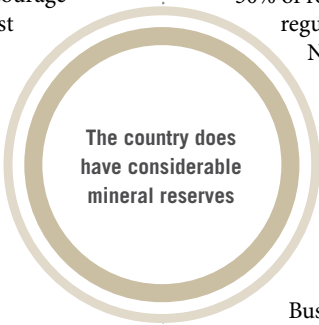
by machinery, transport equipment, manufactured goods, and commodities. The demand for heavy equipment looks set to continue, especially as less than

30% of roads are paved and all lack regular maintenance. Since 2013,

Nigerian federal, state and local governments have focused on repairs and reconstruction of roads, building homes for Nigeria's growing populace and beginning construction work on new towns and Lekki zones.

A report entitled Doing Business in Nigeria, by the US Commercial Service, part of the federal Department of Commerce, noted that the Federal Housing Authority and some state housing ministries are determined to build affordable homes for Nigeria's rapidly growing population – already approaching 180 million. Nigeria's federal government estimates that at least 800,000 housing units will be built in the next few years and charged the Federal Housing Authority to see it gets done. Key cities for home building are the capital Abuja, Lagos, Port-Harcourt, Ibadan, Uyo, Calabar, Asaba and Owerri. In Lagos, construction work is well underway on a new city being built on reclaimed land called Eko Atlantic City. Abuja, too, is expanding rapidly.

According to the US report, the government wants more private firms engaged in mining projects, which likely will translate into a need for more heavy construction machinery. The country does have considerable mineral reserves, with plenty of scope remaining for development. However, US manufacturers face stiff competition from Chinese and European



ABOVE: Nigeria's economic centre still focuses on Lagos, although the city is no longer the country's capital

LEFT: Despite the somewhat anarchic nature of trade and transport in Nigeria, the country's economy is booming

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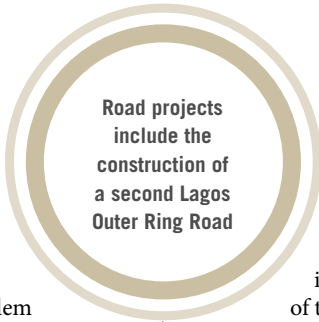


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→ firms who offer prospective buyers financial incentives in the form of cheap financing and often lower prices.

But by the US Commercial Service offers a word of caution. Enforcement of intellectual property rights remains a problem in Nigeria, despite copyright laws and enforcement efforts. Also, clearance of equipment at ports of entry can be “slow, cumbersome and highly bureaucratic”. Corruption of officials and general congestion are significant issues at the ports.



Road projects include the construction of a second Lagos Outer Ring Road

A report by the Lagos-based business publication Ships & Ports noted that the government continues to waive import duties on heavy equipment and spare parts used for all kinds of infrastructure work. On top of this, last February president Goodluck Jonathan announced the National Integrated Infrastructure Master Plan that will see \$2.9 trillion spent over the next 30 years.

Road projects include the construction of a second Lagos Outer Ring Road and Section

V of the A121 East-West Highway. China Civil Engineering Construction picked up the Section V contract, worth around \$1.07 billion. The work within Nigeria’s Niger Delta area is expected to take five years and includes design as well as construction. When it is complete, the A121 will connect to Nigeria’s main North-South highway.

Construction of this section of highway is of prime economic importance for Nigeria, as it will improve links to the oil producing region that provides the basis of much of the country’s economy. The East-West link is around 65% complete, according to reports from Nigeria. □



TURKEY

Despite being a northern neighbour of Syria, a country wracked by civil war and religious extremism, Turkey remains politically and economically stable. This bodes well for foreign investment on infrastructure projects and resource development – key areas of heavy equipment use - and imports of such material.

Recep Tayyip Erdogan won the presidential election in 2014 after serving as prime minister since 2003. He has dealt with alleged challenges from the powerful, secularist military. The economy has enjoyed strong growth, fuelled by trade and foreign investment. Tourism, agriculture and manufacturing are key sectors.

In 2007 demand for new construction equipment reached its highest recorded level of nearly 12,000 units, equating to a four-fold increase within five years, according to Off Highway Research. Much government investment stimulated the construction industry, particularly house building and energy sectors.

During the first half of 2008, the market began slipping away. There was political uncertainty surrounding the left-leaning religious governing AKP party, a dramatic rise in the rate of VAT applied to leasing transactions and a sharp decline in foreign direct investments, new equipment volumes in most product sectors fell by up to 50%. By 2009 new equipment demand was at its lowest level since 2003, just 4,300 units.

Then, in the last quarter of 2009 and following strong growth in the domestic economy coupled with the start of many infrastructure projects, the market bounced

back, posting growth of 83% in 2010. By 2012, sales in many product sectors rose another 10% over 2011. Many customers had postponed their purchases until a decrease in the VAT leasing rate from 8% to 1% in early 2012.

Turkey continues down a path of major infrastructure investment. In October 2013, Istanbul opened the Marmaray Rail Project, constructed by a Japanese-Turkish consortium led by Taisei Corporation, including Imalat ve Montaj, Nurol Construction. Work involved a 13.6km tunnel beneath the Bosphorus Strait and the upgrade of 63km of suburban rail lines to create a 76.3km high-capacity passenger line between the Europe and Asian sides.

A major road infrastructure project is the so-called Third Bosphorus Bridge, part of the projected 260km Northern Marmara Motorway which will bypass Istanbul’s northern urban areas. Construction of the \$2.5 billion road and rail bridge is by a consortium of the Turkish company İçtaş and the Italian company Astaldi that won the bid on May 30, 2012.

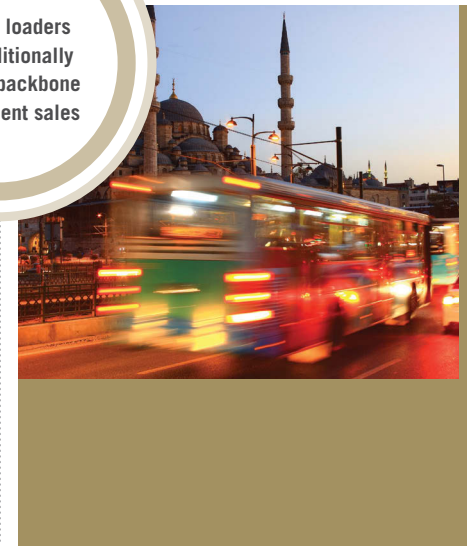
But, as the UK’s Economist newspaper reported in October 2013, some projects may be a dream too far, such as President

Erdogan’s desire to dig what he himself once called the “crazy canal”. The 50km canal on the European side would link the southern Sea of Marmara to the Black Sea in the north in an effort to divert tanker traffic away from the Bosphorus and diminish pollution and the risk of collisions in the sinuous waterway. However, green and environmental activists – an increasingly vociferous and politicised group in the country -- say it could destroy entire ecosystems in the Black Sea and Marmara Sea.

Gathering speed is the construction phase of the Trans Anatolian Natural Gas Pipeline (TANAP) project, a major gas pipeline to be built from Azerbaijan’s Shah Deniz field through Turkey



Backhoe loaders have traditionally been the backbone of equipment sales



RIGHT: Traffic congestion is a serious problem in many of Turkey’s major cities



ABOVE: The Third Bosphorus Bridge is one of several major infrastructure projects underway in the country

to the country's border with Europe. Last December the TANAP consortium announced the construction contractors are the Fernas Insaat, the Sicim-Yuksel-Akkord consortium and Tekfen Holding. They will build three sections running from the border

with Georgia to the Turkish city of Erzurum, from Erzurum to the city of Sivas and from Sivas to the city of Eskisehir.

But losing momentum is construction of Istanbul's third airport in a heavily forested area near Terkos Lake, 50km north of the city. Construction has stopped while a court reviews arguments by local residents and environmental groups that the project would cause serious damage to the environment. The Cengiz-Kolin-Limak-Mapa-Kalyon Consortium, a Turkish joint venture, won the build-operate tender after bidding \$33 billion for a 25-year lease. The first stage of construction is set for completion in four years and the facility is projected to handle 150 million passengers a year when fully operational.

By heavy equipment market sector, mini excavators have not sold well because of cheap labour costs. But this has been changing because of more European-style labour restrictions and an increasing demand for faster and more efficient working on

tight inner city projects such as cable laying and maintenance. Backhoe loaders have traditionally been the backbone of equipment sales, amounting to up to a third of all units. They are especially sought after by owners to ensure a steady income.

The demand for asphalt pavers has grown thanks to the release of government funds for road construction starting in 2011. But up to half of sales will be made to Turkish contractors with work in Iraq, Afghanistan, Ukraine and other countries, according to Of Highway Research. The market for new pavers in Turkey is also influenced to a significant extent by the import of second-hand units from Germany.

Manufacturers should not hold their collective breath over Turkey's accession to the European Union, for which negotiations remain convoluted, thanks to human rights issues as well as disputes with Greece over a politically divided Cyprus. The previous close economic ties with Israel have deteriorated, too. □

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GLOBAL GROWTH IN RENTAL

The machine rental sector is undergoing significant expansion worldwide – *Dan Gilkes* reports

Plant hire, equipment rental, leasing, call it what you will, being able to use a machine when and where you need it, with no further concerns relating to ownership costs, depreciation or sudden repair bills, remains a compelling argument for many contractors. Which is one of the main reasons for the continued growth in popularity of equipment rental across the world.

Rental has been big business in the UK, the US and some European countries for many years, indeed at least 80% of all machinery sold in the UK market goes to plant hire companies. However it remains a minor part of the construction equipment mix in other countries, as contractors prefer the security of asset ownership and machine availability, over the convenience and off-balance sheet attraction of rental.

Rental has also become an important outlet for many equipment manufacturers, not just as a possible customer, but as an operating division. The Cat Rental Store was among the first to become a regular feature of the market, in effect competing directly with some of its own customers. Liebherr also offers a rental business, though only of its own equipment, in the UK, Germany, Austria, Switzerland and France, while Volvo and Case have had rental interests too.

The Cat Rental Store remains the largest however and now has 1,429 dealer-owned locations across the world, providing both

Cat and non-Caterpillar equipment.

“Cost of ownership, economic cycles, duration of jobs and contractors covering a wide range of geographic areas making transporting equipment less attractive, are all factors,” said a Caterpillar spokesperson.

“Cat dealers are making it easy for customers to do business by providing the latest technology in machines, with fleets of young equipment supported by expert advice to select the best solution for the job.

“As the economic situation across the globe is uncertain, rental will be more and more a solution that our customers will be looking for. We have markets that are already mature such as the UK or France, with high rental penetration, but rental penetration is growing in emerging countries too,” said Cat.

“Clearly specialisation is one of the trends that is being followed by many rental companies in Europe, while our network, with a large offer of Cat and complementary equipment, is able to provide machines to all the different sectors.”

