

MARCH 2018

iVT

INTERNATIONAL INDUSTRIAL VEHICLE TECHNOLOGY

CH₄ future

Can methane provide
a better low-emission
replacement for old
diesels than electric?

MARKET READY

ELECTRIC EXCAVATOR

Mecalac e12

NEW TECHNOLOGY

METHANE TRACTOR

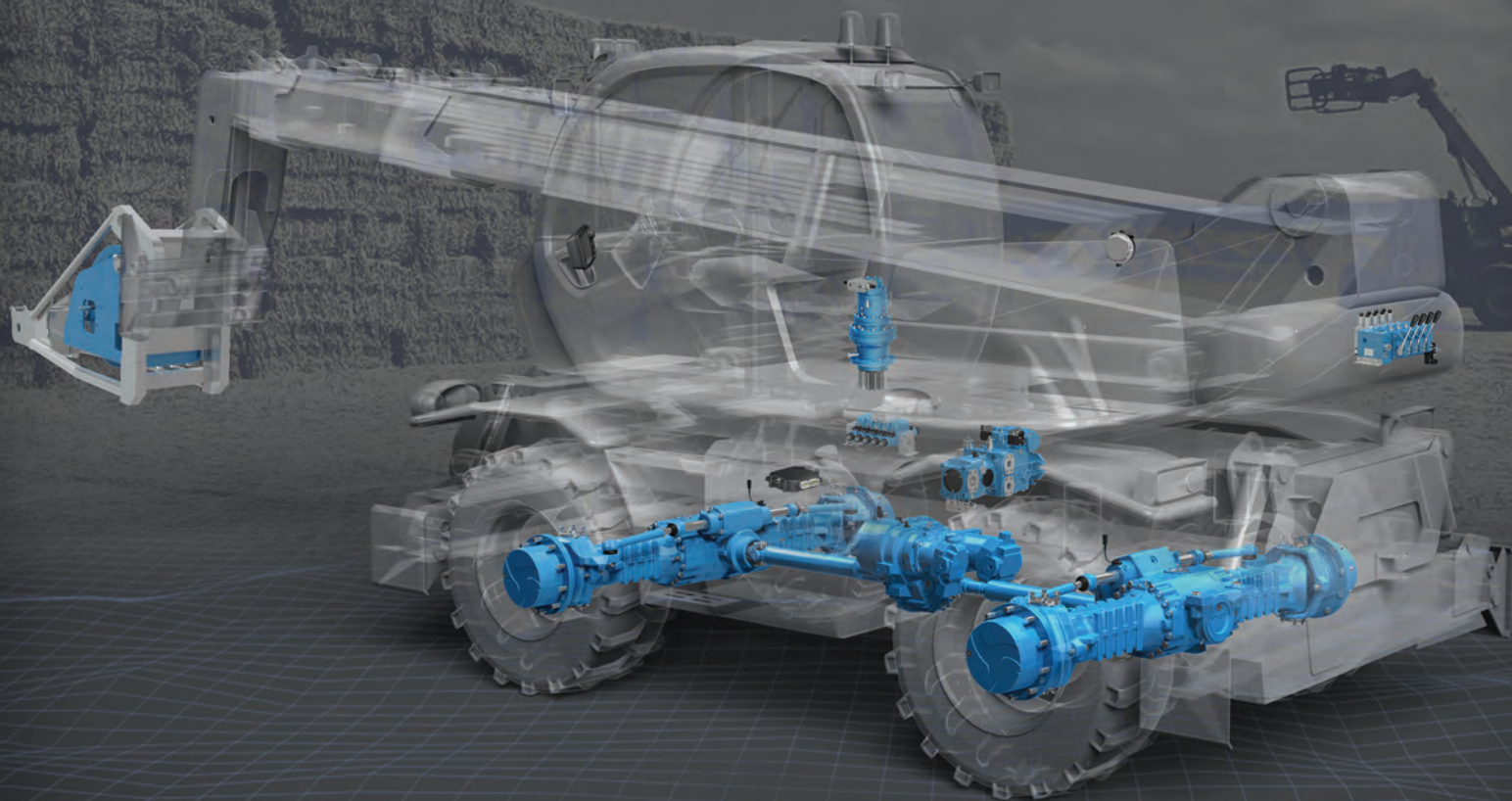
New Holland T6.180

LATEST INNOVATIONS

- | **Fendt** agri-robot swarms
- | **Hamm** operator assistance
- | **Claas** Torion wheel loaders
- | **Cat** electric mine loader

SHOW PREVIEW SPECIAL

- | **Intermat Paris**
- | **CeMAT Hannover**
- | **Agrishow Brazil**
- | **Hillhead UK**



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FOREWORD

One of the most exciting things about working in the industrial vehicle industry in 2018 is the current pace of change. Back in May 2017, I attended the London launch of Volvo Construction Equipment's latest prototype vehicle – the EX2 – the world's first all-electric excavator. It was an impressively innovative machine: the combustion engine had been replaced with two lithium-ion batteries, which were billed to generate 38KWh of power. In place of a traditional hydraulic system was all-electric technology, incorporating electromechanical linear actuators, to help to optimize the transmission chain. (When, at one point during the demonstration, a patch of oil was spotted under the vehicle, Volvo CE staff were relaxed, confident that it couldn't be a leak of hydraulic fluid – because there wasn't any in the vehicle to leak!). Overall, the EX2 was said to be able to deliver a tenfold increase in efficiency, while also reducing noise levels by as much as 10 times, compared with a similar-sized ICE excavator.

Despite the impressive credentials, Volvo pointed out that, "At this stage, the EX2 is purely a research project and there are currently no plans for industrialization." Indeed, when I told others in the industry about what I had seen, some wondered why Volvo CE was being so open about its concepts and not keeping cutting-edge research under wraps, when the vehicles it was producing were clearly so far from being ready for market...

Fast-forward to the present day, just nine months later, and rivals at Mecacac have also built an all-electric excavator – the e12. And this time there are no caveats. This is not being billed as a concept. Engineers at

Mecacac say their design is market ready and will be launched in 2019. Can they really have solved all the problems that held Volvo CE back from announcing a full launch last year? Turn to page 28 and you can make your own mind up as we get a first look at what's inside the e12 and the performance it will deliver. If you want to find out even more, the vehicle will be on display at Mecacac's stand at the Intermat show in Paris this April 23-28. Read our full preview of the event from page 62.

Intermat isn't the only industry event you might be preparing for. As the weather warms up, so show season is upon us again. Those in the material handling industry may be skipping the construction vehicles in Paris in favor of the lift-trucks on show in Hannover – CeMAT takes place exactly the same week, so you will struggle to do both. You can find out more about what's happening at this alternative event on page 18. Across the Atlantic, the following week, Brazil hosts the world's third-largest agricultural machinery show, Agrishow (there's more on page 16) and here in the UK, June sees the construction, quarrying and recycling industries heading to Buxton, in the Peak District, for Hillhead (more on page 14).

It's certainly shaping up to be a busy start to the year. And at each event there are certain to be new vehicles, new innovations and new connections made. As the pace of technological progress continues to accelerate, I can't help wondering what prototypes will be unveiled next... and how quickly such machines might become everyday realities.

Tom Stone, editor, iVT International

Coming up in the June 2018 issue of *iVT*

• SPECIAL 25th ANNIVERSARY EDITION! • Vehicle electronics • Mobile hydraulics • Fluid power innovations • The latest industrial vehicle case studies • And much, much more...

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Easy does it

ROAD ROLLER OEM **HAMM** IS SIMPLIFYING THE CONTROL OF VEHICLES ACROSS ITS RANGE WITH AN INTUITIVE OPERATING CONCEPT KNOWN AS EASY DRIVE

The high-tech design of modern construction machines enables more functions to be carried out than ever before.

Whether these functions are recognized and used by drivers, however, is crucially dependent on the quality of the operating interface. So that drivers of Hamm rollers can use all vehicle functions to their full extent, Hamm engineers attach the utmost importance to simple, intuitive operation. No easy task, since the modern rollers are complex tools, but they have succeeded with Easy Drive. The concept was first realized in the DV+ series tandem rollers in 2015 and has since been introduced in HD+ series tandem rollers, H series compactors and, since the start of 2018, it has been included in the GRW series pneumatic tire rollers.

INTUITIVE OPERATION

The operation of modern construction machines frequently overtaxes

drivers with a surfeit of switches, displays and buttons. A common problem is a lack of clarity in how to adjust important settings. Moreover, tedious searching in the depths of the operating menu is a stress factor for operators. Easy Drive enables drivers to respond quickly and correctly, even without extensive previous knowledge. This is made possible through a minimal number of intelligently arranged switches, good visibility in the operator's platform, and short learning and familiarization times.

A SINGLE CONCEPT FOR ALL ROLLERS

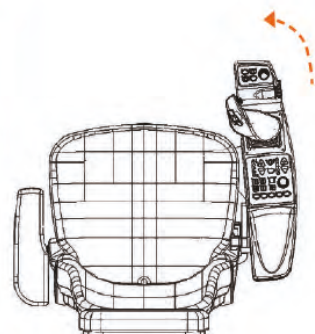
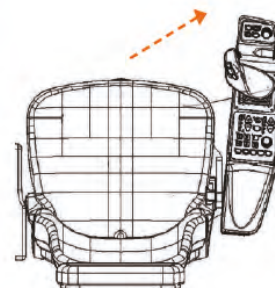
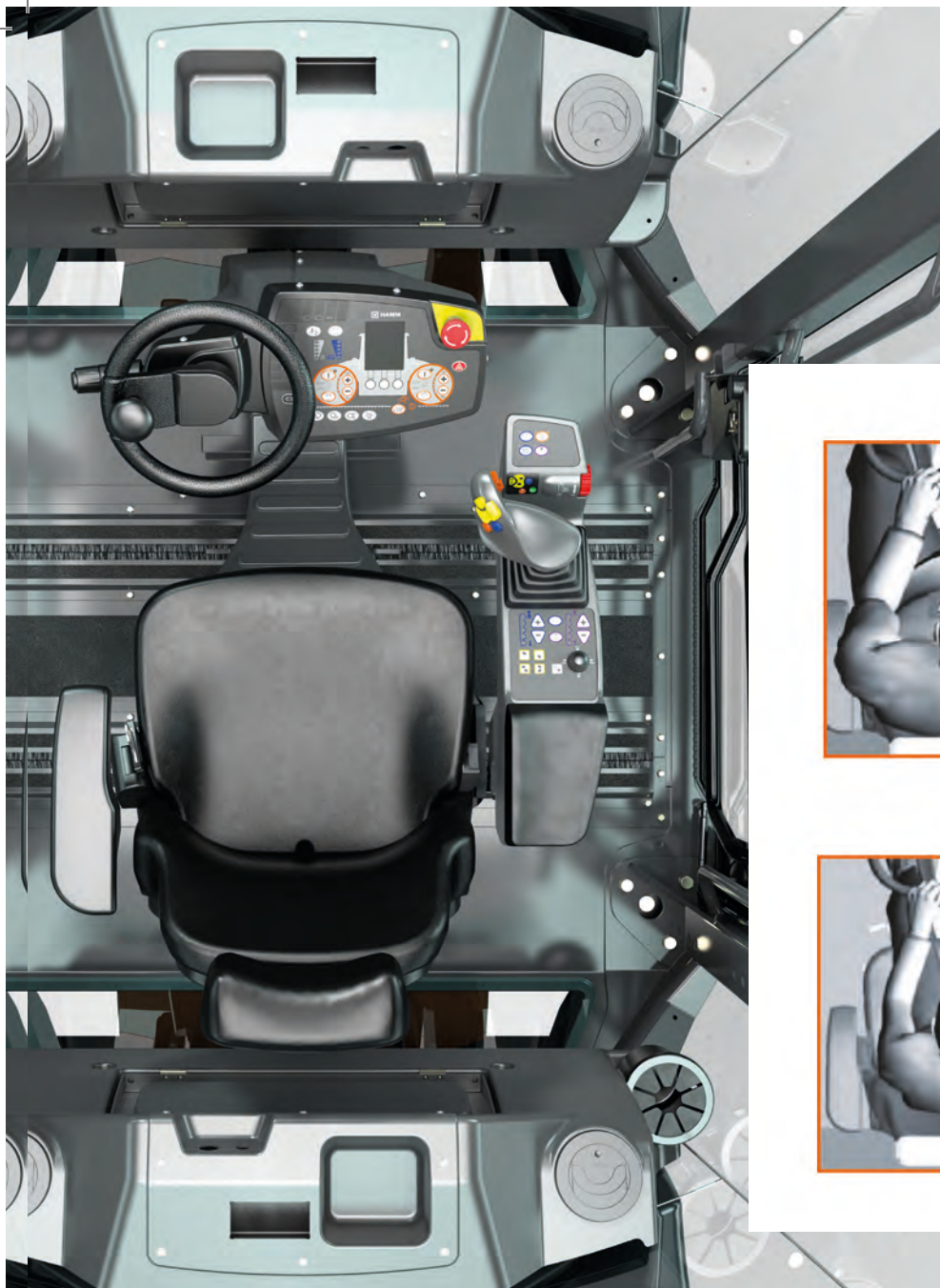
Whichever Hamm Easy Drive vehicle an operator is using, identical colors are used on buttons and switches to indicate that they belong to the same function group. There is also a uniform design, adapted to the specific functions of the individual machine series.