THE FINANCIAL BENEFITS

So why rent? There are clear financial implications of rental versus ownership. Renting helps to reduce the burden of up front investment, also cutting the cost of maintenance and eliminating the risk of expensive breakdown repairs. In effect you only pay for the time that you use the equipment.

“Infrastructure and construction sectors in Qatar are expected to see massive growth because of the FIFA World Cup in 2022, leading to heavy demand for construction equipment and related rental services”

HRH Prince Khalid bin Bandar bin Sultan



Hiring in machinery also keeps the cost of that plant off your balance sheet, with none of the usual concerns over depreciation or future residual value. Several European countries also offer fiscal incentives for rental, further boosting its appeal.

The flip side of that, is that a company might find it hard to raise finance when required, without solid assets on its books to offset and guarantee a loan. Having total control of fleet availability is also a strong concern for some.

While some companies have the luxury of maximum utilisation of their machinery, particularly in production-intensive areas such as quarrying and mining, general construction can be far more seasonal, with project duration much shorter and certainly well within the lifetime of the machinery. The rental industry can therefore supply a specific machine for a short duration task, with none of the investment concerns related to ownership.

Having the right machine for the job is an important consideration too. A company that has purchased a 40tonne excavator for instance will not want to put it to work on a site that really needs a 25tonne machine, as it will be inefficient and costly. Being able to specify the right equipment for the job, is often the most efficient method of working.

In many cases rental also means that you will get the latest available plant, with the benefits of full legislative compliance, the highest levels of productivity and the lowest exhaust emissions, which might be an important consideration particularly for government-sponsored works.

When considering whether to opt for some sort of purchase agreement or a rental or leasing deal, companies have many things to consider. However both the rental machine



FAR LEFT: Reduced tailswing excavators are favoured in the rental segment
LEFT: Demand for machine rental is increasing globally

and the purchased model can both be calculated as a total whole life cost.

For the rental machine you need to look at the daily or monthly rental rate. Then work out what your utilisation will be; do you need the machine all of the time or just for occasional work? Interest payments made on a monthly rental payment may not be the only interest that has to be paid either. If for example the company utilises an agreed overdraft, there will be additional interest owing, through making regular payments by using funds against that overdraft.

If you considering buying the machinery, the whole life calculation is more complex, with several variables that will only be realised over time. There is of course the purchase cost, plus any interest if the equipment is being purchased on a hire purchase agreement.

You will need to work out how many years the machine will be used by your company, and calculate a residual value to work out potential depreciation. Regular maintenance costs, including tyres or tracks will be another factor, even if the machine is supplied with a full repair and maintenance contract. Many companies work on maintenance costs being around 5-10% of the purchase cost of a machine, without incorporating wear parts such as bucket teeth or cutting edges. Plus you always have to factor in the unexpected

breakdown, though to some extent that can be covered by an extended warranty, another expense to add to the list.

There is little doubt that, particularly as equipment becomes more complex and contractors move away from having their own service and maintenance departments, rental has become a more popular option. Passing the risk involved with machine ownership and operation to another company is for many, worth the additional expense of a rental contract.

Traditionally, the majority of rental in the construction sector has been related to smaller machinery, typically under 20tonnes operating weight. However, the European Rental Association (ERA) says that major construction contractors have started outsourcing their equipment needs further up the weight scale, to between 20-50tonnes.

This includes wheeled loaders, excavators and compactors as well as the smaller mini excavators, backhoe loaders and compaction machinery. This may in part be due to shorter project durations, with contractors less inclined to invest in machinery for a limited return. No doubt there is also an element of management contracting at work too, as main contractors take over the project management but leave it to subcontractors to carry out earthworks and construction processes.

EUROPEAN RECOVERY SLOW

The European equipment rental sector is a mature market, yet it increased by 1% in 2013, to around €22.63 billion, according to the European Rental Association's Industry 2014 Report. The ERA is predicting a more positive 2.8% growth in 2014 and a further 2.6% growth in 2015 despite the fact that recessionary cuts continue to bite among member states.

As is so often the case, the figures vary wildly when you look at individual countries though. For example, while the UK remained the strongest rental market in Europe, with growth in 2013 of 10%, the Polish market in comparison saw a slowdown according to the ERA.

That said, Finnish rental company Ramirent says the Polish market and the Baltic States in general, look set to recover slightly over the coming year.

"In the Baltics, our operations developed favourably, backed by stable market conditions," said Ramirent ceo Magnus Rosen.

"In Europe Central, demand for equipment rental improved in Poland and the Czech Republic, while market activity is low in Slovakia.

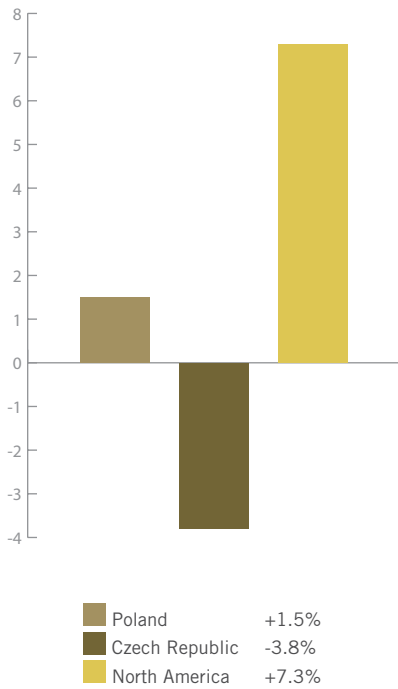
"The construction market is estimated to increase in Lithuania by 3% and to decrease in Latvia by 2% and in Estonia by 7%. Residential construction in the Baltic States is estimated to grow supported by new building start-ups and improving consumer confidence.

"Non-residential construction is expected to recover in Latvia and Lithuania during 2014. The market in infrastructure construction is at a lower level due to a transition period in EU funding. High activity in the energy sector will support the Baltic equipment rental markets in 2014."

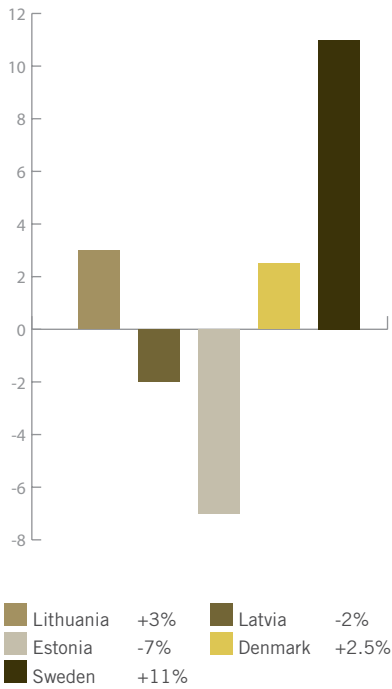
A report published by ERA in October 2014 puts Polish equipment rental market growth at 1.5% through 2014, while in the Czech Republic the construction market is expected to decrease by 3.8%.

Things are looking more positive in Ramirent's domestic Scandinavian markets though. A forecast from the Swedish Construction Federation in October 2014

Increases/decreases in rental markets by country (%) 2014



Increases/decreases in construction markets by country (%) 2014



→ said that the Swedish construction market should increase by a healthy 11% in 2014, with residential construction in particular well up on the previous year.

Non-residential construction also looks healthy, with infrastructure projects in Stockholm and Gothenburg in particular boosting demand.

The Norwegian market is experiencing similar growth, though residential construction has dropped while infrastructure remains stable, thanks in part to government grants for railway and metro projects. That said, overcapacity in the Norwegian rental market was expected to have an impact on sales in the fourth quarter of 2014.

Denmark looks slightly healthier too, according to a report from the Danish Construction Industry, with growth in 2014 expected to hit around 2.5%. Health and education spending will push non-residential growth, while several new transport projects and energy investments will strengthen infrastructure.

One of the ways that Ramirent has continued to build its business is with longer-term rental contracts with major contractors, providing projects with equipment on a national and international scale.

“An important new agreement during

the quarter was the signing of a three-year rental agreement with Skanska’s machinery department in Sweden,” said Mr Rosen.

“We renewed the cooperation agreement with Veidekke in Norway for the next three years. In Finland, construction company Hartela outsourced their tower cranes fleet to Ramirent and signed a five-year rental agreement.

“We continue to develop our organisation to efficiently cater for the specific needs of customers renting over-the-counter and for customers to whom we deliver integrated solutions.”

HIGHER ACTIVITY IN US RENTAL

The equally well established North American rental market, though still expanding, has had to revise its growth forecasts downwards slightly in the last year. That said, 7.3% growth in 2014 as opposed to 7.6% is hardly the end of the world and few companies will be playing down their investment in this market.

The American Rental Association’s (ARA) latest forecasts put 2014 revenue at around \$35.7 billion, substantially more than 2013. The slight drop in confidence relates to a small slowdown in construction output. However ARA forecasts see a further 9.2% of revenue growth in 2015, 7.7% growth in 2016 and 9.3% growth in 2017, to a total of around

\$49.8 billion.

“This latest forecast continues to demonstrate a strong growth pattern for our industry,” says Christine Wehrman, executive vice president and CEO of the ARA.

With such strong predictions, the ARA expects rental companies in the US to continue to invest more than 30% of their revenue in new equipment over the next five years.

In the next four years, the construction and industrial segment and the general tool segment are expected to experience near double-digit growth in US rental revenue. In 2015 construction and industrial rental revenue is projected to increase 9.8% and general tool 9.0%, followed by 7.9% and 8.1% in 2016, 8.6% and 9.8% in 2017 and 9.0% and 11.8% in 2018, respectively according to the ARA.

US-based United Rentals, perhaps the world’s largest equipment rental company with 882 locations in 49 US states and 10 Canadian provinces, reported North American rental revenues rising by 15.6% year on year in October.

“The third quarter provided further confirmation that our strategy and the North American construction recovery are both solidly on track,” said Michael Kneeland, United’s CEO.

“Our end markets are continuing to rally, creating numerous opportunities for well-managed, profitable growth. We reported a robust 16% increase in rental revenue for the quarter and more importantly, the discipline behind that growth is evident in our record earnings before interest, taxes, depreciation



and amortisation margin and gains in volume, utilisation and rates.”

Mr Kneeland continued: “While we reported very strong results, we believe they reflect just a fraction of what our company can achieve over multiple years in the forecasted upcycle. More immediately, we believe that the current uncertainty in the financial markets relates to global concerns, and not North America.

“We’ll continue to take the actions that drive returns over time, including rigorous fleet management, the expansion of our speciality rental lines, and transformational measures for greater productivity.”

UK-based Ashtead Group, which owns UK hire firm A-Plant and the US business Sunbelt Rentals, has also posted strong results in September 2014. The group saw rental revenue rise by 22% in its first quarter of 2014-15 to £417.7 million. Q1 profit also hit a record high, up 33% at £120 million.

“We are pleased to report another strong quarter as we continue to capitalise on

BELOW LEFT: Compact loaders are amongst the machines popular in the rental segment

BELOW: Large excavators and ADTs come in at the heavier end of the rental market

recovering markets and take further market share in both Sunbelt and A-Plant,” said chief executive Geoff Drabble.