At the same time, the operating elements for the same



WHAT'S NEW

Hamm's Easy Drive design makes control layouts intuitive and comparable across its range



“WE MAKE LIFE EASIER FOR OPERATORS – WHEN SWITCHING TO A DIFFERENT MACHINE TYPE THEY CAN INSTANTLY IDENTIFY IMPORTANT FUNCTIONS”

Dr Axel Römer, head of development and design, Hamm



WHAT'S NEW

Vehicle/cab comparisons



functions will always be in the same position on the operator's platform. Dr Axel Römer, head of development and design at Hamm, explains the fundamental thinking behind Easy Drive: "We make life easier for operators – when switching to a different machine type they can instantly identify important functions. This enables top-quality work right from the start and quickly builds up confidence."

SIMPLE AND CLEARLY LAID OUT

The centerpiece of Easy Drive is its clear operating structure. Steering is always done by means of a steering wheel. All other essential functions are operated via the joystick with

its clearly visible buttons, and the multifunction armrest. Here, all operating elements are arranged according to the principle: the more frequently an element is operated, the closer its position to the joystick. At the same time, the operation is designed to be entirely language-neutral. Thanks to the color coding of all operating elements, Hamm achieves unambiguous assignment and a clear overview.

ERGONOMIC AND FLEXIBLE

With the help of universities and ergonomics specialists, as well as roller drivers from different countries, Hamm has ergonomically optimized

the operating concept. The results speak for themselves: drivers can turn the seat in the tandem rollers in either direction and move it from side to side, as standard. What's more, the position and suspension of the seat, the position of the armrests and the dashboard inclination are adjustable on Easy Drive rollers. Thanks to the wealth of adjustment options, every driver will quickly find a comfortable sitting position.

It is also worth noting that the new Easy Drive designs boast additional ergonomic features such as: a wide stepway; spacious operating area; folding armrests; a forward-tilting steering column; document compartments around the seat; and 12V sockets for cell phones or cool boxes. **ivT**



Award-winning design

The Easy Drive operating concept has been exceptionally well-received by drivers. It has also won several awards, including the internationally renowned iF International Forum Design award for first-class product design, the Universal Design Expert Favourite (decided by a jury of experts) and the Universal Design Consumer Favourite (decided by 100 users). This recently established design award highlights products that are flexible, easy and intuitive to use and reducing complexity in operations.

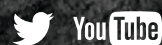
LEFT: Hamm's ergonomically optimized Easy Drive operator display for use in its vehicle cabs

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BOOTH F021 IN HALL 5A.**

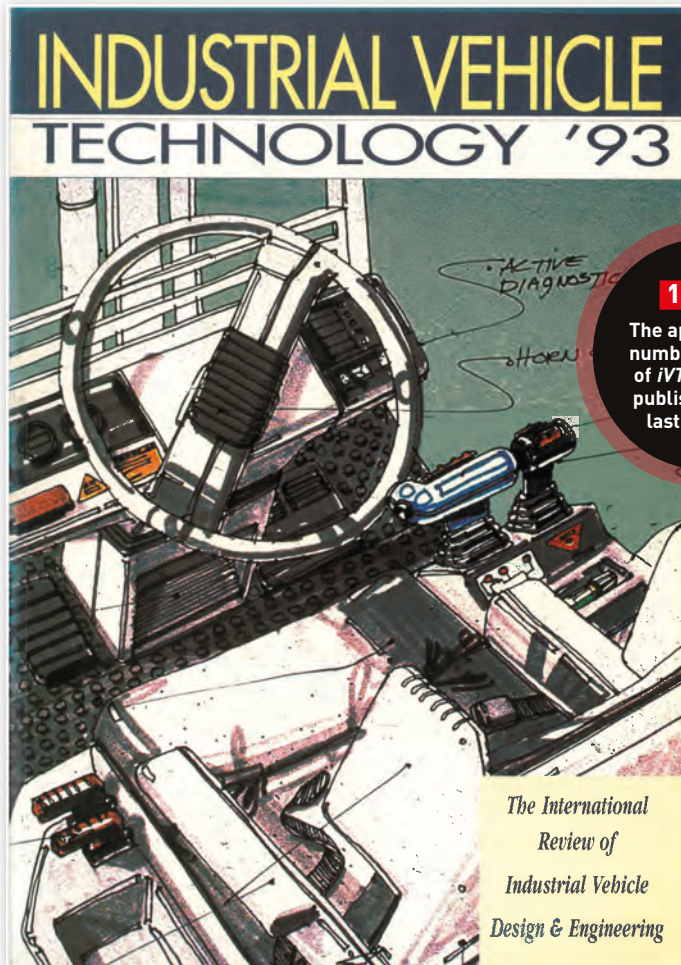


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WHAT'S NEW

iVT is 25!

WE MARK THE BEGINNING OF A YEAR OF CELEBRATIONS WITH A QUICK LOOK BACK AT OUR VERY FIRST EDITION



16,500

The approximate number of pages of iVT magazine published in the last 25 years

From the archives
Industrial Vehicle Technology
International '93 (Issue 1)



Industrial Vehicle Technology International magazine was launched in 1993 – and was an instant hit right across the industry. Before it came into existence, there was no regular magazine anywhere in the world aimed at industrial vehicle engineers and designers.

The first edition focused primarily on the lift-truck and material handling industries, but there was also significant interest from readers in news of off-highway industrial vehicles. Accordingly, when the time came to publish a second edition the following year, the decision was made to create not one title, but two: the *Lift-truck and Materials Handling* edition '94 and the

Off-Highway edition '94. Both annuals are still published today, the former now taking the title *Advanced Lift-truck Technology International*.

By 1998 interest had grown to such an extent that the decision was made to launch a quarterly edition – *iVT*. A decade later, *iVT China* followed. And so the stable was complete.

Looking back at the first issue is a fascinating exercise. It is a window on a bygone, almost completely pre-digital, era. Just as the magazine pages themselves were put together without any help from desktop publishing software, so the vehicle concepts within are drawn and built by hand. It's particularly striking to see how

a concept model for one lift-truck was made with cardboard, balsa wood, glue, tape and marker pens.

Other entries are more familiar. The prediction in a feature on AGVs that autonomous vehicles could be finding their way into all industries 'by the year 2000' is amusing to read now, 25 years later, but will our continued optimism about such systems seem equally unfounded in another 25 years? Only time will tell.

In this, our 25th year, we promise to bring you more snapshots from the past and glimpses into the future – but more than that, some of the best standalone content this magazine has ever seen. The party is only just getting started...

25 YEARS
iVT
INTERNATIONAL
INDUSTRIAL VEHICLE TECHNOLOGY

NEXT ISSUE

The celebrations continue throughout the June issue of *iVT* – our Special Anniversary Edition. Don't miss it!

NOTHING BUT THE LATEST AND NEXT-GENERATION COMPONENTS, SERVICES AND TECHNOLOGIES!



13 - 14 FEBRUARY 2019 COLOGNE, GERMANY

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Loading up

Three new vehicles have been announced that will make it easier to move material of all sizes around different worksites

VOLVO'S IN-HOUSE DEVELOPMENTS

Volvo CE is developing a range of rigid haulers in-house, signaling the end of the Terex Truck-branded models.

The line-up will include 45-, 60- and 72-metric ton versions, with the flagship R100E model weighing in at 100 metric tons. The vehicles will initially be available in less-regulated markets, before being offered more widely.

Thomas Bitter, senior vice president of the marketing and product portfolio at Volvo CE, said, "The E-Series R100E is a completely new 100 metric ton rigid hauler that combines a wealth of market and customer knowledge with proven components, new technologies and a striking new design – all providing a cost-effective and productive solution to fulfill the needs of today's mining and quarrying customers."



CAT GOES ELECTRIC

Caterpillar is currently validating a battery electric load-haul-dump loader at a mine site in Canada. The prototype is a fully electric version of its diesel-powered R1300G, with the electric powertrain supporting the mechanical drivetrain.

Originally built early last year at Caterpillar's Peoria proving ground in Illinois, the intention is to bring a final design to market derived from the lithium-based energy storage proof of concept.

"We tried hard to break this machine and technology before sending it to Canada in September," said Jay Armbrurger, Caterpillar's product manager with responsibility for underground technology.

"With the results we've seen so far, we're confident this R1300G proof of concept is giving us the answers we need to develop a machine that is safe and lives up to the Cat brand promise of durability and reliability."



GEHL UPS THE POWER

Gehl has developed its most powerful skid-steer loader to date. The 4200V, with an operating weight of 5,291kg, is currently the largest machine of its type on the market and offers 1,905kg of rated operating capacity – an increase of more than 90kg on the outgoing model.

Featuring a Deutz-developed Tier IV-certified engine, the vehicle offers 120hp of power and 479Nm of torque, with a top speed of 18.7km/h (11.6mph).

Built to handle the toughest applications, the 4200V excels in demolition, heavy construction, and road building and infrastructure," said Nathan Ryan, Gehl global product line manager, skid-steer loaders.

"The 4200V comes fully equipped to run high-performance attachments in a spacious operator station with standard high-flow auxiliary hydraulics and 14-pin connector."

BIN HYDRAULICS! **NO MORE OPERATORS!**

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Show of strength

The Man Engine, a 10m (33ft)-tall mechanical puppet to be on display at Hillhead 2018



HILLHEAD 2018 EXPECTED TO BE BIGGEST YET

Hillhead 2018 is building up to be the biggest in the event's history.

Taking place at the Hillhead Quarry near Buxton, England, from June 26-28, the working construction and quarrying event is expecting over 500 exhibitors for the first time in its history.

In anticipation of the large numbers of visitors expected, the organizers have decided to extend the main pavilion by 70m (230ft) to make approximately 60,000m² (646,000ft²) of stand space available.

Event manager Harvey Sugden said, "The level of rebooking has been exceptionally high and it is

fantastic to see so many companies coming back to us year-on-year. It emphasizes the importance of the show to the industry, which is a real highlight in the calendar for visitors and exhibitors alike."

Visitors to the show will be joined by the UK's largest mechanical puppet. The Man Engine takes its name from the mechanism of reciprocating ladders and stationary platforms that traditionally transported miners up to the surface from the mine. Powered by a Volvo L220 wheel loader, the 10m (33ft)-tall mechanical puppet will be in residence for the duration of the show.



UK MINERAL PRODUCTS INDUSTRY IN BRIEF

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TURNOVER OF INDUSTRIES SUPPLIED (US\$680BN)

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PEOPLE DIRECTLY EMPLOYED IN MINERAL PRODUCTS INDUSTRY

£82,000

PRODUCTIVITY OF EACH WORKER IN 2014 (1.6 TIMES THE NATIONAL AVERAGE) (US\$114,000)

3.4 MILLION

JOBS SUPPORTED THROUGH INDUSTRY SUPPLY CHAIN

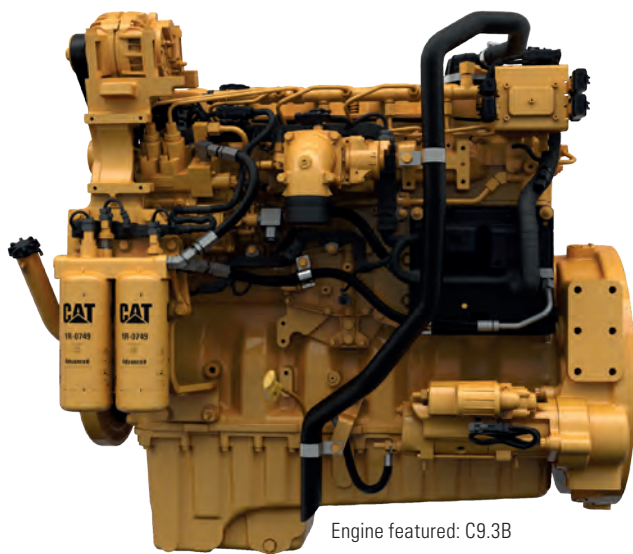
£6.4BN

GROSS VALUE (US\$8.8BN)

Source: Mineral Products Association



PROVEN **READY**



Engine featured: C9.3B

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Farming fiesta



BRAZILIAN AGRICULTURE IN BRIEF

960 MILLION
ACRES OF FERTILE LAND
(388 MILLION HECTARES),

CROP VALUE
US\$65.56BN

ARABLE LAND ACROSS
ENTIRE COUNTRY
31%

AGRICULTURAL
PRODUCTION VALUE
US\$65.56M

10%
OF NATION EMPLOYED
IN AGRICULTURE

AGRICULTURAL
CONTRIBUTION TO GDP
5.5%

Sources:
fao.org
apexbrasil.com
isaaa.org



159,000

The approximate
number of visitors
expected to attend
Agrishow in 2018

AGRISHOW

Time to shine for the Brazilian agricultural industry

The Brazilian farming industry is gearing up for the most significant event in its national calendar – the third biggest agricultural technology fair in the world.

Now in its 25th year, the 2018 Agrishow (April 30 to May 4) is expected to have 800 brands on display, with over 159,000 agricultural professionals representing 70 different nations descending on the show site near the city of Ribeirão Preto in the southeast of Brazil.