“Sunbelt delivered 22% rental revenue growth and A-Plant 19% which, together with a focus on operational efficiency, helped to deliver record underlying pre-tax profits of £120 million.

“We invested £284 million in capital expenditure and a further £32 million on bolt-on acquisitions in the quarter, as we continue our strategy focussed on organic growth supplemented by bolt-on acquisitions. Given the momentum evident in the business, we are increasing our full year guidance for capital expenditure to a range of £825 million to £875 million.

“As a result of this strong performance, and with a strong balance sheet to support future growth, we now anticipate a full year result ahead of our previous expectations.”

MIDDLE EASTERN PROMISE

The Middle East looks set to be a growth market for rental, with US firm Hertz Equipment Rental (HERC) continuing to expand in the region to meet demand. In a joint venture agreement with Dayim Holdings and Phoenix Project development, Hertz Dayim Equipment Rental opened a business in Doha, Qatar, late in 2014.

This was the first time that Hertz Dayim has expanded outside Saudi Arabia, where the partnership was first established four years ago. The JV had already opened a new location in Riyadh, Saudi Arabia last year and also has plans for additional outlets.

“Regional expansion is a major strategic objective for Hertz Dayim Equipment Rental and I believe that Qatar is the right place to begin this expansion,” said chairman HRH Prince Khalid bin Bandar bin Sultan.

Hertz Dayim saw the opportunity in Qatar to provide a premium full line rental service as the majority of the competition in the market concentrate on one or two product lines. The company’s entry into the sector is based on a business model that provides a wide range of equipment to satisfy a greater number of customers involved in stadium construction, metro, ports, rail, drainage systems and highways, in addition to the traditional petro-chemical, oil and gas projects.

“Infrastructure and construction sectors in Qatar are expected to see massive growth because of the FIFA World Cup in 2022, leading to heavy demand for construction equipment and related rental services,” said the Prince.

“With Qatar’s planned infrastructure megaprojects over the next five years, Hertz Dayim is well positioned for expansion into the Gulf States. Regional presence will give scale to our business, as well as the flexibility to move fleet across different Gulf Corporation Council markets. We are confident that we will replicate the success of the Saudi business across the GCC and this is just the first step in that direction.”

Further evidence of growing interest in the Middle East for equipment comes with the news that the International Powered Access Federation (IPAF) held its first Middle East Convention, in Dubai in January 2015.

“The UAE construction sector is growing at a fast pace, and so is the use of powered access equipment,” said Jason Woods, IPAF’s representative in the UAE.

“Along with that, there is increased interest in finding much safer and economical ways to work at height and this brings with it challenges for safe operation of equipment. IPAF’s first Middle East Convention aims to address the growing interest and needs of this region.”

EMERGING MARKET INTEREST

The Middle East is not the only growth area of interest to international rental companies. Though perhaps not performing →



→ as well as they were just a few years ago, all of the BRIC countries remain attractive to rental, as their construction and industrial growth continues apace. The strongest gains in equipment rental market penetration will almost certainly come in the emerging world, where hire will gradually climb towards the market penetration percentages currently seen in more mature markets.

According to Caterpillar, rental is also growing strongly in China. The primary drivers are government requirements of state-owned enterprises to operate more efficiently from a financial perspective, continued privatisation of the construction industry, increased health and safety regulation and increasing labour costs.

Though certainly not growing at quite the pace that it was, China remains one of the strongest potential markets for any rental business. Hertz Equipment Rental's global internal communications director Zoe White said that the firm opened a rental business in Shanghai in 2007. It has

since expanded to cover 18 provinces throughout China, with five main business hubs and several smaller stores.

"After the earthquake in Chengdu, we realised a need to assist western China with a number of road projects," said White.

"Western China is the first Hertz location in the world to operate a fleet of road pavers and rollers.

"This has been a great learning experience for Hertz in the possible expansion of road projects. Today the China market is expanding as safety regulations improve and labour costs rise. This has been most prominent in the aerial equipment space, where our machines are replacing bamboo and metal scaffolding.

"Municipal contractors painting many of China's elevated road systems have been many of the earliest adopters of more

Though certainly not growing at quite the pace that it was, China remains one of the strongest potential markets for any rental business

efficient and less labour intensive aerial equipment. Every year, there are a number of painting projects to coat the bottom side of these highways across China. The contractors are looking for reliable, fast equipment to ensure they get the work done in their limited available time."

CONCLUSIONS

The growth in equipment rental, in both mature and developing markets, looks set to continue apace. Financial constraints, market regulation and the increasing cost of ownership, make rental an attractive alternative for a growing number of contractors, governmental authorities and other equipment users. The ability of rental companies to tailor both machinery and financial packages to meet the needs of those individual customers, will also drive this continued demand. □

LOOKING FOR A SPRAYER?

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ACQUISITION DECISIONS

Customers can face the choice of buying used or new equipment – *Dan Gilkes* writes

The decision to buy either new or used equipment is almost as old as the construction plant market itself. However some of the reasons for choosing between the two might well be changing, to meet new demands from customers across the world and to cope with a changing supply base.

Ever more stringent emissions legislation in Europe, the US and Japan, rapidly developing emerging markets that want the productivity of the latest equipment, the predominance of rental in some markets that delivers increasingly young second-hand machinery onto the market and the expansion of OEM-backed remanufacturing facilities, are all playing a part in reshaping the international used equipment sector.

In addition, the global economic downturn of the last few years has made many contractors take a fresh look at the ways in which they can make the most of their finances, and indeed the finances that may or may not be available to them from banks and other lending institutions. In some cases that can mean mixing new and used equipment purchases, to provide the right fleet for a construction project or for a company's general use.

In some cases companies may also find that incorporating rental into the 'fleet' offers an even more cost-effective total operating solution, not buying the equipment at all but combining ownership and rental to find an effective mix of utilisation and asset management. This is particularly true for short duration projects, or those that require an element of specialised equipment, such as asphalt pavers or milling machines with a large number of potentially expensive wear parts.

However it is not just the machinery that is being bought and sold that has been changing, but the way in which used equipment in particular is being marketed and sold. The days of plant dealers with a well-thumbed copy of Resale Weekly or Exchange and Mart stuffed into a back pocket are fast becoming a thing of the past. These days they are more likely to have a smartphone or a tablet and be operating from a warm office rather than a cold auction lot.

Increasing dependence on the internet in



business has made the world a considerably smaller place, for both the dealer and the end user.

Traditionally, developed mature markets have been the main buyers of the latest new equipment and, for Europe at least, the second life of the machine is also usually within the EU. Emerging and developing countries then became the first port of call for used equipment suppliers dealing with a machine's third life and beyond.

But that too is changing. Though emerging market buyers are in many cases keen to avoid overly-complex, highly emissions-regulated machinery, that might require specific fuels and oils to run efficiently, or need expensive modification to operate at all, they do like the productivity and performance benefits of the latest machinery. Therefore they are looking for lower regulated or deregulated versions of the same up to date models, machines that carry many of the technological and productivity advances, but without the costly and complex emissions compliant engines.

As with all procurement issues, supply and demand plays its part. A contractor winning a major infrastructure project that suddenly

ABOVE: *Ritchie Bros continues to grow its presence in the equipment sector*

requires a large fleet of articulated dump trucks for instance, will struggle to find many on the new market with an acceptable lead time, and may well be forced to top up the fleet with used machinery. Even on the used market they might struggle if planning has been left to the last minute, and could end up with machine makes that might not have been their first choice.

Currency fluctuation can be a thorn in the side of the international used equipment dealer. The Russian currency for instance has recently taken a big hit as sanctions continue to bite, making imported equipment an expensive choice for end users there.

That said, the international used equipment business has always had to contend with currency fluctuations, differing machine configurations and varying emissions standards and has coped well in the past, adapting to the changing demands of customers and the changing supply of equipment.

→ **IN-HOUSE REMARKETING**

One of the biggest challenges for those traditional used equipment dealers has, for some time now, come from the OEM manufacturers and their dedicated dealer networks, with approved used machinery programmes becoming an increasingly popular sector of the business. By marketing used equipment alongside new, those dealers have a greater business opportunity for a wider buying audience. More importantly, by marketing used equipment alongside new, they can attempt to retain the profitable service and maintenance aspect of machine ownership, through the second and even the third life of the equipment.

The benefit for the customer is that while prices may be slightly higher from an authorised network outlet, in most cases the dealer will have carried out extensive checks on the machine before providing a manufacturer-backed warranty, offering additional peace of mind for the customer.

In the case of schemes like Volvo's Approved Used programme for instance, the warranty can be as long as one year or 1,000 hours of operation, which could be particularly attractive to a customer. In addition the dealer has access to the manufacturer's finance business, to provide any necessary funds and a range of purchase options. The most popular equipment within the Cat Certified Used programme includes dozers, excavators, motor graders and wheeled loaders.

"Europe, Africa and the Middle East, Cat used equipment sales have been increasing more than the industry at large and more than new machines sales," said a spokesperson.

"Our used equipment solutions are popular, as purchasing used equipment can be a time consuming and risky business.

"The Cat Certified Used programme provides manufacturer-backed extended coverage on machines with less than 10 years and less than 10,000 hours. Every used machine that achieves 'certified' status has undergone a rigorous 140-point inspection and is serviced using genuine Cat parts, fluids and filters."

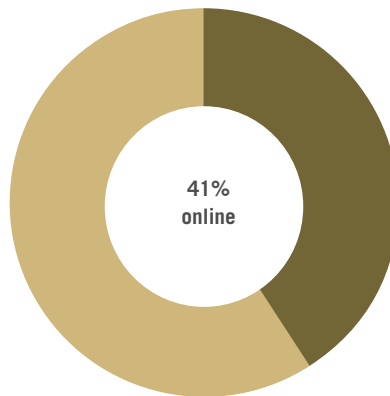
NEW LIFE OPTIONS

Many dealers have a third option available to them, in the form of remanufacturing. Initially reman programmes were designed for individual components, with customers able to exchange engines, transmissions and other major components for remanufactured items that had been completely rebuilt, incorporating any technology upgrades and then warrantied.

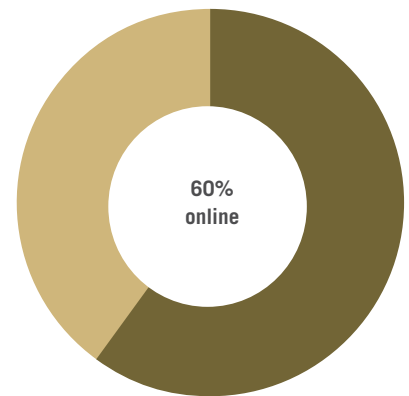
However the remanufacturing business



Ritchie Brothers gross proceeds from auctions



Ritchie Brothers bidder registrations



has expanded to include complete machine rebuilds from some manufacturers. Customers can either bring their own used equipment in to be remanufactured, or look at used machinery from the dealer that would benefit from a thorough overhaul prior to purchase. Indeed in larger quarrying and mining operations planned rebuilding and remanufacturing have become part of the regular preventative maintenance programme, ensuring longer service life, with less chance of costly and time-consuming breakdowns.