Hosted by Informa Exhibitions, Agrishow was conceived by ABAG

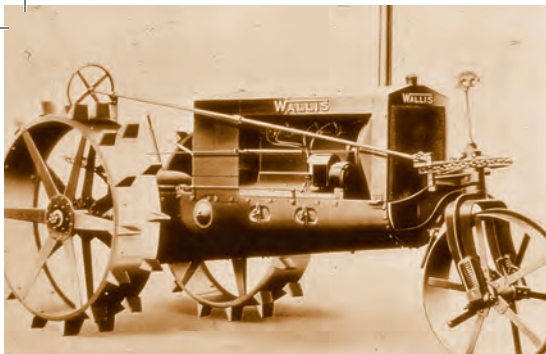
(Brazilian Agribusiness Association), ABIMAQ (Brazil's Machinery and Equipment Industry Association), ANDA (National Association for Fertilizer Dissemination), FAESP (Agriculture and Cattle Federation of São Paulo State) and SRB (Brazilian Rural Society).

Business at last year's show reached R\$2.2bn (US\$676m) but organizers are expecting to exceed that this year.

A field demonstration site will give visitors the opportunity to test the various innovations on display for themselves.



Brazil's Agrishow is mainly held in the open air, as visitors can normally expect sunny skies. This year it will cover more than 440,000m² (4,700,000ft²)



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HANDLING THE FUTURE

MANFRED KUTZINSKI, DIRECTOR OF CEMAT GERMANY, EXPLAINS WHY THIS YEAR'S SHOW WILL PROVIDE KEY INSIGHTS INTO HOW THE INDUSTRIAL SECTOR CAN BE DIGITIZED



**CeMAT
Germany
April 23-27, 2018**

For more information
about how to attend CeMAT
2018, visit: www.cemat-hannovermesse.com

'Connect and collaborate' is a noticeable, key theme that will be present at CeMAT Germany, one of the world's largest materials handling, intralogistics and supply management shows, which is taking place from April 23-27, in Hannover, Germany.

For the first time ever, CeMAT will run alongside Hannover Messe – a huge, annual industrial technology fair that has been hosted in Hannover since 1947. In 2011 Hannover Messe coined the phrase Industrie 4.0 – a term that explains the current digital revolution in the industrial sector, which is resulting in data sharing between, and the automation of,

machines and vehicles. In an era where sensors play an ever-increasing role in the industrial vehicle market, it makes sense for CeMAT 2018, having collaborated with Hannover Messe, to keep the shows' themes in line with Industrie 4.0, as well as incorporating it, along with other prominent trends in the industry, such as logistics.

"Traditionally CeMAT has always been a show in its own right, but since the introduction of Industrie 4.0 there has been a crossover with the topics it covers," says Manfred Kutzinski, director of CeMAT. "It makes sense to bring these topics together – logistics and industry – while combining the CeMAT and Hannover Messe shows."


"We'll cover the bigger picture of supply chains, from transport to production – the entire process."

With visitors expected in the tens of thousands, at least 40% are expected to have ventured from countries outside Germany. "In the past few years in particular, we've seen more visitors from the USA attending the show because they're aware of its size and what it has to offer," says Kutzinski. Exhibitor-wise, 700 companies – more than 50% of which will be international brands – will be showcasing their latest innovations.

Key elements

Show highlights for delegates include the stands of, and presentations from, major forklift vehicle companies. "Toyota, Jungheinrich and Still are just three of the large organizations that will have huge pavilions with wooden roofs covering their open-air sites," says Kutzinski. To give an idea of the scale, he reveals that the Jungheinrich pavilion will be 5,000m² (1.2 acres).

As well as learning about companies' best and newest products at the exhibition, delegates can also expand on their industry knowledge at keynote speaker sessions and forums. "We've run forums in the past, but this year there will be a focus on slightly different topics," says Kutzinski. "We will have a Logistics 4.0 forum and an Industrie 4.0 forum, as well as discussions that will cover how the port industry – including the industrial vehicles that it involves – can be digitized in the near future. **ivT**



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SHOW HIGHLIGHT: MANITOU

AN ERGONOMIC RANGE

CeMAT Germany will see Manitou launch six new industrial models designed with ergonomics and performance in mind. These new models will be within a weight range of 1.2 tons (1.3 US tons) to 2 tons (2.2 US tons).

With a maximum loading capacity of 1.6 tons (1.8 US tons) and a height of 12m (on the heavy-duty version), the compact ER16 reach truck boasts a turning radius of just 2,700mm (8.8ft). Designed for operation with the driver standing up, it is ideal for use in applications such as storage and warehousing.

Visit Manitou: Open-air site (FG), Stand K62

WHAT'S NEW

CEMAT PREVIEW

CeMAT



Logistics 4.0 meets Industrie 4.0

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CeMAT



SHOW HIGHLIGHT: **MAGAZINO**

ROBOT TAKEOVER

German robotics company Magazino will be showcasing the second version of its new, fully autonomous Soto robot. Using 3D imaging technology, it can collect objects from 5cm to 2.5m (2in to 8.2ft), store them, and carry them to their assigned destinations. Soto is suitable for use in warehouses and factories and will be available on the market at €50,000 (US\$61,340).

Visit Magazino in Hall 21, Stand G42

SHOW HIGHLIGHT: **BAUSER**

ESSENTIAL DISPLAYS

Bauser will be exhibiting its standard and customized hardware and software solutions based on CAN, CANopen and SAEJ1939 – including battery and time controllers, panel instrumentation and hour meters. One such solution is the Type 909, a 3.5in (8.9cm) thin film transistor (TFT) liquid crystal display (LCD) in color with four push buttons and up to five colored warning lamps. It offers digital and analog inputs, as well as a CAN interface with CANopen or SAE J1939 protocols, and it is can operate in temperatures ranging from -30° to 85°C (-22° to 185°F).

Visit Bauser in Hall 26, Stand 27



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SHOW HIGHLIGHT: **ELOBAU**

ERGONOMICS AND SENSORS

At CeMAT 2018, Elobau will be showcasing its modular MA225 armrest and a new range of ultrasonic sensors. Thanks to its innovative and modular design, the armrest can be arranged to create a customized operating system for the functions required of the respective vehicle. The new ultrasonic sensors are precise, versatile, reliable, and suitable for use in a wide variety of applications.


Visit Elobau in Hall 26, Stand K02

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CeMAT

hall 26, booth K02

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sensor technology



The new modular armrest MA225 midi Customised as standard

Until now, customised multifunction armrests were only realistic for large mobile machine manufacturers, but with the modular armrest MA225 midi, elobau also opens up this possibility to manufacturers requiring smaller quantities. The innovative, modular design allows customers to configure their armrest with an ergonomic arrangement of operator controls without the high development costs. Additionally, the armrest has inbuilt USB charging and storage. Every-

one can now benefit from elobau's years of experience in designing and manufacturing functional, ergonomic and user-friendly operator controls for demanding applications. Conformance to Safety Level AgPL c according to ISO 25119 and fully compliant with EU Regulation 167/2013 "Mother Regulation", as well as being manufactured from bio-based materials, the MA225 midi armrest sets the standards for functionality and design.



From Paris to the world

FRENCH CONSTRUCTION VEHICLE OEM MECALAC IS READY TO LEAD THE PACK AT INTERMAT PARIS WITH AN IMPRESSIVE ARRAY OF NEW INNOVATIONS, AS EXECUTIVE VICE PRESIDENT ALEXANDRE MARCHETTA EXPLAINS

► This is an exciting moment for Alexandre Marchetta. Groupe Mecalac, the company he runs with his father, is riding a wave of recognition for its innovative urban construction vehicles and hangs poised on the cusp of an historic expansion into the new markets of North and Latin America. Yet in this instant of nascent global possibilities, the young executive vice president is quick to emphasize Mecalac's credentials as a family-owned company with human values, focused on building profitable, long-term relationships.

"Talking to drivers, site managers and mechanics helps us to understand people's priorities for today and their expectations for tomorrow," Marchetta explains. "From the very beginning, we have listened to our customers both



nationally and internationally and to their needs, which are not only economic but structural and cultural, too." Such a philosophy, he believes, will enable Mecalac to continue adapting to the specific demands of new markets while offering a distinctive product range with sharply defined parameters. "Our core business is in compact, versatile, easy-to-handle, ergonomic machines – machines that can dig,

load and carry." The vision is one of frictionless, space-efficient, multifunctional operations tailored to future urban jobsites. "When a single driver and a single machine can cover a wide range of tasks on one building site without any complicated maneuvers and with extended capabilities in each function, a huge amount of time will be saved."

Paris in the spring

Today, Marchetta wants to talk about Intermat Paris, which he sees both as a source of national pride and an opportunity to court international custom. "Intermat is a chance to show the entire world our extraordinarily dynamic sectors of building and public works," he says. "It is a catalyst for business, as each successive edition proves – and 2018 will not be otherwise."

4,000m²
The total area of
Mecalac's stand at
Intermat Paris 2018
(43,000ft²)



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Around 183,000 visitors from 167 different countries are expected from April 23-28 for the world's third-largest building and civil engineering exhibition. As it takes place on Mecalac's home turf, it provides a perfect shop window for the company's products – including, this year, the e12 electric excavator and the Connect Energy Link RFID-based coupling system (see page 28). “We have always been faithful to Intermat, our loyalty being linked to the attraction of visitors from the Europe-Africa axis,” Marchetta remarks, “although the whole world loves to travel to Paris!”

In keeping with previous years, Mecalac will take the opportunity to showcase its machines performing live in the real-life worksite conditions of the outdoor demonstration area. “We have decided to be outside to exhibit the benefits of our products in action,” says Marchetta. “We will welcome both present and future customers to a space of around 4,000m² [43,000ft²] with a demonstration surface of about 1,000m² [10,800ft²] This will allow us to effectively present all our product lines, including the backhoe

loaders, site dumpers and compaction rollers that we produce in England through Mecalac Construction Equipment UK, part of Groupe Mecalac since February 2017.”

Coming to America

The acquisition of the former Terex plant in Coventry in the UK is pivotal to Mecalac's transatlantic aspirations. “The historic markets of France, Germany and Great Britain have driven the growth of our brand and continue to underpin and inspire Mecalac's research and development,” Marchetta stresses. “But not all markets have the same expectations of construction machinery. Our new global offering can provide relevant solutions in Eastern Europe, Russia, the Maghreb, central and southern Africa, the Middle East, Australia and North and Latin Americas. We are looking for a long-term balance by responding to the needs of other countries, which will contribute to the overall health of our business.”

In Europe, Mecalac sees its 12MTX machine as an alternative proposition to the traditional backhoe loader for urban applications providing greater



TOP: The complete range of Mecalac construction vehicles
ABOVE: The 15MWR, the largest in Mecalac's range of award-winning wheel excavators

BELOW: Alexandre Marchetta with his father, Henri Marchetta, chairman of the Mecalac Group

compactness and multifunctionality. Nevertheless, demand for backhoes can now be served by exports from the Mecalac UK plant. Meanwhile Mecalac hopes the rapidly evolving nature of urban construction sites will provide a bountiful market for its core products, with space constraints becoming a more pressing consideration, even in the USA. In particular, the company envisages growing demand for wheel excavators being met by its flagship MWR range, which secured a 2016 Bauma Innovation Award with its radically reimagined architecture, allowing for improved dynamic stability by dint of a low center of gravity more analogous to a telehandler than a conventional excavator.

The Mecalac brand is certainly synonymous with innovative vehicle design, with numerous patents protecting the company's

“FOR 18 YEARS I HAVE WORKED WITH MY FATHER. A PASSION FOR INNOVATION IS PART OF OUR DNA”

Alexandre Marchetta, executive vice president, Mecalac Group



OEM INTERVIEW

unique technical solutions and a growing list of industry honors set to be added to, at Intermat 2018, by a Special Award for Energy Transition for the e12 concept. How, then, do the Marchettas go about fostering the climate of continuous innovation which seems to underwrite their success? “Machines created by people, for people: for us, that’s what customer focus is all about,” Marchetta replies. “The thing that has always characterized our approach is the relevance of the concept. With the new MWRs, listening proactively to our customers and the issues they face was what prompted us to create an innovative solution based on an existing concept.”

Safer solutions

Operator safety is one aspect of machine development wherein Mecalac has established itself as an industry leader. “The famous swing system on our wheel loader range is recognized as the safest in this category of machines,” he says. “Whatever they load frontally can also be transported and swiveled through 90° without loss of stability – even when steering at the maximum angle.” But with safety regulations becoming more and more stringent, particularly in the UK and USA, Mecalac is not content to rest on its laurels, but continues working to introduce a range of safety innovations to its vehicles – including a Mecalac-patented retractable footboard.

“Stepping up and down from the cab is the source of too many worksite accidents,” Marchetta explains. “Now, with the retractable footboard, the cab step automatically extends when the operator lifts the console to exit the vehicle. This provides a ledge directly beneath their feet, which slots perfectly back into the cab when they get back in.