This is often a tailored solution, with the customer, dealer and manufacturer agreeing exactly which components are to be replaced, repaired or upgraded. This will usually involve a complete nut and bolt rebuild, with frame and chassis components undergoing stress tests to assess wear and tear before being rebuilt.

Costs will vary depending on condition and hours, but overall the customer will pay considerably less than a new or even a young used machine for the reman product, which will come with that all-important manufacturer warranty and be ready to start a second life in virtually as-new condition.

ONLINE EXPANSION

There has been no let-up in the used equipment market as far as the big auction companies are concerned. US firm Ritchie Brothers is perhaps the best known of the international auction organisations. It sold \$1.2bn of equipment in the first nine months of 2014, a 16% rise on the same period the year before.

Perhaps the most telling statistic from the firm's results however is that 41% of gross auction proceeds within that period came from the online marketplace, with 60% of bidder registrations now internet-based. What's more, Ritchie Bros passed \$1 billion year-to-date online sales by September 12 in 2014, almost a month earlier than it did in 2013.

Sales demand has not just come from the firm's US operations either. At a sale in Romania in September the firm sold 630 pieces of heavy equipment, to buyers registered in 53 countries. Of that number, online buyers purchased 24% of the machinery.

"The selection of equipment at our auction in Romania included premium-brand wheeled loaders, dozers, dump trucks, hydraulic excavators and more," said Nicola Nicelli,



FAR LEFT: Older units can still give valuable service if they have been well maintained
LEFT: Large items of equipment attract heavy bidding at auction
BELOW: Auction companies have seen strong business for heavy equipment

vice president of sales for Southern Europe. “Instead of selling these items at one of our own sites, we brought the auction to the seller’s location, where the equipment was situated. By offering on-site and online bidding options and a diverse selection, we attracted local and global buyers, which resulted in strong price levels across all equipment categories.”

Auctioneer IronPlanet takes this a step further, by operating as a complete online auction facility. The seller simply makes the equipment available for inspection by IronPlanet, which then publishes the inspection reports online. Buyers can review the inspection reports and place bids in the run up to the auction.

After the auction has been completed the company then brings together the buyers with potential finance providers and shipping and transportation companies. As IronPlanet is backed in part by Caterpillar, Komatsu and Volvo, buyers have the assurance and confidence to bid online.

The most recent development from IronPlanet was the introduction in the summer of 2014 of allEquip, a buy-it-now online marketplace for used machinery.

“IronPlanet’s allEquip offers online buyers the convenience of a ‘buy now’ marketplace for the ready-to-work equipment they need now,” said Greg Owens, ceo of IronPlanet.

“Buyers can purchase equipment online today and every day at competitive prices, with confidence, knowing the equipment was inspected and guaranteed. We are committed to making the buying and selling of equipment faster and easier.”



It is not just the auctions that have gone online either. With an increasing number of used machine sales being carried out through authorised new machinery dealers, Volvo is the latest manufacturer to introduce a mobile phone and tablet App with an Approved Used search function.

“We know that more and more customers are searching for used equipment by way of mobile devices,” said rental and remarketing director for Volvo CE’s EMEA region Nick Rose.

“Up to 40% of current searches for used equipment are via mobile devices, so this app puts Volvo CE and our dealers in a prime position to meet this need in relation to used equipment. The App will fundamentally change the way in which customers search for and purchase used equipment. As they will be dealing directly with the dealer, they will also potentially have access to other dealer offerings, such as finance or warranties.”

EMISSIONS RESTRICTIONS

As new machinery in North America and in Europe has had to comply with ever more stringent emissions regulation, there has been a

growing concern in the used equipment sector that problems lay ahead. Many engines that conform to US EPA Tier 4 Interim/EU Stage IIIB standards are equipped with ultra-high fuel injection pressures and common rail injection systems, often with diesel particulate filters (DPF) and diesel oxidation catalysts (DOC) or with exhaust aftertreatment such as selective catalytic reduction (SCR) and exhaust additive fluids.

To function correctly most of these systems require ultra-low sulphur fuel, which is simply not readily available in many emerging markets. It was feared that it would therefore be difficult to export much of this machinery when it became available on the used market to these countries, as the engines would soon be damaged and unable to run correctly on higher sulphur fuels.

As an example, there are currently more than 178,000 Caterpillar Tier 4 Interim machines working in highly regulated countries. But customers in non- or less-regulated countries have been showing growing interest in this equipment on the used market. Bear in mind that is just one manufacturer.

Machinery and engine builders have of course been working hard to solve this dilemma and since December 2014, Caterpillar dealers in certain countries have been able to remove exhaust aftertreatment, modify and decertify engines under 130kW (174hp) for resale in less regulated countries (LRC) and non-regulated countries (NRC). Engines above that power output have been deemed suitable for non-regulated country use without modification.

“Because Caterpillar serves customers in all markets, we develop products to meet the needs of customers in all types of regulatory environments,” said Ramin Younessi, vice president of the firm’s Industrial Power Systems division.

“For example, all non-road equipment operated in the US, Canada, Europe and Japan must operate on ultra-low sulphur diesel fuel. When equipment developed for certain markets, like our Tier 4 equipment moves to different markets, it adds challenges for Caterpillar, our dealers and our customers. Challenges arise due to diverse emissions regulations, the need for dealer readiness training and the need to help customers

→ understand how to operate and maintain these next generation products,” he said.

“Most importantly, customers contemplating the purchase or modification of used Cat Tier 4 products need to understand and comply with their local regulatory requirements.”

“In keeping with our aggressive product migration strategy, Caterpillar identified used products and geographies as higher probability recipients of used Tier 4 Interim products,” added engineering manager Rick Jeffs.

“We have therefore focused our design and development efforts for this first series of modification processes to align with those higher probabilities. Using those same priorities and probabilities, Caterpillar has also been preparing dealers to support the migration of used Tier 4 Interim products to those targeted geographies.

“Further, we know Tier 4 Final products won’t be far behind the Interim products, which is why the strategy we’ve developed focuses on a solution for today’s customers and for future customers.”

Local Cat dealers in LRC and NRC territories have undergone the necessary service training to support Tier 4 products. They have also taken stock of the required parts, such as optional fuel filtration kits to ensure that machinery can be sold and run in those countries.

“Buyers can purchase equipment online today and every day at competitive prices, with confidence, knowing the equipment was inspected and guaranteed”

Greg Owens

“When you select Cat Tier 4 products that require modification to migrate to lesser- and non-regulated countries, the authorised modification processes must be done

exclusively by a local Cat dealer trained to support the products,” said Mr Jeffs

“Migration is a complex issue, and potential customers of popular Cat equipment will have new purchase and support factors and issues to consider. They will find their Cat dealer an invaluable resource and the safe source to consult with on whether the used equipment they are considering for purchase or sale will operate effectively in their region, and if an aftertreatment modification process is permitted or needed.”

JCB was one of the first manufacturers of engines and equipment to offer a de-emissioning process for its Tier 4 Interim Ecomax engines, though it was able to work from a different starting point as none of

its engines used a DPF to meet emissions regulations. It is important to state that this is complete de-emissioning though, not de-tiering to a lower emissions level. What’s more, this one-way process cannot be reversed, as it involves recalibration of the engine’s ECU and the fitting of a new engine number identification label.

It is therefore important that an international contractor doesn’t go down this route for an overseas contract thinking that they will bring the machinery back to a regulated territory once that job has finished. It won’t be possible.

JCB’s Power Systems division has developed a secure recalibration for the ECU, which is time-limited and specific to that individual engine. The software shuts off the engine’s Exhaust Gas Recirculation (EGR) valve and reduces fuel injection pressures for improved durability.

There is no requirement for the dealer to remove or install any other new parts, other than a fuel lubricity filter in regions where the fuel quality does not conform to the EN590 standard. The dealer technician also removes one fuse from the machine, to prevent the ECU from testing the operation of the EGR valve prior to engine start-up.

The de-emissionised engine offers the same power and torque outputs as the standard Tier 4 Interim Ecomax and requires no additional service or maintenance work, other than changing of the lubricity filter when required. A lubricity filter helps to protect the fuel system against premature wear when fuels have poor lubrication capabilities.

It seems likely that any engine and equipment manufacturer that wants to continue to compete on the used market will have to follow suit and introduce a means to de-emission their equipment for the market in this way, allowing the transfer of modern, highly productive machinery to markets around the world. □

There has been no let-up in the used equipment market as far as the big auction companies are concerned



LEFT: The auctioneer in action

PRESSURISING BITUMEN DEVELOPMENTS

A raft of global pressures is driving developments in the materials and equipment we use for the handling, storage and treatment of bitumen. The goal is to achieve better performance and longer life for less financial outlay, and at the same time overcome the challenges of inconsistent and varying bitumen supplies. *Kristina Smith* reports

There's never been a more exciting time to write about bitumen, with change on almost every front: the sources and therefore the chemical make-up of bitumen is changing, the way it is traded and moved around are changing and the ways we are modifying and using it are changing. And all these things are interlinked.

For those specialist manufacturers supplying equipment, technologies and additives for bitumen, the challenge is to come up with solutions that accommodate these changes while meeting the needs of the regions they are supplying. Getting more for less is a common theme, with budgets tight in almost every corner of the world.

The pressure to limit environmental impact is there too, though the focus is much broader than just reducing carbon emissions. Decisions are based on economic benefit: how a technology can save the owner money as well as carbon over the life of a road.

Looking around the world, we tend to find the innovators in developing rather than developed countries. "In West Africa, they are going straight from a gravel road to a high-quality paved road in one step, skipping 40 years," said Anders Marschall-Mouritsen-Mouritsen, CEO of DenimoTech. "They really want to invest in new technology right away."

In Brazil, too, contractors are also adopting new technologies, although the motivation is somewhat different. Many of the road projects there are being financed through PPP models, with concessionaires developing, maintaining and operating the roads for 25 years.

"Our strongest market is in South America and specifically Brazil," said Bob Klutz, senior research scientist at Kraton Polymers which makes HiMA (highly modified asphalt), a polymer-modified bitumen which can take significantly more polymer than a standard one.



"There you have a private entity which is much more focussed on the long-term picture, and which is less reluctant to adopt new materials. They have been much quicker to put down trials and then, once the material has been successfully trialled, to move forward onto full projects."

THE NEW BITUMEN

The last five years have seen a profound change in the way bitumen is produced and distributed. Bitumen is a by-product of the oil refining process, traditionally the residue left over after all the higher-value lighter fractions such as petroleum gas, petrol and diesel have been distilled out.