“MAJOR URBAN CENTERS ARE TRYING TO DRASTICALLY REDUCE THE EFFECTS OF POLLUTING ENERGIES AND QUIETER, NON-POLLUTING SOLUTIONS ARE NEEDED FOR JOBSITES”

THE HISTORY OF MECALAC

The name Mecalac derives from Mécanique du Lac, a reference to the lake at Annecy-le-Vieux in the French Alps, where the company was founded in 1974. Ten years later, Mecalac introduced the 11CX, an articulated machine with 360° rotation that fulfilled the functions of a loader, excavator, forklift and tool-handler and was to prove the forerunner of the current 12MTX vehicles. In 1991, Mecalac was bought by the current chairman, Henri Marchetta.

In 2002, Mecalac acquired Ahlmann, a German company that had been pioneering the development of the swing loader since the 1950s.

Under Marchetta’s leadership, the company continued to grow and diversify its product range, producing its 10,000th machine

in 2007 and creating innovative new design concepts with unerring regularity, including the 8MCR skid-steer crawler in 2009, the next-generation 12MTX in 2015 and, in 2017, the game-changing MWR range of wheel excavators. In the same year, Mecalac bought from Terex in the UK a plant that manufactures backhoes, dumpers and compaction rollers, as a precursor to gaining traction in American markets.

“Today, the company has five factories, two in France and the others in Germany, Turkey and the UK,” explains vice chairman Alexandre Marchetta. “For 18 years I have worked with my father. A passion for product innovation and for anticipating technological developments and changes to working practices is part of our

DNA – which is synonymous with stability for employees, partners and customers. The history of Groupe Mecalac is linked to product developments – and these are now accelerating with widening ranges, regular awards for innovation, and Mecalac becoming known as a specialist in versatile, environmentally friendly machinery for urban construction sites.”



GUILHEM VELLUT



TOP RIGHT: Lake Annecy, in the French Alps, which inspired the Mecalac name

ABOVE: Mecalac’s headquarters is still in Annecy-le-Vieux, where the company was founded in 1974

“The fuel tank on the MWR wheel excavators is located on the undercarriage,” he goes on, “meaning the driver no longer has to carry out operations at height. Mecalac dumpers are equipped with a hazard-detection system, facilitating avoidance of obstacles in the machine’s path which the operator may have missed.” All such marginal gains are important in a marketplace where driver safety is an increasingly fundamental factor in purchasing decisions.

Looking to the future

The compact multifunctionality of Mecalac machines has enabled them to establish a strong presence in the French capital and the company is

fully involved in the Grand Paris project launched by Nicolas Sarkozy in 2007, which aims to transform the city into a sustainable 21st century metropolis. “Major urban centers are trying to reduce the effects of polluting energies, and quieter, non-polluting solutions are needed for jobsites,” Marchetta reflects. “The transition will take time and, as with electric cars, part of this will be the economic model that must necessarily support the technological transition. But we believe we have taken an important step by introducing the Mecalac e12, an 11 ton, 100% electric excavator offering eight hours of autonomy.”

There is a tide in the affairs of men which, taken at the flood, leads on to fortune. The Paris 2024 Olympic Games is on the horizon and Mecalac is reaching out to the world just as it prepares to turn its gaze on France. As the Games approach and Parisian environmental policy grows ever-more assertive, there is a real feeling that Mecalac is set to seize its historical moment. **ivT**

Turn the page for a case study on Mecalac’s e12

Turn to page 62 for ivT’s full Intermat Preview



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French revolution

ONE OF THE MOST IMPORTANT VEHICLES TO MAKE ITS DEBUT AT APRIL'S INTERMAT PARIS EXHIBITION WILL BE MECALAC'S ALL-ELECTRIC EXCAVATOR, THE E12. IT'S NOT SIMPLY A PROTOTYPE, BUT A MACHINE THAT IS PREDICTED TO REACH MARKET IN 2019

▷ *Efficacité, compacité, autonomie.*
This is the no-compromise formula for electrification at Groupe Mecalac, which has a philosophy sharply focused on building innovative, process-oriented machines for space-limited and environmentally sensitive urban sites.

The French company has established an enviable worldwide reputation for eye-catching vehicles, boldly reimagining accepted configurations to create new forms of compact multifunctionality. Mecalac recently acquired the Terex production plant in Coventry, UK, and is on the cusp of an ambitious expansion beyond its traditional European markets and into the USA, where it sees a burgeoning demand for its versatile and space-efficient off-highway products.

Now Mecalac is staking a claim in the emissions-free markets of tomorrow by unveiling the e12 – a market-ready, fully electric excavator. Making its world debut on home soil at Intermat Paris 2018 on April 23-28, it is poised to receive a Special Award for Energy Transition. Commercial availability is anticipated in early 2019. The machine is an electric version of the 12MTX, with which it shares dimensions, though sporting a blue, rather than yellow, livery. Identified as the perfect template for a new electric vehicle due to its strikingly innovative architecture, it is with the 12MTX that the e12's story begins.



15%

Estimated
power curve
efficiency gains
from the e12's
electrohydraulic
system



The e12 will make
its world debut on
home soil in Paris at
Intermat this year



ABOVE: A blue livery distinguishes the electric e12 from the yellow of the diesel 12MTX

Billed as the first articulated excavator in the world, the 12MTX's rear-mounted 85kW Tier 4/Stage IV diesel engine is positioned separately from a compact turret that offers full 360° rotation. With an operating weight of 9,700kg (10.7 tons), an overall length of 4,619mm and a turning width of 2,710mm, its maximum reach is 7,100mm and its maximum break-out force 6,400daN.

Four machines-in-one

Though an excavator, its uniquely versatile design enables it to do the work of a wheel loader, a telehandler and a tool carrier, so that fewer vehicles are needed on site and use is highly efficient. Mecalac reckons that a 12MTX spends just 25% of an average day in idle mode, compared with 70% for conventional vehicles performing only one job.

"You have to imagine it's four machines in one," explains Mecalac's head of design and

146
The record-breaking total power capacity (in kWh) of the e12's 1m³ LiFePO₄ battery pack

product management, Patrick Brehmer. "We need a powerful engine to run the hydraulics – but a compact turret. It's the most compact excavator in the world because the engine is separate from the turret. Then you have an articulated undercarriage, so the boom is made to work in both directions. It is also a loader, but instead of driving forward and backward to load we can use the boom. We can do dynamic and static loading, even at a 90° angle. We can take pallets like a telehandler but we can place them 4m [13ft] below ground level, which no telehandler can do."

In conventional excavators, the dipper cylinder is positioned over the boom, providing power in only one direction, but the 12MTX's cylinder is underneath, providing real lifting power for loading and handling. Whereas an excavator normally has just one pump,

25%

The predicted idle time thanks to the multifunctional design of the 12MTX

needing only to sit and dig, a loader has two pumps, enabling simultaneous driving and lifting.

"The 12MTX has two completely separate hydraulic circuits: one hydrostatic closed loop for driving and one for working," says Brehmer. "The boom has no influence on driving. Normally, when you begin to move an excavator's turrets and boom, you slow down – but we need maximum energy in both for loading and tool carrying. The hydrostatic loop's high sensitivity is important for telehandling, where you must go inch-by-inch."

Progress to lower emissions

With cities such as Paris pushing to eliminate diesel vehicles, emissions-free construction zones are on the horizon and huge global markets for electric machines may rapidly emerge. Thus Mecalac looked into the key obstacles to commercially viable electric excavators.

"WE REALIZED THE 12MTX WAS PERFECTLY READY FOR ELECTRIC: WE COULD REPLACE THE ENGINE WITH 1M³ OF BATTERY AND REMAIN COMPLETELY COMPACT"

Patrick Brehmer, head of design and product management, Mecalac



First, any compromise on performance must be avoided; customers need to do the same job in the same time as with diesel. Second, for urban applications there must be no compromise on compactness. Finally, there can be no compromise on autonomy – the length of a working cycle. This is the greatest challenge presently facing electric vehicle manufacturers. "One day of work is 8-10 hours," says Brehmer, "Our customers are under day-to-day pressure and cannot just work for 4-5 hours. Unlike a classical excavator, in our vision the vehicle is constantly working, not waiting for the loader or the telehandler. So there must be no compromise on performance, compactness or autonomy."

Efficacité, compacité, autonomie

For eight hours of autonomy in continuous, peak-performance operation, Mecalac calculated that a mobile excavator would

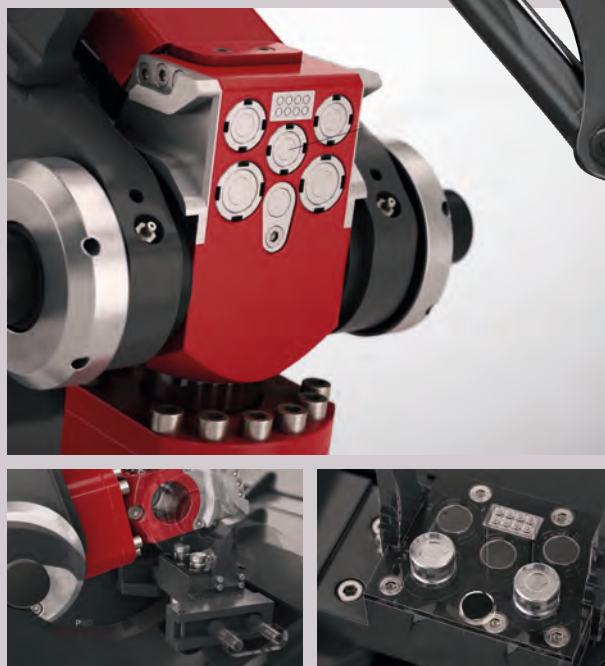
AUTOMATIC ATTACHMENT RECOGNITION

When your company ethos centers on versatile machines performing a wide variety of tasks, the ability to quickly swap attachments and optimize settings for specific implements takes on a magnified importance. That's why, as well as the e12, Mecalac will be using Intermat Paris 2018 to showcase Connect Energy Link, its latest coupling system.

Connect Energy Link builds on the success of Mecalac's previous coupling system, the lightness, integration and ease-of-use of which garnered a 2015 Intermat Innovation Award. The new system provides automatic connection of the machine's hydraulic lines and electric cables to the attachment – without any need for the operator to leave their workstation.

RFID technology is employed, with a sensor in the excavator arm detecting an electronic chip in the attachable tool. This allows automatic attachment recognition, so the machine adapts its electrical and hydraulic settings automatically to optimize the efficiency of a given attachment.

Mecalac is confident that this patented innovation will improve safety, save time and provide operators with unprecedented convenience and energy-efficiency when using a single vehicle to wield a varied host of tools in modern urban settings.



ABOVE: A machine's hydraulic lines and electric cables are automatically connected without the operator leaving the cab

require 146kWh of energy, necessitating 1m³ of batteries. But can this be accommodated without compromising that second non-negotiable – compactness? The answer lay in the architecture of the articulated 12MTX.

"Initially, it was designed to carry a big engine and keep a compact turret, but we realized that it was perfectly ready for electric. We could replace the engine with 1m³ of battery and remain completely compact," explains Brehmer. "Other architectures involved some form of compromise, but we didn't want to add one millimeter to the 12MTX because then the customer would lose something. Even with new engine specifications like Tier 4 or 5, we make each machine smaller than the last – because the job doesn't change and the operator still needs optimum visibility."

High power density technology

Even keeping the e12's batteries to 1m³ required a technology with much higher power density than the lead-acid batteries used in cars and

"LITHIUM-ION BATTERIES ARE MADE FOR 1,000 CHARGING CYCLES, WHICH MEANS THREE YEARS. IT'S OKAY FOR A PHONE, BUT NOT A MACHINE"

forklifts, which would only provide around 30kWh per 1m³ of space. While offering superior power density, lithium-ion batteries presented limitations in terms of lifetime. "You see it with smartphone batteries," Brehmer explains. "Lithium-ion batteries are made for 1,000 charging cycles, which means three years. After that, battery performance quickly decreases and you can no longer work for a full day. But our machines are made for nine years. It's okay for a phone, but not a machine."