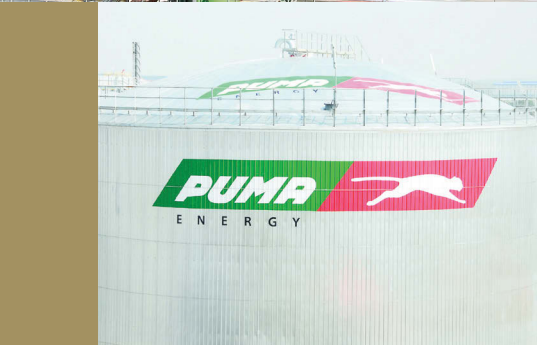
However, many refineries just aren't producing bitumen anymore, because oil companies began to demand that they become profitable businesses in their own rights, rather

ABOVE: A Bitumen tanker at sea

than just a cog in the oil processing wheel. Older, less efficient refineries, particularly in Europe and Australia, have been closed down as new, efficient refineries in Asia start up.

Since 2010, 12 European refineries have shut down with several more under threat of closure or reduced operation. Russia, which has traditionally been Europe's key supplier of crude oil, is now looking to build a pipeline to China.

Other refineries have been fitted with technologies which allow the residue that would have gone to bitumen to be broken down further to produce more profitable products. Bitumen today may well be a blend of several different feedstocks which means the chemical composition of the bitumen will vary. →



ABOVE & LEFT: *Langsat Terminal in Malaysia*

Malaysia, and one in Matilda, Mozambique with a further six due to open in 2015 in Dagenham, UK, Chile and four other locations.

Puma chooses locations close to areas of high demand, at ports which can accommodate the size of ship required. “We are looking to connect the supply points with the demand points. And that requires large vessels and large terminals that can receive them,” said Ellisor.

Bitumen vessels are specialist craft, expensive to construct and operate because they have to continually heat the bitumen. At the other end of the scale, cheap-and-cheerful ways of transporting bitumen have been developed: in bags or blocks from 1tonne right down to 25kg.

“Over the past four to five years we have had a lot of requests from customers, mostly in Africa, who require the equipment to melt the cold bitumen,” said Diego Massenza, director of Massenza which manufactures specialist bitumen equipment including PMB and bitumen emulsion plants. “We’ve developed new types of plant to handle the new packaging.”

Manufacturer Poerner invested in a new form of 1tonne bitumen bag, which it has supplied, together with cooling and packing units to refineries in Iran, Bosnia and Russia. At the other end of the chain are small

contractors or asphalt mix suppliers with the melting equipment.

Political forces may also have an impact on the increased use of bitumen blocks. As Iran waits for sanctions to be lifted, much of its bitumen finds its way in blocks to warehouses in the Gulf region to be bought by traders and sold on.

MORE FOR LESS

Many newer bitumen technologies which are gaining traction around the world are touted as beneficial to the environment: warm mixes, mixes containing RAP (recycled asphalt planings) and those using ground tyre rubber. Those successfully adopted make economic sense for the road owner and the contractor, in capital cost terms, although the jury is still out on the whole-life cost-efficiency of some ‘environmentally friendly’ solutions.

Warm-mix asphalt (WMA) is widely used in the US, encouraged by the Federal Highway Administration (FHWA). WMA mixes require less energy to create them and produce less harmful emissions during manufacture and laying. They are also more suited to long-haul situations and colder climates as they lose heat at a much lower rate than hot mix asphalt (HMA).

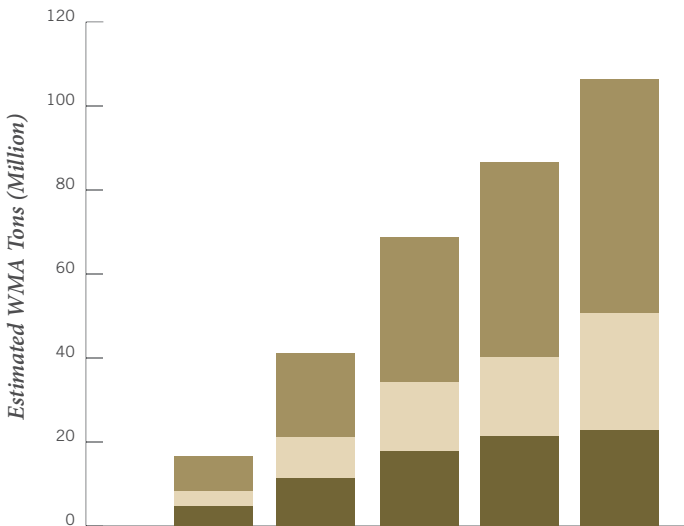
In the US, WMA now accounts for over 30% of the total asphalt mixture market (see graph

→ Then there is the impact of the US producing its own shale oil and tar sands, and refining to produce bitumen which is then exported. “The US is refining increasing amounts of shale oil and tar sands in lieu of petroleum. The bitumens produced from these different sources are different as well and we really don’t know their long-term performance characteristics,” warned Klutetz.

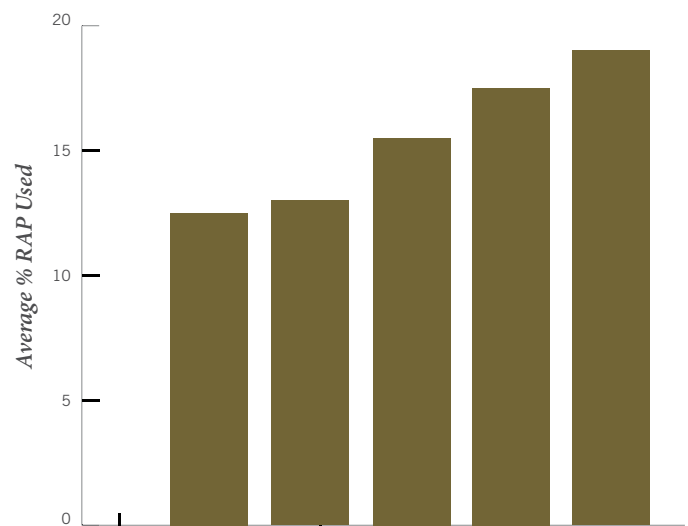
As well as question marks over their long-term performance in roads, these bitumens are also travelling much further distances. “We have a situation where production is more centralised in some places, and there are large consumption areas where there are no producers,” said Jonathan Ellisor, global supply manager for Puma Energy.

Puma Energy owns and operates seven bitumen vessels and either owns or leases 16 different bitumen terminals around the world. It recently opened a very large terminal in

1. Estimated WMA Tons



2. Average Percent RAP Used by DoTs



Year	2009	2010	2011	2012	2013
DOT	8.55	19.99	34.60	46.41	55.68
Other Agency	3.60	9.84	16.29	18.86	27.85
Commercial & Residential	4.55	11.31	17.81	21.35	22.78

1), according to the National Asphalt Pavement Association's (NAPA) fourth annual survey. The main factor behind its meteoric rise in popularity is a system which sees contractors paid a bonus for achieving better compaction.

Companies supplying warm mix technology, such as Total, CECA-Arkema and MeadWestvaco, hoped that WMA would also take off in Europe, but that hasn't happened. Without any bonuses for compaction, it seems that the economic case is much harder to make, although the possibility of combining both warm-mix and RAP could tip the balance.

NAPA's survey also maps the rise in the use of RAP in the US, a 21% increase in the amount used between 2009 and 2013. The proportions of RAP used vary but is rising (see graph 2), with many specialist suppliers offering additives which they claim allow for higher and higher percentages to be accommodated.

In 2014, biorefiner Arizona Chemical introduced a product called Sylvaroad RP1000 which the company claims can take up to 75% RAP in a mix, while Italian additive specialist Iterchimica has produced an additive called Iterlene ACF 1000 HP Green devised to use 100% RAP in a cold mix for the repair of potholes.

Though waste tyre rubber has been used in pavements for over 50 years, particularly

in the US, Australia and South Africa, new technologies may start to increase its uptake. The challenge is to develop solutions which don't require costly modifications to mixing plants, but which allow the rubber to chemically modify the mix.

“There are concerns about whether the roads will have good durability and actually perform as we expected”

Bob Kluttz

There are two ways to use rubber. The 'dry' process involves adding granules to the mix and brings limited improvements in performance. The 'wet' process sees the ground rubber added to bitumen at around 200° and mixed intensively for around an hour, resulting in a new modified binder with much greater performance improvements.

One recent development combines bitumen, ground tyre rubber (GTR) and mineral filler into pellets which can be used without modification to existing asphalt plants. Developed by Phoenix Industries in the US, Billian UK began manufacturing them in the UK in 2014. Tests have shown that the resulting mix behaves similarly to one modified with an SBS polymer.

Another solution from Lehigh Industries, which produces micronised rubber powders, and additive specialist Rheopave combines the rubber powder with a polymer blend called X10 which allows the rubber to be suspended evenly through the mix, so that it doesn't have to be constantly agitated, according to Lehigh.

There is a big challenge, however, linked to the use of any of these 'new' materials which are being added to mixes. Specifications have all been written in relation to traditional, unadulterated bitumen.

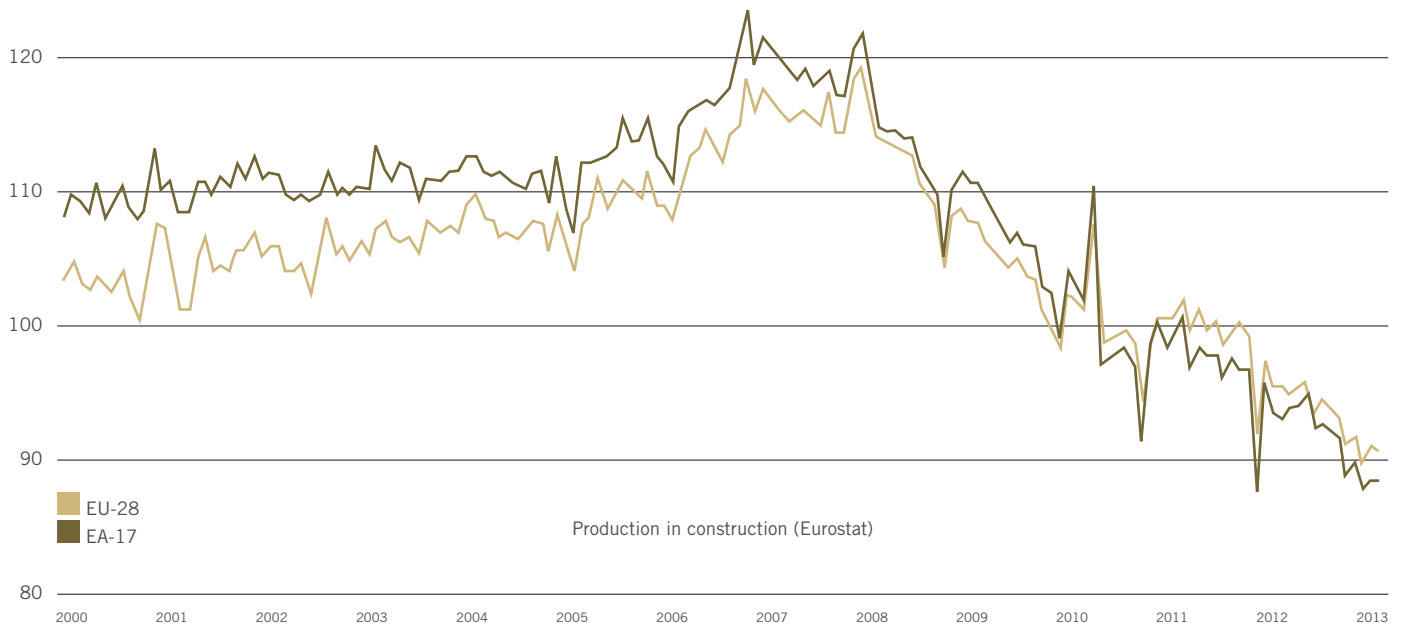
“There are concerns in the industry around the various materials that are being added to bitumen: whilst they appear to meet the specification properties, there are concerns about whether the roads will have good durability and actually perform as we expected,” said Kluttz.