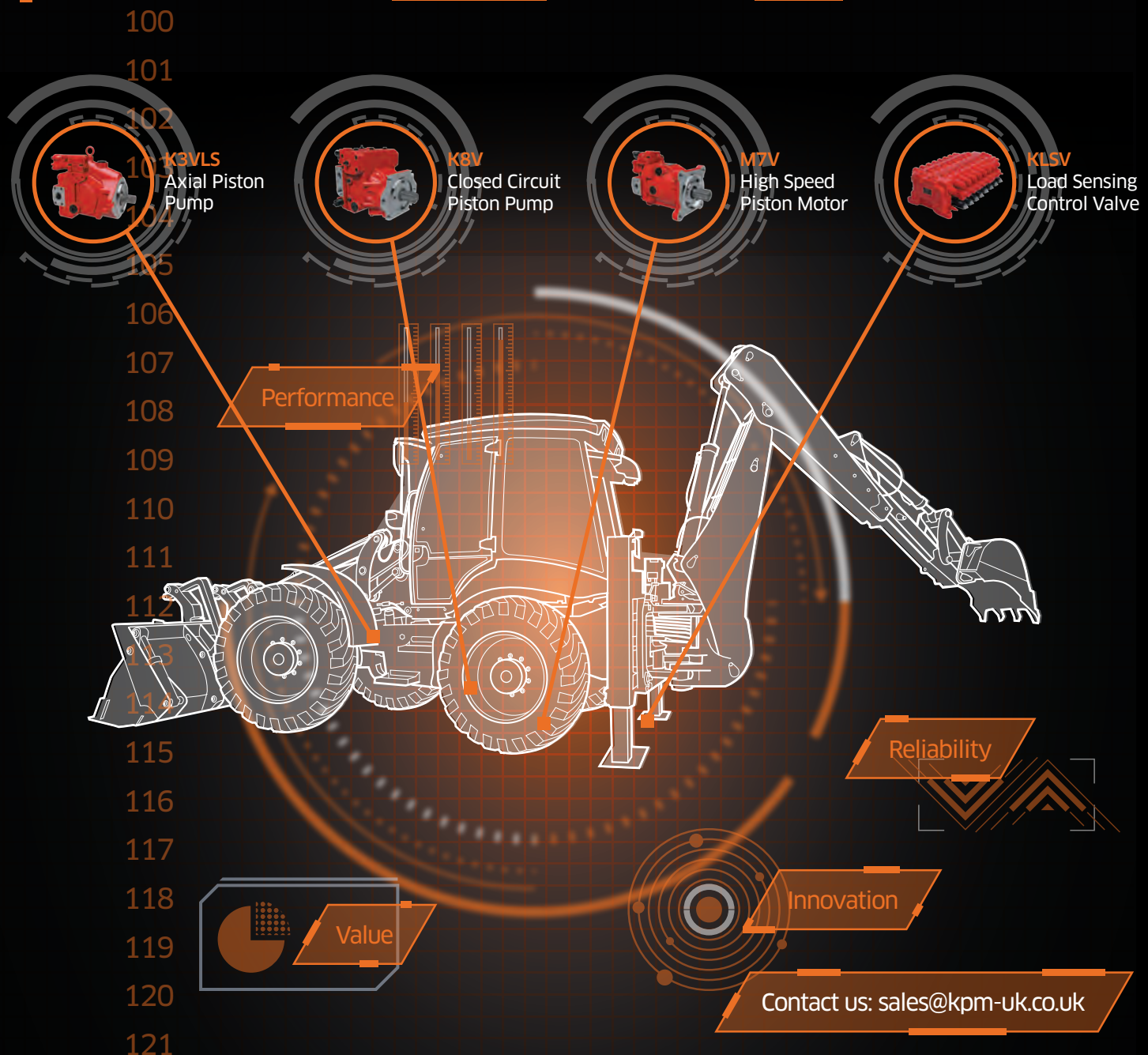
Instead, Mecalac opted for lithium iron phosphate (LiFePO₄ or LFP) battery technology, which

offered several advantages. LFP has sufficient power density to provide the requisite 146kWh from a 1m³ space and can also complete three times as many charging cycles as lithium-ion without deterioration – supporting peak vehicle performance across a nine-year lifespan. Moreover LFP batteries are dry and inert, which eliminates any risk of leakage or explosion, even in the event of a severe shock on the work site – and any possibility of a 1m³ excavator battery-pack combusting is clearly better avoided. LFP batteries require no specific cooling within the temperature and power ranges of e12 operation, saving on space and cost.

But even with LFP in place, further innovation was still required to achieve eight-hour autonomy at 100% performance. "We had to keep optimizing the energy request," Brehmer continues. "That's why the whole pilot system, from the joystick to the main valve, is now electrohydraulic – with a new generation of main valve that allows us to gain the last 15% by optimizing the power curve."

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A NEW WAY TO SELL INDUSTRIAL VEHICLES

Along with next-generation machines, Mecalac is launching its Mecalac Financial Solution: a paradigm-shifting financing model for customers.

"As we're innovative on architecture and technology, we also wanted an innovative way of coming to market," Patrick Brehmer explains. "Of course, batteries and engines have a huge cost." Traditionally, total cost of ownership falls roughly into three parts – one-third on initial outlay, one-third on maintenance and one-third on diesel over a machine's lifetime. With the e12, maintenance and running costs would be slashed, since 50% of maintenance on conventional machines is linked to the engine, while battery power will be 6-10 times cheaper than diesel, Brehmer believes, depending on local electricity markets.

But the upfront cost of buying an electric vehicle will be higher – and customers may wish to pay for use of the machine, rather than purchasing outright. The nature of battery markets is a key factor. "The price of batteries



is decreasing rapidly," says Brehmer. "You might buy a machine today, but two years later there may be much cheaper batteries available with better autonomy – so it's impossible to resell. We want that to be our problem. Our customers want to work, to dig – not check battery prices on NASDAQ."

With many companies managing the second life of reduced-capacity

batteries for purposes such as stadium illumination, a whole new business model for machine reuse is anticipated. This is why Mecalac has partnered with DLL, a world leader in financing for capital goods, to develop the Mecalac Financial Solution, aiming to offer end-users a number of flexible and individually tailored options for servicing their electric vehicle needs.

The benefits of eliminating the noise, vibration, emissions and maintenance of internal combustion are clear. An electric powertrain also brings performance benefits, including the increased precision of dedicated closed circuits.

Instant wins

The e12 recovers energy during braking and can feed it back to the batteries via an inverter. But what excites Patrick Brehmer most is the instantaneous response that electric transmission affords. "Electric motors have great tractive force and, unlike a classical engine, which achieves maximum torque only at a certain RPM, we have maximum tractive effort immediately available. For off-highway and loading applications it's incredible!"

He expects the e12 to be ready for market in 2019. "We didn't want to just make a prototype or concept. At every show you see electric and

autonomous vehicles, but what can customers actually buy? Quite a boring machine. But at Mecalac, innovation only has a meaning if we bring it to the customer."

A universal solution

Diesel engines entail a range of solutions around differing Tiers, Stages and diesel quality between countries – but electric power, Brehmer believes, will provide a single, whole-world solution. The date of diesel bans in some European cities is already fixed and feedback suggests that the e12 will attract interest on both sides of the Atlantic. Change is in the air and, with its transformative brand of thinking, Mecalac could be happily placed to lead a French revolution in global construction vehicle markets. **ivT**

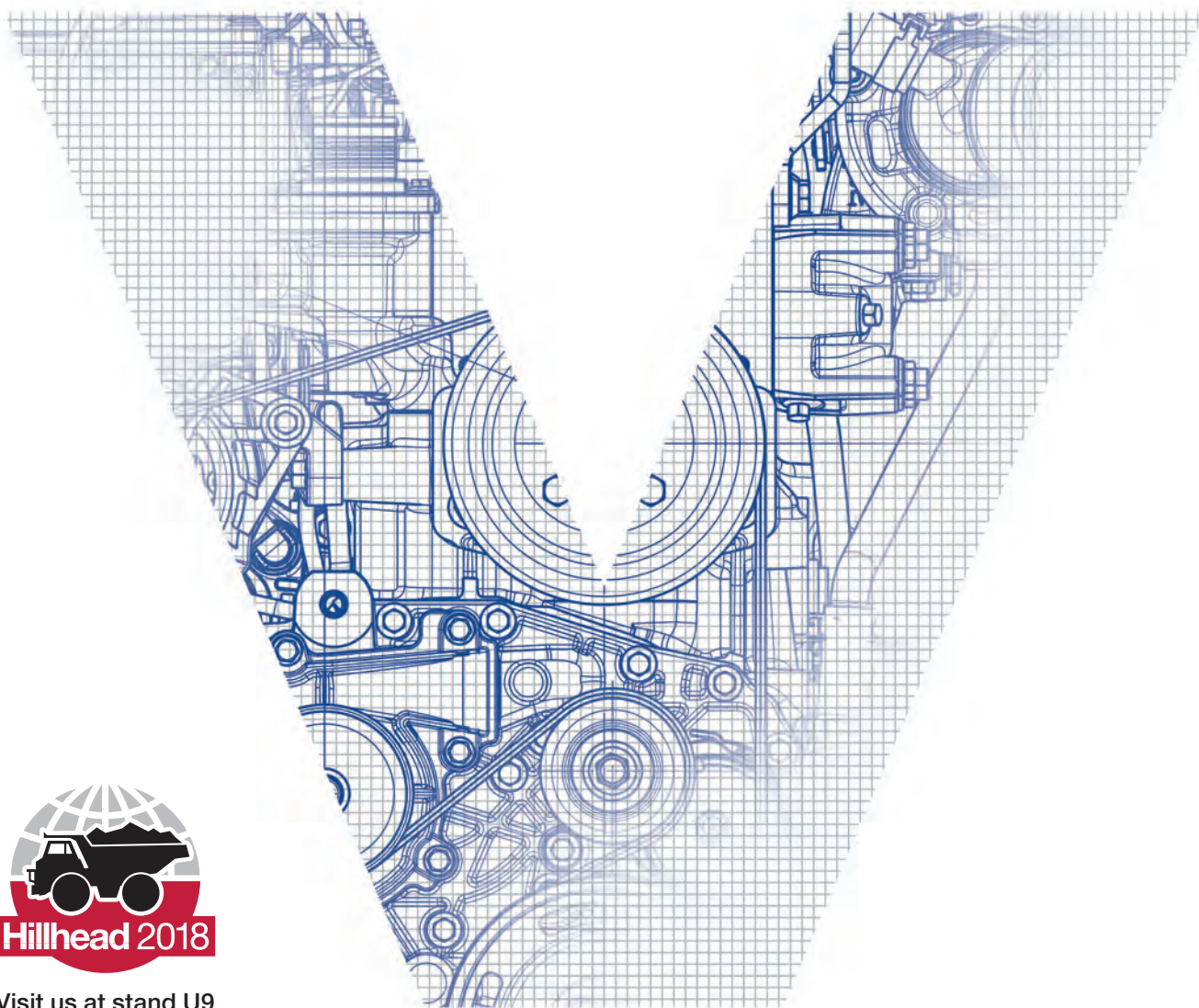
On the Web

Watch a video summary of Mecalac's e12 at www.ivTinternational.com/e12

"WE DIDN'T WANT TO JUST MAKE A PROTOTYPE OR CONCEPT. AT MECALAC, INNOVATION ONLY HAS A MEANING IF WE BRING IT TO THE CUSTOMER"



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WITH HYBRIDIZATION AND ELECTRIFICATION
ON THE INCREASE, IVT SHARES SEVEN
KEY DRIVERS FOR THE TECH

▷ Electrification and hybridization are already underway in some sectors of the non-road mobile machinery (NRMM) industry and will undoubtedly have a large part to play in helping to reduce emissions and increase efficiency in the future.

What does electrification and hybridization mean for customers, suppliers and OEMs? It is critical that companies understand the scenarios facing the industry. The opportunities are great, but without the knowledge, companies could find themselves outdated, with little to offer industry.

There will be hardships, threats to market share, and weakening of profits for some companies. However, there is a light at the end of the tunnel: Electrification and hybridization offer greater functionality, lower emissions and lower fuel costs. It is just a matter of time before technology becomes commercially viable on a large scale.

Here, we look at hybridization and electrification as a trend in itself. We consider: what is the short-term future? And what are the key drivers to the evolution of electrification and hybridization in the longer term?

Currently, the market for fully electrified and hybridized machinery is limited to small, niche vehicles and high-horsepower, high-annual-hour machinery. Both categories are relatively low volume. The high-volume applications – for example, those sold into the rental industry,

to contractors, and agricultural applications – are not currently suitable for full hybridization or electrification. The up-front cost and/or TCO of hybrid or electric machinery in these less cost sensitive end-use categories is just not financially viable yet.

A key short-term trend in the agricultural equipment industry will be the electrification of the power take-off (PTO). In most agricultural applications, the PTO takes power from the transmission with one or two of its own clutches to allow it to operate independently. The electrification of PTO means the load on the engine and the strain on the transmission is reduced, while the operator would have greater functionality and flexibility with an electrical system, rather than a less efficient hydraulic system.

Electrification of implements will have to go hand-in-hand with electrical coupling on the PTO. Key suppliers are working closely with OEMs to fill this requirement, and OEMs have been acquiring implement suppliers.

In the current market, electrification development costs are extremely high and many OEMs are more concerned with investing in other cost-cutting or yield-increasing technologies, rather than focusing on electrification.

The magnitude and intensity of certain key drivers is going to have to increase before electrification and hybridization becomes more mainstream in the NRMM industry. So what are those drivers?



1 CO₂ and/or greenhouse gas (GHG) legislation being introduced beyond Stage V (Primary driver)

It is likely that developed markets will introduce some form of CO₂ legislation by/beyond 2025 and it is feasible that some of the emerging BRICS nations (Brazil, Russia, India, China and South Africa) will introduce CO₂ legislation for NRMM too. This will drive electrification and hybridization, which will increase investment in technology and drive down price (compared with current premiums). This will make electrification and hybridization more suitable for high-volume applications that currently can't support the added cost of electrified machinery.



2 Air quality indicators and low-emission zones (LEZ) (Primary driver)

Globally, cities are beginning to introduce strict emissions regulations in specific central areas. This will likely have a similar impact to CO₂ and GHG legislation (see 1), but on a smaller scale, within a quicker time period.