“No matter how performance-related your specs are, they all have a very much empirical component which has been designed around



3. The impact of the recession on road budgets

Source: IBEF (The International Bitumen Emulsion Federation)



→ real bitumen. The more you change bitumen, the less reliable the ‘related’ part of the performance-related becomes. This is very much an issue for all of us.”

The result is that roads are failing sooner than expected. “In the US they are seeing less and less rutting on the roads because they are adding more and more RAP,” said Dr Haleh Azari, manager of the AASHTO Advanced Pavement Research Laboratory (AAPRL) at the National Institute of Standards and Technology (NIST). “On the other hand, roads are failing with fatigue cracking and very early ageing. They try to counter that by adding rejuvenators, but there is often a high variability in the mix leading to spots where the road fails.”

Azari, with Dr Alaeddin Mohseni, president of Pavement Systems, is developing a suite of new tests which can determine the performance of mixes containing materials such as RAP, RAS, warm mix additives and ground tyre rubber. “The problem is that the current tests cannot determine the performance of new materials,” said Azari.

PAVEMENT PRESERVATION

In June 2014, 27 roads in the south-west UK county of Devon were closed by the local authorities. The signs placed by the roadsides read: “Danger. Road is unsafe to travel on due



ABOVE: “We are looking to connect the supply points with the demand points. And that requires large vessels and large terminals that can receive them” - Jonathan Ellisor

to the road surface condition”.

The closures in Devon are an extreme illustration of the budget difficulties and decisions that many road authorities around the world, are facing. The graph (see graph 3) illustrates starkly how road budgets in Europe have declined over the past seven years.

“This isn’t only a problem for Europe, the lack of funds is everywhere,” said Etienne Le Bouteiller, technical and development manager at Colas and executive director of International Bitumen Emulsion Federation (IBEF). “Look at China and India, for example. They started building their road networks 10, 15, 20 years ago. After 10 to 15 years of high traffic, quite often overloading, the road needs maintenance. They are facing big problems because they have to spend a lot of money.”

Le Bouteiller is championing the first Pavement Preservation & Recycling (World) Summit (PPRS) due to be held in Paris in February 2015. Interest looks to be worldwide with delegates and speakers from 33 countries including Europe, US, South Africa, Japan, Thailand, China and other parts of Asia signed up by the end of 2014.

In the US, the pattern of underfunding and deterioration is the same. “The construction of our US interstate highway system was completed in the 1980s. Since that time, the lane miles have increased by around 10% while

RIGHT: Poerner bags provide one aspect of the new bitumen technology

traffic has increased by over 200%. Our roads are falling apart, not because we are doing a bad job but because we are putting a lot more traffic on them,” said Kluttz. Meanwhile, the US’s gasoline tax has not increased since 1993 while the loading on the roads has increased. “Effectively funding is going down while the need is going up,” said Kluttz.

Road owners must take a more proactive approach, urges Le Bouteiller, developing long-term strategies, known as pavement management systems. Le Bouteiller cites the UK, South Africa and Australia as countries which already have pavement management systems in place; elsewhere the practice is less developed, he said.

The principle of a pavement management system is applying the right treatment to the right road at the right time. In simple terms, the longer you leave a road untreated, the more expensive any work will get (see graph 4).



POLYMER MODIFIED BITUMEN PLANT



QUALITY HAS A NAME

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→ In the US, there has been an increasing focus on preservation strategies over the past five years. “It is still a work in progress,” said Kluttz. “There are many, many types of treatment, they all have varying costs and their relative costs vary from one place to another. There is no fixed answer for everybody.”

Kraton is one of several companies involved in a trial at the National Center for Asphalt Technology (NCAT) in Alabama which is looking to define how much extra time a variety of treatments can give a road. Kraton’s 4.75mm HiMA thin overlay is being put through its paces on one of 25 sections, with results from the first cycle of trials expected in March 2015 at NCAT’s Track Conference.

Hand-in-hand with more sophisticated management programmes must come more sophisticated treatments, said Le Bouteiller: “We need to improve the existing technologies that we have.”

Using polymers is one such solution. In the UK, where chip seal – bitumen emulsion sprayed onto the road followed by chips of rock – always includes polymer modified bitumen, surfaces do last longer. “I converted the last county [to polymer modified bitumen] three years ago,” said Steve Waller, sales manager for Nynas. “They immediately saw the benefit, with fewer failures and fewer problems.”

Le Bouteiller highlights other new technologies aimed to extend the life of a surface treatment, such as fibres added to chip seal and microsurfacing layers and fog seal containing fine fractions in the bitumen emulsion. However, more sophisticated technologies depend on the quality and consistency of materials used, warned Bouteiller:

“When you want to make a good cake, you need to use good ingredients,” he says. “Just because bitumen meets the specification does not mean that it is suitable: there’s a difference between conformity and suitability.”

A QUESTION OF CONSISTENCY

One of the biggest challenges facing asphalt mix producers, contractors and ultimately road owners is the variability of bitumen out there on the global market. Buying bitumen which appears to meet the specifications, but which could have come from almost anywhere in the world, is introducing new risks.

Large price differentials between different areas have tempted a new group of bitumen traders onto the scene. Some of these are simply entrepreneurs looking to exploit a possible opportunity with no specialist knowledge.

Bitumen is now almost being traded as a commodity with bitumen hedging, offered by firms such as Global Risk Management becoming more widespread, particularly in Europe, Southern and Northern Africa.

As an antidote to this situation comes a new breed of bitumen specialist. One is Albr3cht Supply Concepts, run by ex-Nynas man Frank Albrecht who uses his specialist knowledge of bitumen to work with refineries which need to make a profit from their residues and links them up with asphalt mix producers who need a sustainable, predictable supply of bitumen.

“In these markets, we can really raise the quality and reliability of the binders”

Marschall-Mouritsen

Another is Bitumina, a group of vertical bitumen companies which works with refineries through the whole bitumen chain. Its newest concept is bituterminals. With all the equipment needed to transform bags of bitumen into any form of binder, including emulsion and polymer modified bitumens,

bituterminals will also offer pavement design, specification expertise and a surety of bitumen supply.

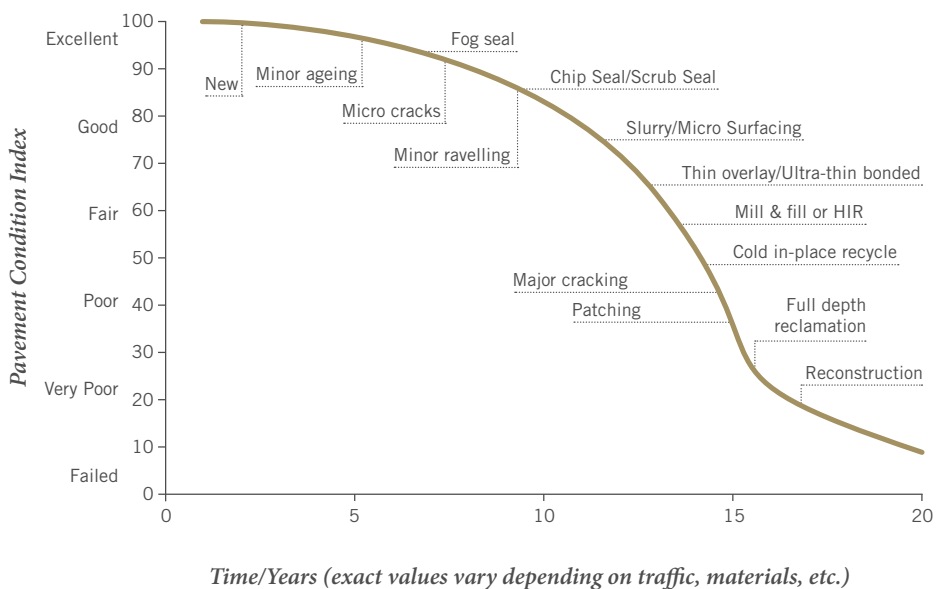
The first of these is already operational in Bolivia, with others, which will operate on a franchise model, planned for Mongolia, Ghana and Indonesia. “These are countries with attractive growth rates but whose economies are too small for the huge oil conglomerates,” said Marschall-Mouritsen whose company Denimotech is part of the Bitumina group. “In these markets, we can really raise the quality and reliability of the binders.”

Marschall-Mouritsen believes that this form of total technology solution, is the way forward. Once a colloidal mill specialist, Denimotech has vastly expanded the range of equipment it offers over the past three years, as well as opening manufacturing bases outside its native Denmark, with plans for more.

The strongest message to emerge as a result of all these changes is that bitumen is not just bitumen. The traditional model for the supply and consumption of bitumen, where the asphalt mix producer receives a steady supply from its nearest refinery is gone.

New models must take into account the variability of bitumen on the world stage, must understand the differences in bitumen and what works best where, depending on pavement designs and specifications, and must have the flexibility to process and treat bitumen accordingly. Exciting times indeed. □

4. Solutions from the bitumen industry



AGILITY IS THE NAME OF THE GAME

As 2014 drew to a close, the news from those involved in most sectors of construction, including construction equipment, was more positive than for some years writes *Patrick Smith*

While worldwide for 2015 a crystal ball would be helpful, in Europe the sector has already listed specific priorities it wants to tackle, and among these are the upcoming emissions regulations (see separate story), external trade and access to foreign markets, and market surveillance.

And an infrastructure investment package worth some €300 billion, unveiled by European Commission President, Jean-Claude Juncker, can only help construction equipment manufacturers, as can other major construction investments throughout the region. But one of the more telling statements on where we are at in Europe, and elsewhere, came at the Committee for European Construction Equipment (CECE) Congress in Antwerp, Belgium, towards the end of 2014. It took as its theme the Construction Equipment Industry in an Agile World.

Indeed, agility, and the need to be flexible, was a recurring theme of the congress as speakers emphasised that since the economic events of eight years ago, the world is now a much different place in which to do business.

CECE is well placed to review and respond to such changes, representing and promoting the European construction equipment and related industries towards the European Institutions; coordinating the views of national sector associations and their members, and working with other organisations worldwide

“A strong industrial manufacturing base is important for economic resilience and growth”

Eric Lepine



ABOVE: New regulations from the EC will see exhaust emissions on off-road construction equipment reduced dramatically by 2020

to achieve “a fair, competitive environment via harmonised standards and regulations.”

The European construction equipment industry consists of around 1,200 companies and employs 130,000 persons directly, with the same number in sales and services, and in 2013 had a turnover of €25 billion from European production.

CECE is a network of 16 member associations in 14 countries, including Russia and Turkey, and holds office in Brussels, the Belgian capital, and seat of European Union (EU) power.

“A strong industrial manufacturing base is important for economic resilience and growth,” says Eric Lepine, CECE president, who is managing director of Caterpillar France.

Dr Rikard Mäki, director, technology planning and public funding, Volvo Construction Equipment, said that population and infrastructure growth is fuelling construction equipment growth with the environmental stress requiring sustainable solutions. He said the largest growth is coming from the emerging markets, as will new competitors, and with dual markets to serve there is a complexity in products and manufacturing, although technology is growing at an exponential rate enabling numerous possibilities.

For example, real-time communication is an enabler for active safety; site automation; site resource utilisation optimisation; optimised energy consumption, and machine awareness of surroundings. →

→ While connected vehicles are coming soon, there will be challenges to manage and several areas require industry collaboration, including investment and product cost; system reliability; system compatibility (mixed fleets); standardisation, and regulations.

As part of the 2020 Strategy for Smart, Sustainable and Inclusive Growth, the EU vowed to lift the share of industry in Europe's gross domestic product (GDP) to 20% by 2020. However, the ratio of industrial production appears to be developing negatively rather than positively, from 16% in 2011 to 15.1% in 2013.

"We fear that this issue will be downplayed. To win in Europe, we will need a concerted effort by business, policymakers and other

stakeholders in society," says Lepine.

Late last year he underlined that the construction equipment industry is willing to play an active part in reaching the goals set by the EU, but EU policy-makers must set the right framework conditions, providing business with planning certainty, coherent policies, access to finance, room for innovation and facilitating the access to foreign markets.

"We urge the European Commission to confirm and even upgrade the industrial production target..." says Lepine.

Investment in infrastructure in Europe will also be necessary to boost sales of construction equipment, and the CECE welcomes the €300 billion investment package unveiled by Commission President Juncker (see separate story).

"We are happy that the machinery industry has now been included in the TTIP negotiations between the US and the European Union," says Lepine.

The TTIP (Transatlantic Trade and Investment Partnership) is primarily a deal to cut tariffs and regulatory barriers to trade between the US and European Union countries and to make it easier for companies on both sides of the Atlantic to access each other's markets.

The construction equipment industry will benefit in particular when it comes to regulatory convergence and harmonisation of technical and environmental requirements applying to machines, to public procurement liberalisation and to third world countries' market access for remanufactured products. If successfully negotiated, business would be made easier and costs reduced for manufacturers acting on a global scale and for customers alike.

There would no longer be the need to provide additional certificates, testing procedures and documentation. Change of machinery components and constructive adaptations of the machines could be done more easily.

According to calculations made by one of the CECE member companies, costs of a machine for the US market today are more than 17% higher than those for the same machinery type operating in Europe.

Meanwhile, the star performer among the European construction equipment markets in 2014 continued to be the UK, where earthmoving equipment sales grew by 44% in the first half of the year compared to the same period a year before.

Among initiatives, JCB Finance saw a new £60 million (€76 million) fund to support



ABOVE: JCB Finance's €76 million fund helped to support construction machinery purchases

BETTER SURVEILLANCE

The presence of non-compliant machines on the market, and thus of unfair competition, has been a concern for the sector for many years.

Some companies spend 70% of their R&D to comply with EU directives on environment, safety and other technical requirements of European legislation.

"The legislation must therefore be properly enforced and policed," says Eric Lepine.

According to a CECE survey, one out of three companies faced losses in sales because customers opted for a non-compliant machine.

In February 2013, the European Commission issued a legislative proposal which was amended by the European Parliament. But since then, the package is blocked in the EU Council and no change is expected before March 2015.

"This is a situation we regret, especially because only such slow progress is made here."

CECE is calling on the new European Commission to include the issue in its new agenda for jobs and growth. The well-functioning and protection of the internal market is key for achieving the EU growth agenda.

"Furthermore, restoring the level playing field in the Single Market through an improved market surveillance system will enable a shift from price competition to a competition on quality, reliability and efficiency."

"We aim to help non-road mobile machinery suppliers, a key industrial sector, to reap the full benefits of the internal market"

Ferdinando Nelli Feroci

construction machinery purchases, which was launched as a survey revealed UK builders are at their busiest for 20 years.

"Our new Buy Now Pay Later scheme for machines delivered by 31 December, 2014, will help reduce our customers' bills and improve their cash flow as payments only need to start in March 2015," says Paul Jennings, JCB Finance managing director.

The Construction Products Association (CPA) envisages a 5.3% growth in construction output in 2015, primarily due to a recovery in private housing and commercial sectors, in addition to a return to growth in the public sector, but in comparison, the British Chambers of Commerce predicts UK economic growth of 2.7%.

Further figures from the CPA, in its Construction Industry Forecasts 2014-2018 (Autumn 2014 edition), predict private housing starting to rise 10% in 2015 (18% in 2014); public sector construction rose

by 0.9% in 2014 following five years of falls in output; roads construction to rise 46.1% by 2018, and energy infrastructure to grow 118.2% by 2018.

“In the long-term, growth rates are projected to slow to 3.7% per year, on average, between 2016 and 2018. These slower rates of growth reflect policy uncertainty following the May 2015 General Election, which may have an adverse impact upon construction output,” says the CPA in its report.

Apart from the UK, other Northern and Western European countries all recorded a robust growth in construction equipment sales as well, says CECE, while the Central and Eastern European countries developed unevenly with the Russian market continuing its heavy downturn due to the political situation, and also because of a cyclical downturn in the construction equipment industry.

In addition, players from Asia increasingly expand their business, although Turkey, once a promising market for the industry, saw double-digit declines for the fourth consecutive quarter.

CECE also noted that for the first time after the long dry spell, construction equipment sales in the Southern European countries including Italy, Spain and Portugal improved notably, “signalling that the European construction sector is now stabilising after

having hit the bottom, with positive effects on the construction equipment market.”

However, the majority of European construction equipment manufacturers report growing incoming orders, particularly from non-European countries, especially the Middle East, with Saudi Arabia being the growth engine in the region.

In terms of product groups, road equipment proved to be the best performing construction equipment sub-sector.

WORLD'S TOUGHEST EMISSIONS RULES

New regulations from the EC will see exhaust emissions on off-road construction equipment reduced dramatically by 2020.

The European Commission has published its long-anticipated proposal on exhaust emissions that will set standards for

construction equipment and other machinery that are the strictest in the world.

It involves a revision of the Directive 97/68/EC covering exhaust emissions reduction for engines installed in non-road mobile machinery (NRMM), setting standards for construction equipment and other machinery that are the strictest in the world.

The EC says the planned measures will cut emissions of major air pollutants from the relevant engines and cut the complexity of the legal framework for the sector.

At the same time, it sets out harmonised rules for placing those engines on the EU market.

Compared to vehicles for use on roads, NRMM covers a very wide variety of machinery typically used off the road in manifold applications.

RIGHT: Jean-Claude Juncker wants to raise €315 billion to boost industries, including construction and construction equipment.
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JUNCKER'S CUNNING FINANCE PLAN

Jean-Claude Juncker, former Luxembourg Prime Minister; a specialist in finance, and now the European Commission's new president, wants to raise €315 billion.

If successful, it is claimed this will create some 1.3 million new jobs over the next three years, and boost many industries, including construction and construction equipment.

The highly ambitious plan aims to entice pension funds, insurance companies and other large

investors to finance infrastructure projects in the European Union, and it will top the Commission's 2015 work programme.

“This is the greatest effort in European history to mobilise the EU's budget to trigger additional investment, and without changing the rules,” says Juncker, whose investment plan is the centrepiece of his economic agenda.

A project must be a public-private partnership (PPP), and the EU's 28 member states have already submitted a list of projects

totalling €1.3 trillion, although some of these projects are already not eligible.

Basically, the EC's plan seeks to create a European Fund for Strategic Investments, and this will be backed by €16 billion of guarantees from the EU budget and €5 billion from the European Investment Bank (EIB) who will house and manage the fund.

It is hoped that the total €21 billion will be leveraged 15 times over to more than €300 billion, the cash coming from large investors

from countries such as China, Singapore, Qatar and Abu Dhabi being targeted.

Few disagree that there is a need for better transport links, power grid connections, super-fast broadband, and school and hospital improvements, but the recent economic climate has meant that many such infrastructure improvements have been delayed.

With the new fund expected to be up and running by the middle of 2015, this could well change.

→ In the construction equipment sector the regulation applies to a wide variety of machines: from hand-held equipment to the largest mining machine; used to erect houses; build infrastructure; operate quarries, and provide emergency relief when natural disaster strikes. Even railcars, locomotives and inland waterway vessels fall under the scope of NRMM.

While CECE has welcomed the plans, it has called for calls for a balance between competitiveness and environment.

“We welcome that highly essential requirements are met, such as a predictable introduction pace and emission limits that acknowledge the vast technological progress made in the industry,” says Eric Lepine.

Indeed, CECE says the proposal needs further studying and refining, in particular with regard to further provisions for replacement engines and the concerns of niche equipment manufacturers.

It emphasises that the European construction equipment industry is working hard to provide its customers with machines offering the highest productivity and lowest environmental impact, but delivering the next generation of machines to the market in time “will remain a complex challenge.”

The EC says the new Regulation will replace a patchwork of 28 national laws on this matter, and will also repeal an extremely complex Directive comprising 15 annexes and eight amendments since it was adopted in 1997.

The EC says that besides improving air quality throughout the EU, the new proposal provides the NRMM sector with a predictable and stable regulatory framework that is fit for the future: a clear focus in this context was therefore put on international alignment of technical requirements, particularly with a view to bringing those of the EU and the US closer together. This will ensure a level playing field for European industry and avoid unfair competition from low-cost imports of non-regulated machinery.

Beyond that, the proposal is expected to alleviate the pressure on individual Member States for additional regulatory action at national level that would eventually hamper the internal market.

Key elements of the regulation for the sector are introductory dates of 2019-2020; limit values that will reduce emissions to extremely low levels, and an unprecedented rate of introduction across the entire power range of equipment, irrespective of combustion cycle and fuel.