MARKET REPORT



3 Enclosed working environment regulations (Niche application)

In enclosed inner-city developments, electrically driven machinery is often already required by law in developed countries. These regulations will become more common.



4 Increasingly stringent legislation regarding workplace emissions (Localized)

Legislation over conditions in workplaces will drive electrification and hybridization of construction machinery, even in open-air spaces. The industry is already seeing evidence of this trend. Wacker Neuson's WL20e electric wheel loader is a good example of a smaller, all-electric industrial vehicle already on the market to meet demand in these areas.



5 Stage V: the first emissions regulations to include engines below 56kW (Primary driver for low-powered machinery)

Stage V regulations, which come into force in 2019, will be the first applicable to engines below 56kW. As smaller machines are easier to electrify and OEMs and engine manufacturers will not have existing emissions-reducing technology to build on in this class, many OEMs will choose to focus more on developing electric and hybrid machines.



6 Noise pollution limits for inner-city operation (Niche machinery)

Currently applicable in some large cities, noise regulations will continue to be adopted in developed countries and will consequently make electric industrial vehicles more in-demand.



7 Improved operational efficiency from 48V mild hybrid systems (Niche machinery)

All accessories on the engine are likely to move off the load of the engine and onto a 48V electrical circuit. Mild hybridization, electrifying the PTO, and other ways to electrically power implements and attachments, are attractive prospects for OEMs and suppliers looking beyond 2021 because the technology for auxiliary power requirements is similar to, and easy to translate from, automotive industries. This means investment versus payback is much more attractive.



This article is taken from KGP's forthcoming multiclient report on hybridization and electrification in the non-road and commercial vehicle segments. www.kgpauto.com

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'ELECTRIC' MAY BE THE BUZZ WORD WHEN IT COMES TO ALMOST ANY TYPE OF VEHICLE, BUT FOR OFF-HIGHWAY MACHINES, OEMs AND ENGINE MANUFACTURERS ARE PLACING BIG BETS ON OTHER WAYS TO LOWER EMISSIONS



Natural solutions



20%

The potential
reduction
in carbon
emissions
achieved
by using a
natural gas
engine over
a diesel one

MAIN IMAGE AND
INSET: New Holland's
T6.180 100% methane
powered prototype

Whenever renewable energy is discussed, the talk quickly turns to a green, electrically driven future conjured up by media images of windmills, solar panels and bunny rabbits. Unfortunately, everyone who has even the basic concept of what it would actually mean to junk the internal combustion engine knows that this scenario cannot possibly become a reality.

Our governments lurch from one technological soundbite to the next without apparently considering realistic options. As we start to experience the problems of charging and operating electrically powered vehicles in everyday circumstances, it is increasingly evident that, as engineers, our challenge is still to develop efficient ways of powering

the prime mover in a vehicle or machine with as little environmental impact as possible, and that includes the avoidance of the truly horrific visual impact of wind farms that inhabitants of many countries are being asked to endure.

Gas! Gas! Gas!

Natural gas is abundant in our world and it is becoming one of the favored options for the generation of electricity. Companies such as the German engine manufacturer MAN have been exploiting the need for large gas-powered engines for decades, with units like those in its E32 range. In recent years, MAN has translated some of that success to the municipal transport sector – with an average market share

of 39%, MAN is Europe's leading supplier of gas-powered buses. Gas power accounts for 20% of all MAN city buses sold during 2016.

Manufacturers recognize that generally the engines used in these vehicles are simply converted diesel power plants. Steven Nendick of Cummins comments, "CNG/LNG engines are built on the same production line and share the same key components – blocks, cranks, etc – as their diesel cousins."

This makes sense, so for manufacturers, the principle modification has become the introduction of spark ignition and the requisite reduction of the compression ratio. This fact, coupled with the lower per-unit energy value of the fuel (60-70% of an equivalent diesel

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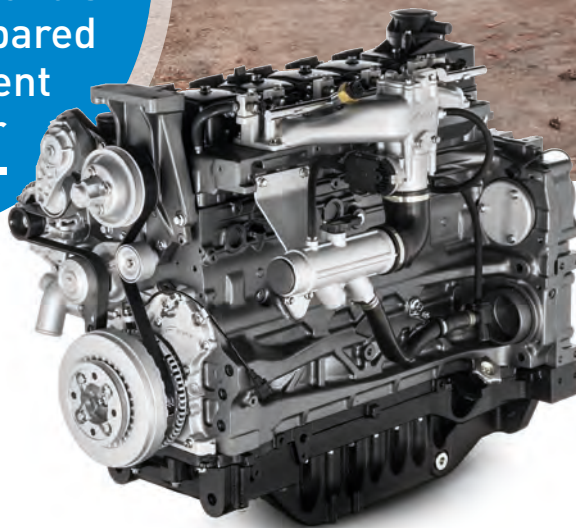
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30%

The reduction in operating costs for New Holland's T6.180 when compared with an equivalent diesel tractor



engine) results in a generally lower engine performance in terms of power and, more importantly, torque. This works for bus operation, stationary applications, and to some extent hybrids, where the power requirement is more or less constant. But these effectively de-rated engines may not be so attractive in conventional off-highway applications where maximum output is frequently demanded of the engines.

However, the motivations for considering gas more widely are many. Citing the principle arguments, firstly there's the cost of fuel: Depending on global prices and location, natural gas can be priced as low as 20% of the price of diesel fuels.

Then there are emissions: Burning natural gas in an engine results in a straight 15-20% reduction in carbon dioxide emissions and a dramatic reduction in other pollutants.

Finally there's the cost of any aftertreatment: Because of the purity

of the burn in a natural gas engine, exhaust is handled by a simple three-way catalytic converter. No SCR, no DOC, no particulate filters.

Commercial interest

Serious steps have been taken by both New Holland and Deutz in recent years to assess the viability of natural gas in agricultural tractors as many farmers are now considering natural gas in the form of biogas as a fuel. Deutz collaborated with the University of Rostock and the Deutsche Bundesstiftung Umwelt

ABOVE: New Holland's T6.180 in action producing biofuel
INSET: New Holland's six-cylinder NEF gas engine

(DBU is the Environmental Agency in Germany) on the conversion of its TCD 3.6 diesel engine. The engine, a four-cylinder 3.6-liter diesel unit, was a stock production unit taken directly from the factory. It underwent several reworks to fit spark plugs, modify the compression ratio, and remove the common-rail inlet system and replace with a manifold to connect the inlet ports to a gas carburetor.

Then the tractor was fitted with a number of separate pressure vessels holding around 132 lb (60kg) of CNG, which is roughly equivalent to 16 gallons (73 liters) of diesel in terms of fuel capacity. Final testing took place at the end of 2015, with a reported positive response and the conclusion that production tractors using CNG engines were a viable concept and in practical terms a desirable production solution.

New Holland took a different approach for its methane-powered

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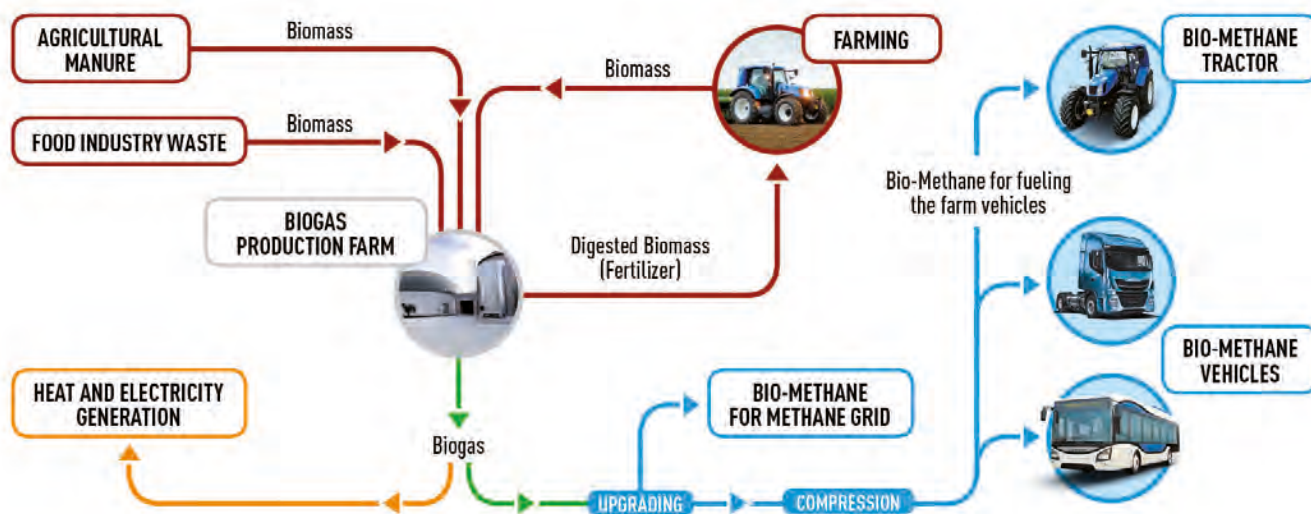


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Carlo Lambro, brand president, New Holland



TOP: The production and usage network for methane biofuel

BELOW: Organic matter is fed into a 'bio-digester' on an energy-independent farm, creating methane gas to power vehicles



tractor prototype, taking an existing NEF Series six-cylinder gas-powered variant from its sister company IVECO, which already used this model in commercial vehicles set up for gas. As the commercial-vehicle variant of the engine does not form a chassis component, the block of the engine had to be reinforced prior to installation. The New Holland project retained the common-rail concept and utilized a reprogrammed ECU to effect the required ignition timing. The engine was installed in a T6.180 tractor unit produced in the company's plant in Basildon, in the UK. Retaining the common rail meant it was easy to address combustion-related issues, for example that of unburned fuel igniting in the exhaust tract causing a 'knock' or 'popping' sound during deceleration. So by sensing any hydrocarbons present in the exhaust gas and adjusting the mix via the ECU, New Holland eliminated this condition in this engine. Refinement like this is a massive step in providing a 'like for like' driving experience compared to the diesel variant.

"The T6 Methane Power tractor is one of the cornerstones of our Clean Energy Leader strategy, which we launched 10 years ago to increase farming efficiency and sustainability,"

says Carlo Lambro, New Holland brand president. "We saw early on that alternative fuels are key to achieving a low-carbon future for agriculture, and we have invested accordingly. Today, we see methane and propane as the fuels with the greatest potential for the development of technologies that deliver on all fronts: performance, costs and sustainability."

Professor Colin Garner of Loughborough University, an expert in fueling for internal combustion engines, agrees: "The high level opportunities with methane are generally good. Methane offers lower CO₂ emissions because of higher hydrogen to carbon ratio of the molecule, compared to diesel. World supplies are abundant and methane is currently cheaper than diesel fuel."

Upgrading performance

For New Holland, the project was overseen by FPT Industrial, the engine development and production wing of CNH Industrial. And like other major engine manufacturers, FPT Industrial has been eyeing the gas-fueled market for some years. Based in the center of Europe and providing engines for both road and off-highway applications, FPT has reacted to the demand for cleaner emissions within cities by providing a range of spark ignition engines

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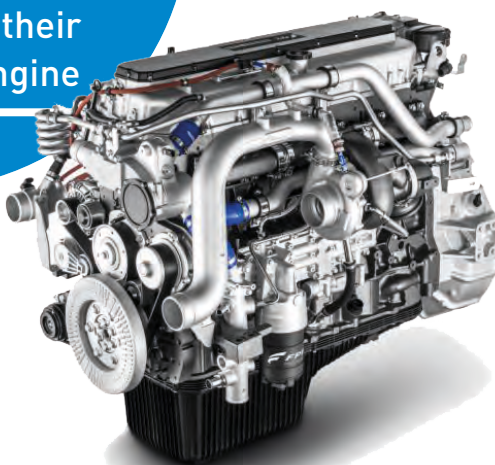
ABOVE (LEFT TO RIGHT):
Cummins ISL G; Deutz
TCD 3.6; MAN E3262
natural gas engines

BELOW: FPT Industrial's
Cursor 13 NG engine



10%

The target overall
improvement in torque and
power for FPT Industrial's
new gas engines, when
compared with their
baseline gas engine



**"NATURAL GAS IS THE CLEANEST
AND MOST VIRTUOUS THERMAL
ENGINE FUEL. ITS TECHNOLOGY IS
WELL TESTED, READY FOR THE
MARKET AND WILL PRODUCE
ENVIRONMENTAL BENEFITS
RIGHT NOW"**

Pierpaolo Biffali, head of product engineering, FPT Industrial



based on the company's automotive product. Even now, the automotive market still provides the catalyst for development simply because of the volume of production in that sector.

However, it has become clearer in recent years that the demand for clean engines currently driving the automotive industry will spill over into the industrial sector as products become more widely accepted.

To this end, FPT Industrial has set up an R&D team to concentrate purely on gas vehicle engine development: the Hi-eNG project. "Natural gas is the cleanest and most virtuous thermal engine fuel. Its technology is well tested, ready for the market and will produce environmental benefits right now", says Pierpaolo Biffali, head of product engineering at FPT Industrial. According to Biffali, the latest NG engine, the Cursor 13, "reaches near zero CO₂ emission when fueled with biomethane".

This project is aiming for second-generation, high-efficiency

Dictionary definition

methanogen |
noun *Biology*
a methane-producing
bacterium, especially
an archaean, which
reduces carbon
dioxide to methane.

CH₄
Methane

natural gas engine and expects that, when finished, torque, rated power and the reduction in greenhouse gas emissions will all show a 10% improvement compared with the company's baseline gas engine. The team intends to validate proposed changes using their single cylinder combustion simulation engine. Examples of features in development are pent-roof combustion chambers with 'tumble flow' intake ports and twin injectors, both of which promote sufficient gas flow into the combustion process. FPT Industrial is also testing a centrally mounted spark distributor (rather than a plug and a high-pressure cooled EGR circuit) which helps to reduce throttling loss at part load and means that the engine 'feels' more like a diesel.

Natural gas future?

With the growing pressure on environmental responsibility, a handful of the major players are turning their attention to the

"THE BIOGAS GENERATED FROM OUR BIO-DIGESTER UNITS IS USUALLY AROUND 60% METHANE, WHICH IS BASICALLY THE SAME PURITY AS NORMAL NATURAL GAS"

Dr Mauro Nicoletti, area manager,
Schmack Biogas



challenge of producing engines that can handle both natural and biogas as a fuel within an interchangeable engine envelope. There are still challenges, as underlined by Prof. Garner's caveat: "To get a decent energy per unit volume into the fuel tank, of a vehicle you need to store it at either high pressures, or in a liquefied state (i.e. below -163°C (-261.4°F)) and keep it there. These are not barriers, as it is being done – it is just easier with diesel which can be stored at very high energy density (i.e. energy per unit volume [J/m³] at normal atmospheric pressure and normal, ambient air temperatures."

The target is obvious: give the customers viable ranges of industrial engines that perform equally well on either gas or diesel and are physically interchangeable. These will provide the OEMs with a more flexible product to offer to new markets which are, or will become, environmentally sensitive. These initiatives should be applauded by our industry and supported as truly viable options for the future. **ivT**

On the Web

Find out more about New Holland's T6.180 at
www.ivTinternational.com/methane

MAKING METHANE

Although currently there are seemingly endless amounts of naturally occurring fossil-based gas in the world, it never hurts to have a Plan B and that plan may extend to further investigating the subject of artificially stimulating the creation of methane – the principle component of all-natural gas. It's the gas that bubbles from swamp, the gas that provides the stench of effluent, and in future it might be the gas that provides us with that elusive 'renewable' energy source that we will need to power our off-highway equipment.

So how do we produce methane? Methane in the form of biogas has been used for decades in the agricultural industry for heating, and latterly in the public transportation services in some municipalities within Europe.

The basic science is that the methane is produced when certain acids are consumed and digested by any methanogenic organism, the most common culprit being methanogenic archaea, a single cell organism that flourishes in anaerobic environments. Air-breathing organisms (yes, humans, too) secrete methane as a product of digestion, which accounts for those embarrassing moments in meetings when we have a 'methane escape'.

For industrial purposes, though, companies like Schmack Biogas exploit this fact by developing industrial processes and plant designs to allow the production of a pure, methane-rich gas that can be used for a number of industrial applications, which now, as it turns

out, includes its use in industrial engines. Schmack Biogas is one of the largest in the business and has collaborated with several vehicle manufacturers on the use of biogas.

Dr Mauro Nicoletti oversees the design, production and installation of biogas production plants for Schmack Biogas in Bolzano, Italy, and explains, "The biogas generated from our bio-digester units is usually around 60% methane, which is basically the same purity as normal natural gas." Biogas can be refined further, but is sufficiently pure as produced to be pumped into the gas grid in most countries. The digester plants create an anaerobic environment into which virtually any type of organic waste is introduced. These include vegetable and food waste, animal dung, grain-based waste and human excrement.

Within these digesters, the waste is encouraged by bacterial degradation to break down into hydrogen, carbon dioxide and acetic acid. The archaea then consume the acids, converting all of the waste to carbon dioxide and methane. The biogas can be used, bottled or stored, and the by-product of the process is a pure organic liquid fertilizer that has commercial as well as environmental value. This process happens naturally, requiring nothing more than the right conditions. Obviously there are variables, in particular feed balance (excessively high protein can cause over-acidification), and both mechanical agitation and

finite temperature control help promote the effectiveness of the process. This sounds complicated and on a small scale the monitoring and feeding process can be quite challenging.

Dr Nicoletti explains further, "Usually after a year in operation, our customers feel that the process is user-friendly and that use and maintenance is not a complication." However, on a serious production scale, these plants can be almost fully automated and experts agree that, although the design of such plants is well developed, there is still much scope for process improvement and the potential from economy-of-scale that would be gained by more widespread adoption of the gas as a fuel.

Biogas could become a truly renewable source and one that makes long-term sense. Methane captured using this process would minimize emissions of methane, which is one of the most damaging greenhouse gases. A commercial use could be found for much of our domestic and commercial waste; effluent treatment for domestic sewerage could be rationalized and become cheaper.

This will not happen overnight, but driven mostly by the agricultural and commercial vehicle sector, natural and biogas will become more widely available at fueling centers. However, to become really effective this will need widespread government support, and with the potential for lost revenue from fuel excise, that support may be a while coming.



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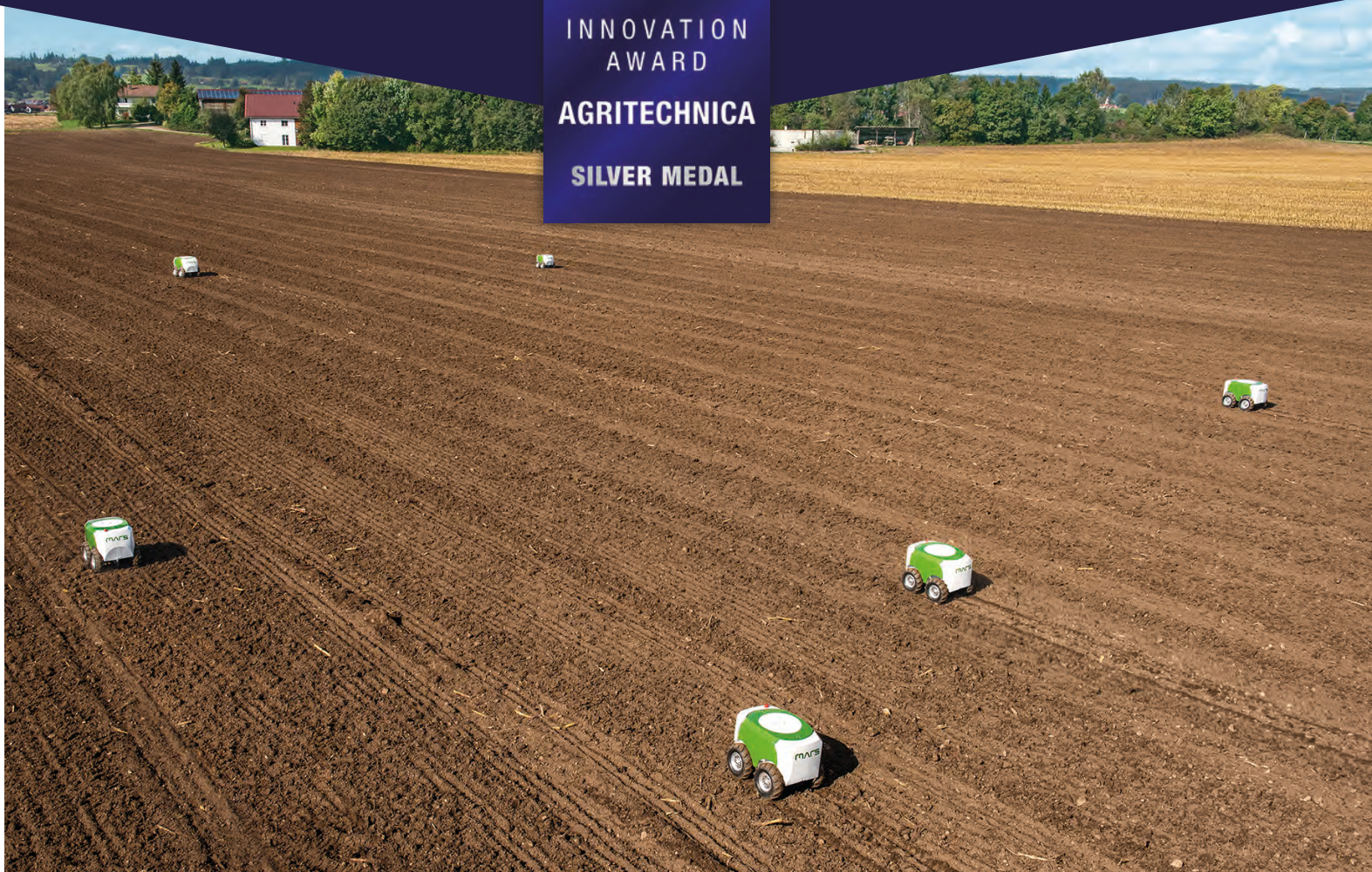
Tech leaders

The 44 judges sitting on the panel for Agritechnica's Innovation Awards were required to sift through more than 320 submissions. Entries ranged from very practical technology that will provide substantial benefits to the agricultural industry now, all the way to futuristic concepts indicating a path the industry is only beginning to tread. Prior to the show we covered the two gold medal winners, now we present our selection of some of the most interesting of the silver award winners from the competition

BELOW: Fendt's Mobile
Agricultural Robot
Swarms in action



INNOVATION
AWARD
AGRITECHNICA
SILVER MEDAL

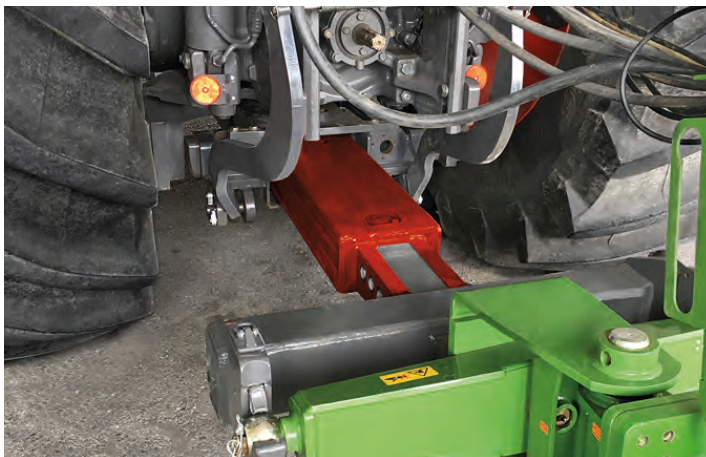




AGROCOM (POLSKA) SMART CROP DAMAGE IDENTIFICATION

Estimating the extent of crop damage caused by extreme weather is labor intensive and often inaccurate. In response, the Polish arm of Agrocom has developed the Smart Crop Damage Identification (SCDI), which can make more accurate assessments. 3D images captured by drones are combined with lidar to calculate the extent of damage. The system reduces the working time required by farmers when checking stocks and for quality assurance.

<https://tinyurl.com/smartcrop>



FENDT, VARIOPULL

The VarioPull from Fendt is able to maintain the same weight distribution on a tractor's front and rear axles regardless of the drawbar load, drawbar power, ballast or the use of the traction booster. Altering an implement's attachment point, the system can bring it flexibly up to within 80cm (32in) of the tractor's rear axle, with weight distribution being optimized as it moves closer. This allows the operator to position the attachment further back to give more space for the drawbar when carrying out a headland turn.

<https://tinyurl.com/variopull>



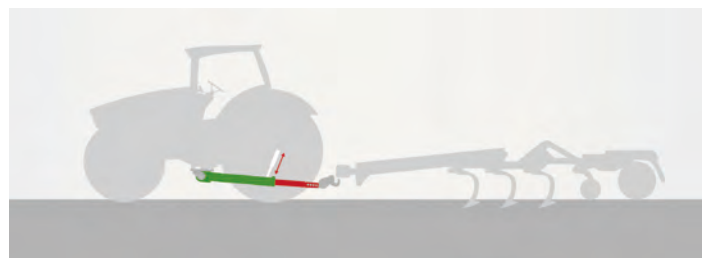
AGRITECHNICA REVIEW



FENDT, MOBILE AGRICULTURAL ROBOT SWARMS (MARS)

Fendt's MARS (Mobile Agricultural Robot Swarms) is the first time swarm technology has been presented to the agricultural industry in a marketable way. The system relies on a number of small, auto-steered, electric units, that can be filled with maize and deployed for seed drilling. The system emits low noise levels and can operate without lights at night-time, making them suitable for seeding fields near residential properties 24 hours a day. Each unit weighs as little as 40kg (88 lb) and the swarm can coordinate the work to reduce soil compaction and avoid the dangers posed to humans by larger vehicles. All job data is logged in the cloud and the units can communicate both with each other and with the operator.

<https://tinyurl.com/fendtmars>





KRONE, LIFTCAB

Given the modern trend for high-yielding maize varieties that reach heights of over 4m (13ft), forage operators can often be driving unsighted into a wall of maize plants for much of their day. The LiftCab from Krone enables the entire cab to be raised by 70cm (28in), reducing operator strain and providing an overview of the crop and harvest fleet – easily spotting obstacles. The space created underneath has the added benefit of providing easy access to service and maintenance points.