“By simplifying the existing legislation,



ABOVE: The Russian market is continuing its heavy downturn due to the political situation

improving transparency and lightening the administrative burden, today’s proposal contributes to the competitiveness of European industry. We aim to help non-road mobile machinery suppliers, a key industrial sector, to reap the full benefits of the internal market and to help EU enterprises to be more successful abroad,” says Ferdinando Nelli Feroci, Commissioner for Industry and Entrepreneurship.

“At the same time, our proposal will lead to a very significant reduction of air pollution emissions and hence protect the health of European citizens. Good for business and good for the environment.”

The work started off with a public stakeholder consultation in January 2013, and included regular and intensive consultation of all the relevant stakeholders, including Member States, associations, industries and NGOs.

According to the EC, engines installed in NRMM contribute significantly to air pollution and are accountable for roughly 15% of the nitrogen oxide (NOx) and 5% of the particulate matter (PM) emissions in the EU.

Moreover, studies indicate that their relative contribution to the total NOx emissions could become bigger over time, should efforts and technical progress in the on-road sector not be carried over to NRMM.

Against this background, the Commission has proposed more stringent emission limits for the placing on the market of new engines installed in NRMM. In this way, NRMM with older, more polluting engines will be replaced over time, resulting in “a very significant emission reduction overall.”

The new regulation addresses major air

pollutants: nitrogen oxides (NOx), hydrocarbons (HC), carbon monoxide (CO) and particulate matters. As for the latter, it introduces in most engine categories (for the first time ever in the NRMM sector) a limit on particle numbers (PN) complementing the limit on particle mass (PM).

“In this way, emissions of so-called ultrafine particles will also be limited, taking up the most recent conclusive evidence on their adverse health effects,” says the EC.

The new regulations are expected to result in increased use of diesel particulate filters (DPFs) on engine exhausts.

The European construction equipment manufacturers, many of them niche producers or SMEs, already produce the cleanest and safest machinery in the world, but now need economy of scale to stay competitive in a global environment and maintain profitable manufacturing sites in Europe.

“The global market for highly regulated products is in comparative terms quite small. Europe cannot afford to deviate too much from requirements in other ambitious nations in this field”, says Lepine. “We urge the EU to maintain alignment in standards and limits with other regions, notably with the US, and actively promote worldwide alignment.

“Product cycles are long and product diversity is huge, putting a tremendous strain on development time.”

COMMODITY PRICE DROP

CEMA, the European association representing the agricultural machinery industry, says it expects the agricultural machinery market to drop by another 5-10% in 2015.

The organisation represents 4,500 manufacturers of agricultural equipment employing directly 135,000 persons and indirectly in the distribution and service network another 125,000 persons.

Following the boom of the past three years, demand for agricultural machinery in Europe weakened in 2014, according to CEMA.

“For 2014, we expect the market to be around 5% below last year’s level,” said Richard Markwell, CEMA president, during a press conference at the EIMA trade show in Bologna, Italy, late last year.

Nonetheless, the overall sales volume for 2014 will still represent the second highest level of machinery investment ever achieved by the European farming sector.

With an estimated volume of €26 billion for 2014, the European market will remain at the top position in the world, ahead of the US (€21 billion) and China (€14 billion).

Within the EU, market performance differs substantially: compared to last year, more than half (15) of the 28 member countries showed a lower demand for agricultural machinery in 2014, among them, the two key markets of France and Germany which, taken together, make up around 40% of the total EU market.

The recent decline in both markets has therefore had a major impact on manufacturers’ overall business performance in Europe.

Following last year’s (2013) boom, the market in France has performed particularly weakly in recent months, with investment volumes bouncing back to the long-term average. Italy remains in fourth position in Europe, yet continues to show a slight, though steady market decline.

“We really hope that the Italian farmers will soon be able to catch up again with their investments in advanced technology in order to remain competitive,” says Markwell in light of the persisting low sales levels for new machinery in Italy.

“We really hope that the Italian farmers will soon be able to catch up again with their investments in advanced technology in order to remain competitive”

Richard Markwell

Christoph Wigger, chairman of the CEMA Product Group for large tractors and combine harvesters, and CEMA Secretary General Ulrich Adam commented on the specific market situation for tractors and harvesters following the group’s meeting in Bologna.

Tractors make up one-third of the total European agricultural machinery market, and from January to September 2014, 119,000 new tractors were registered in the EU, which is 4% below the levels observed during the corresponding period in 2013.

“The extraordinary times on the biggest market, France, are over, and the manufacturers strongly feel that,” says Adam.

“At the same time, we are glad to see a recovery in Spain, a market which had dropped considerably in the past few years, as well as a ‘return to normal’ in countries such as Portugal and Greece which had previously gone through a deep recession.”

Tractor sales in Germany, the second largest tractor market in Europe, remained robust, with an expected sales volume of 35,000 units in 2014.

Combine harvesters represent around 6% of the total agricultural machinery market in Europe. Sales dropped by around 9% to 9,600 units in 2014.

“2014 brought challenging conditions on the field for arable farmers in certain regions,” says Adam, referring to the wet harvesting conditions in France and Germany, but also the record harvests in the main crop areas for grains and oilseeds, for instance, in the UK.

“There was an intense use of machines on the field, and we observed a higher last-minute demand in 2014.”

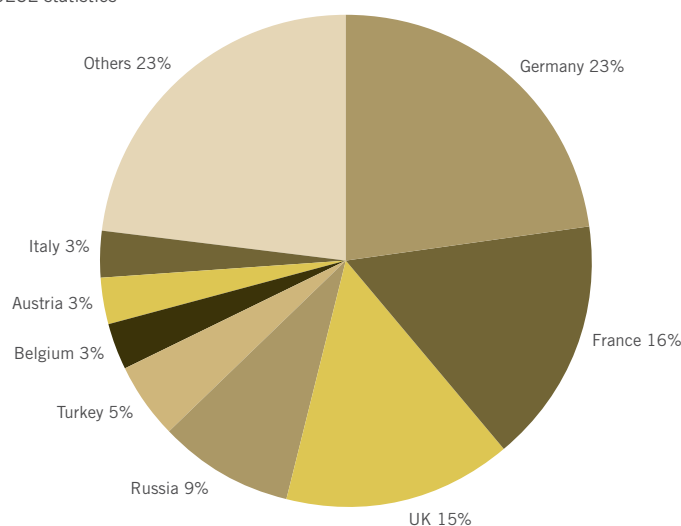
CHALLENGING YEAR AHEAD

Overall market conditions for agricultural machinery in Europe are expected to remain challenging throughout 2015. Manufacturers see the investment climate among customers adversely affected by the recent drop in agricultural commodity prices. In addition, the new rules for EU subsidy payments under the Common Agricultural Policy (CAP) to be introduced in 2015 will add further uncertainties, especially in Central European countries. As a result, CEMA expects the agricultural machinery market to drop by another 5-10% in 2015.

At the same time, the industry believes that worldwide trends, such as global population growth, urbanisation and climate change, will continue to structurally support demand for high-end farm machine technology in the years ahead. □

Share of sales (units) in the first half of 2014

Source: CECE statistics



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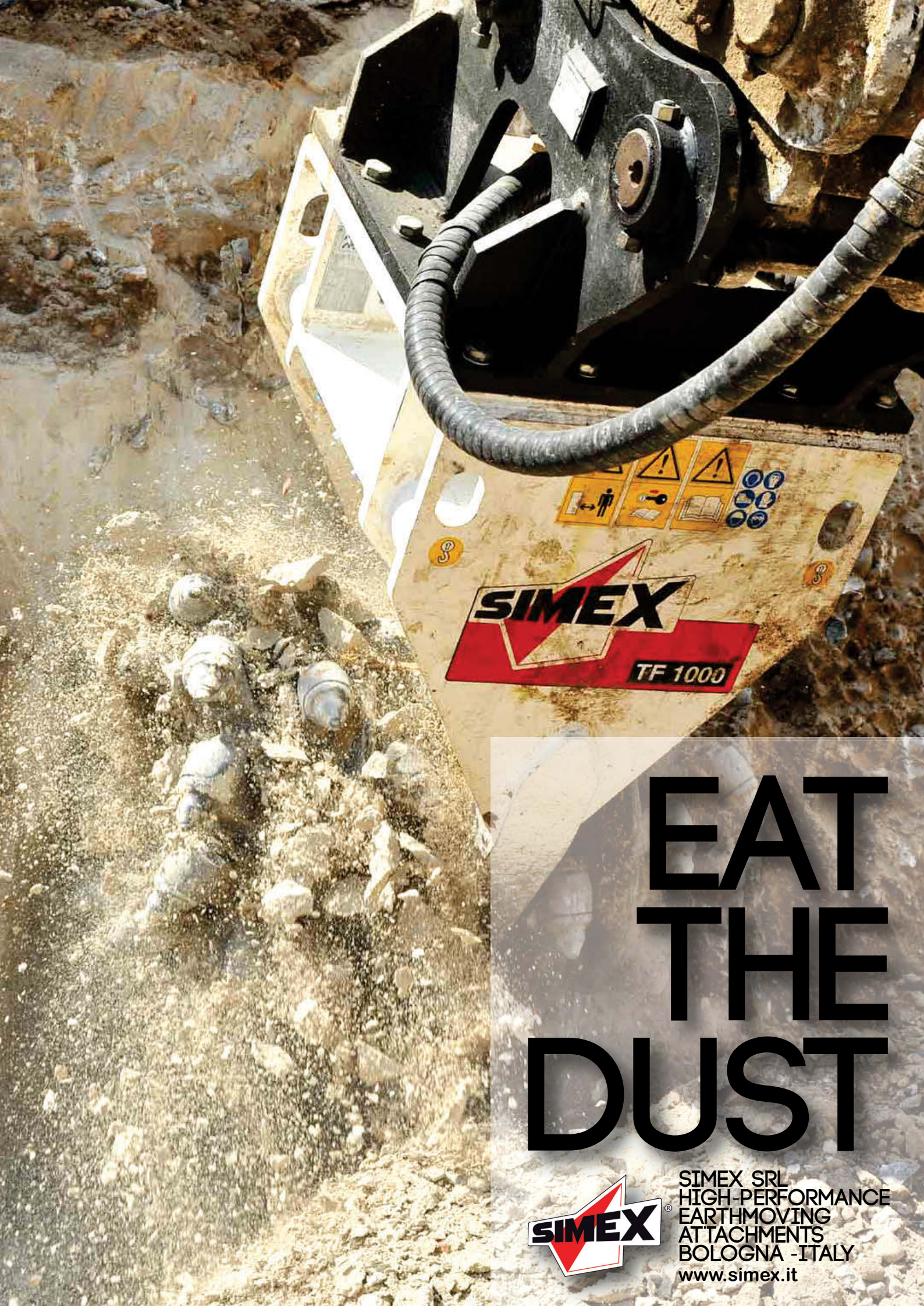
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