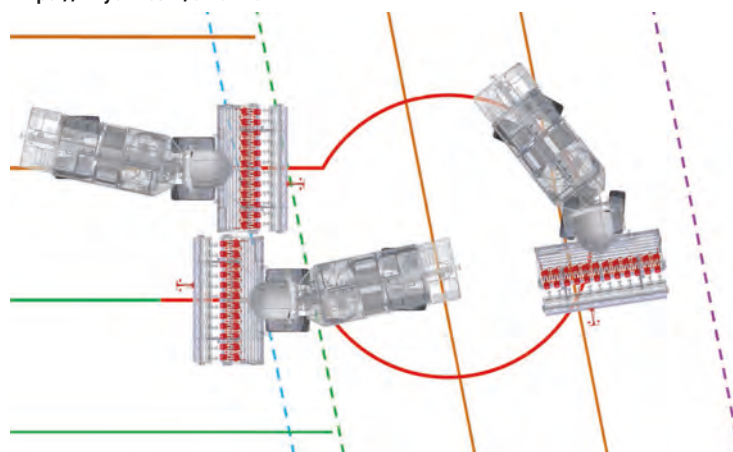
<https://tinyurl.com/kroneliftcab>



HOLMER, SMARTTURN

While typical tractor headland management systems record sequences of repetitive functions that operators can retrieve at the push of a button or based on GNSS positioning, the SmartTurn is an altogether different approach. A software solution, it automates the complete headland turn of a beet harvester, including the raising and lowering of the lifter unit. Holmer's mechanical row guidance system is combined with Reichardt's GNSS-controlled version, turning it into a self-propelled tanker harvester. All headland turn maneuvers in the field to be harvested are optimized, minimizing field traffic and so reducing compaction, losses and downtime.

<https://tinyurl.com/smartturn>



JOHN DEERE, EZ BALLAST WHEELS

To have the necessary traction required for heavy draft tasks, tractors are traditionally ballasted by attaching heavy weights to the front and rear axles. That is time consuming and hazardous, but John Deere's EZ Ballast Wheels offer a simpler solution. Weights can be fitted to the wheels with a pallet fork and without the need to jack the tractor. In fact, they can be secured or released by a single person. As well as increasing the traction of the tractor, the wheels improve fuel efficiency as well as better protecting the soil.

<https://tinyurl.com/ezballast>



Turn the page for one of the key vehicle launches from Agritechnica

YOUR RACE YOUR TEAM



Professionals in motion



Filling the

MAIN AND RIGHT:
The Torion 1914 is
the mid-range vehicle
in the Claas line-up
with a tipping load
of 12.4 metric tons





gaps

THE TORION WHEEL LOADER RANGE, DEVELOPED IN ASSOCIATION WITH LIEBHERR, ROLLED UP TO FILL GAPS IN CLAAS'S PORTFOLIO AT AGRITECHNICA LAST YEAR. NOW YOU CAN TAKE A CLOSER LOOK AT THE DESIGN AND COMPONENTS OF EACH VEHICLE

▶ German farm machinery manufacturer Claas has spent the past two years developing a new range of agricultural wheel loaders in association with fellow German manufacturer Liebherr.

The goal for Claas was to introduce a wheel loader range specifically manufactured for all levels of the agricultural market, something the two companies claim has never been achieved before.

And so, before a packed stand at the huge Agritechnica show in November 2017, a senior representative of each company introduced the new Claas Torion range of wheel loaders.

Former Claas managing partner Helmut Claas, and Willi Liebherr, president of Liebherr International, pulled the covers off the new machines. Designed for

agricultural use, the new Torion range consists of seven models in three category sizes.

"The range was designed and specified for usability in agriculture, with specific focus on customer segments by model size," says Alastair Bourne, Claas UK product manager for the Torion range. "Tests were carried out during the past two years at farms in Germany."

Start small

The smallest Torion 535 and 639 models are powered by 46kW (62hp) and 50kW (68hp) Yanmar engines and are ideal for a variety of smaller agricultural jobs, Bourne explains.

"The Torion 535 and 639 are suited to all kinds of farmyard jobs on dairy and cattle farms, such as feeding, manure loading and bale handling," he says. "They are also

"THE RANGE WAS DESIGNED AND SPECIFIED FOR USABILITY IN AGRICULTURE, WITH SPECIFIC FOCUS ON CUSTOMER SEGMENTS BY MODEL SIZE"

Alastair Bourne, Torion product manager, Claas UK



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50kW

The power provided by the Yanmar engine (68hp) for the compact Torion 639

suitable for special crop farms, vegetable farms and for pallet and box handling. These two models are reliable, easy and safe to operate."

Both four-cylinder engines meet the requirements of exhaust standard Stage IIIB (Tier 4i). Exhaust treatment is carried out with a diesel particulate filter (DPF) with integrated diesel oxidation catalyst (DOC). Claas says the use of SCR technology is not required.

The filter regeneration mode can be adjusted according to the conditions, with either manual or automatic regeneration, as preferred.

In the Torion models, fresh air is drawn in from the radiator cooling package and pre-filtered. The air filter is readily accessible in the machine engine compartment.

A dust extractor valve efficiently removes dirt and dust particles from the filter, which protects it and makes servicing easier.

In these smaller Torion models the generously sized radiator cooling package ensures there is plenty of cooling capacity in all climate conditions. The intelligently designed air supply route guarantees high cooling capacity right from the outset. The heat given off by the engine can leave the engine compartment without being drawn back into the system.

The tipping load of these models is 3.4 and 3.85 metric tons respectively, and clearance height is less than 2.5m (8.2ft).

The infinitely variable hydrostatic drive has two drive modes: F1

"ON THE TORION 535 AND 639 MODELS, THE HYDROSTATIC DRIVE, PUMP AND HYDROMOTORS ARE MADE BY BOSCH REXROTH AND THE AXLES BY COMER"

Alastair Bourne, Torion product manager, Claas UK



ABOVE: The smaller Torion models are suitable for a variety of farmyard tasks

from 0-6km/h (0-4mph) and F2 from 0 to 20km/h (0-12mph). The driver can switch from one drive mode to the other at the touch of a button, depending on the application.

"On the Torion 535 and 639 models the hydrostatic drive, pump and hydromotors are made by Bosch Rexroth and the axles by Comer," confirms Bourne.

Pressing gently on the brake/inching pedal allows infinitely adjustable deceleration of the ground speed, with the engine speed remaining the same. Fully depressing the pedal automatically

reduces the ground speed to zero, and activates the service brake (hydraulically operated drum brake).

The creep speed facility is ideal for agricultural jobs that require higher oil flow, but slower speeds, such as bedding or sweeping livestock houses.

This means the machine is driven at a constant speed in a set inching position and the required flow of hydraulic oil can be controlled with the accelerator via the engine speed.

The cab and boom on both models are positioned for maximum visibility and the rounded rear window provides the operator with an optimum view to the rear when on the move.

The loaders' size enables them to operate in more confined areas, particularly thanks to their sharp 40° articulating angle.

Torion mid-range

Moving up in size, the mid-range Torions consist of three models, from 103kW to 123kW.

The Torion 1511 is the biggest in this range, at 123kW (165hp),

CLAAS TORION RANGE



the 1410 is rated at 114kW (155hp) and the 1177 at 103kW (140hp). These three models are powered by John Deere Power Systems engines, which have dynamic cooling, demand-driven, engine cooling, and have already proved their worth in the Claas Arion 500 series tractors.

"The mid-range Torion 1177 to 1511 models are designed for farms and contractors with increasing demands in lift capacity and performance," says Bourne. "Or for every agricultural customer who looks for capacity and efficiency in loading and versatility, with still reasonable machine-size dimensions. Arable farms and contractors will also benefit from these models."

Specific applications could include silo compaction and handling of grain, fertilizer and other bulk material.

All three mid-sized Torions have a three-range hydrostatic varipower transmission. The convenient system provides three drive modes, from 0-6, 0-16 and 0-40km/h (0-4, 0-10 and 0-25mph) for optimal adjustment to conditions. "The pumps and the two hydromotors are all made by Bosch Rexroth," says Bourne.

ABOVE: The mid-range 1511 has a hydrostatic transmission with three different drive modes

BELOW: A dynamic cooling system comes as standard on the 1812 while a diesel particulate filter is optional

The engine is positioned low and well toward the rear, so acts as a counterweight, making high tipping loads of 7.75 to 9.75 metric tons possible. All models feature Smart Loading, with a programmable bucket return function and defined lifting and lowering limits.

All three models in the mid-range Torion series are equipped with a standard 7in touchscreen, which serves as a central information hub for operating the machine and is extremely easy to use.

Two joysticks are available for convenient and sensitive control of the Torion. The ergonomically designed joystick

makes operation of all boom functions easy and precise.

The direction of travel can also be changed easily via a toggle switch on the handle. The multifunction lever, available as an option, has an additional four-way control lever that can be used to control a third and fourth hydraulic circuit, for filling and dumping a high dump bucket or opening and closing a silage grab.

Two large Torion models

The largest of the Torion models, the 1812 and 1914, have Liebherr engines with dynamic cooling, providing 143kW (192hp) and 168kW (225hp), and offer tipping loads of 11.1 and 12.4 metric tons respectively.

These bigger machines have been designed for the contractors and large farming businesses that have the highest demands in terms of power, performance and operator comfort.

"For the large-scale farmers, contractors, or those working in the biogas industry, the bigger Torion 1812 and 1914 models will be the most beneficial," says Bourne. "Customers that look for high load capacity and efficiency, served by





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efficient C-Matic transmission and powerful Liebherr engines, will need these machines."

The efficient Liebherr engines in these larger models meet Stage IV emissions standards with no additional diesel particulate filter, but it is available as an option.

Both large models are equipped as standard with the dynamic cooling system. An optional automatic reversing fan system for very dirty working conditions is also available.

Similar to the models in the mid-range series, these two largest Torion models enjoy optimal weight distribution, with the engine located well toward the rear.

This means that it can be accessed easily, facilitating swift maintenance. The boom is available with either agricultural kinematics or Z-kinematics, the agricultural kinematics being particularly well-suited for all agricultural applications.

Both machines can be equipped with a high-lift boom as an option, as long as they are using agricultural kinematics. Measuring 3m (9.8ft), it is 40cm (15.7in) longer than the standard boom, and can achieve loading heights of up to 4.64m (15.2ft) at the pivot pin.

"Both the Torion 1812 and 1914 models have ZF – C-Matic transmissions and axles," says Bourne. "The transmission split

CLAAS AND LIEBHERR: FAMILIES OF SUCCESS



The Torion range has brought Claas and Liebherr together for the first time, but strong, decades-long, parallels can be drawn between the two.

Claas was founded in 1913 by brothers Theo, Franz, August and Bernhard (pictured above, from left, around 1950), originally producing

straw binders but later developing a strong knotting system to tie bales. In 1958, August's son Helmut Claas joined the family firm, becoming director of the engineering department four years later. He was responsible for several innovations that put Claas firmly on the map, including the Dominator combine harvester series developed in the 1970s.

Liebherr also started life as a family business, when, in the late 1940s, Hans Liebherr recognized the need for tools and machinery for the construction industry. Together with design engineers and tradesmen, in 1949 he developed the TK10, the

company's first mobile tower crane. This launched the company on its journey, developing construction machines and making a foray into refrigerators. Today the group has manufacturing bases in a number of countries and remains family run.

Claas is also still very much a family business, with Helmut's daughter leading the group. It employs around 11,500 workers worldwide and had a turnover of €3.8bn (US\$4.73bn) in the 2015 financial year.

At the end of 2016 Liebherr employed 42,308 people and had a turnover of just over €9bn (US\$11.2bn), the third-highest in its history.

TOP: The agricultural kinematics loader in the 1914 is unique to the Claas Torion

12.4
The maximum tipping load of the Torion 1914 (the largest in the range) in metric tons

gear box for the two hydrostat motors with clutch (shutting off the larger hydro over 16km/h [10mph]) is made by Dana. And the axles are made by Dana Spicer." The mid-range 1177, 1410 and 1511 also carry the Dana clutch and Dana Spicer axles.

Claas has been very vocal about the fact the Torions are the first complete agricultural spec wheel loaders to be introduced to the global markets, though other loader manufacturers may disagree.

Responding to this, Bourne says, "Claas is happy to confirm that the Torion wheel loaders for agricultural use have a well-tested and best-proven basement from one of the most powerful and most reliable wheel loader ranges with a global footprint.

"The adaptation of such premium wheel loader models

to agriculture was made by Claas and Liebherr product managers with long-term experience in agriculture and in material handling.

"One example unique to the Claas Torion is the offering of the 'agricultural kinematics' loader end in the largest models in the range, the 1812 and 1914.

"This combines the best of both a parallel and Z-bar linkage loader end. With the parallel linkage you get higher torque forces in the upper lift range and a true parallel lift range. From the Z-bar linkage side of the design you get incredible tear-out force with your front attachment," he says. **ivT**

On the Web

Watch a video Claas Torions in action at www.ivTinternational.com/torion

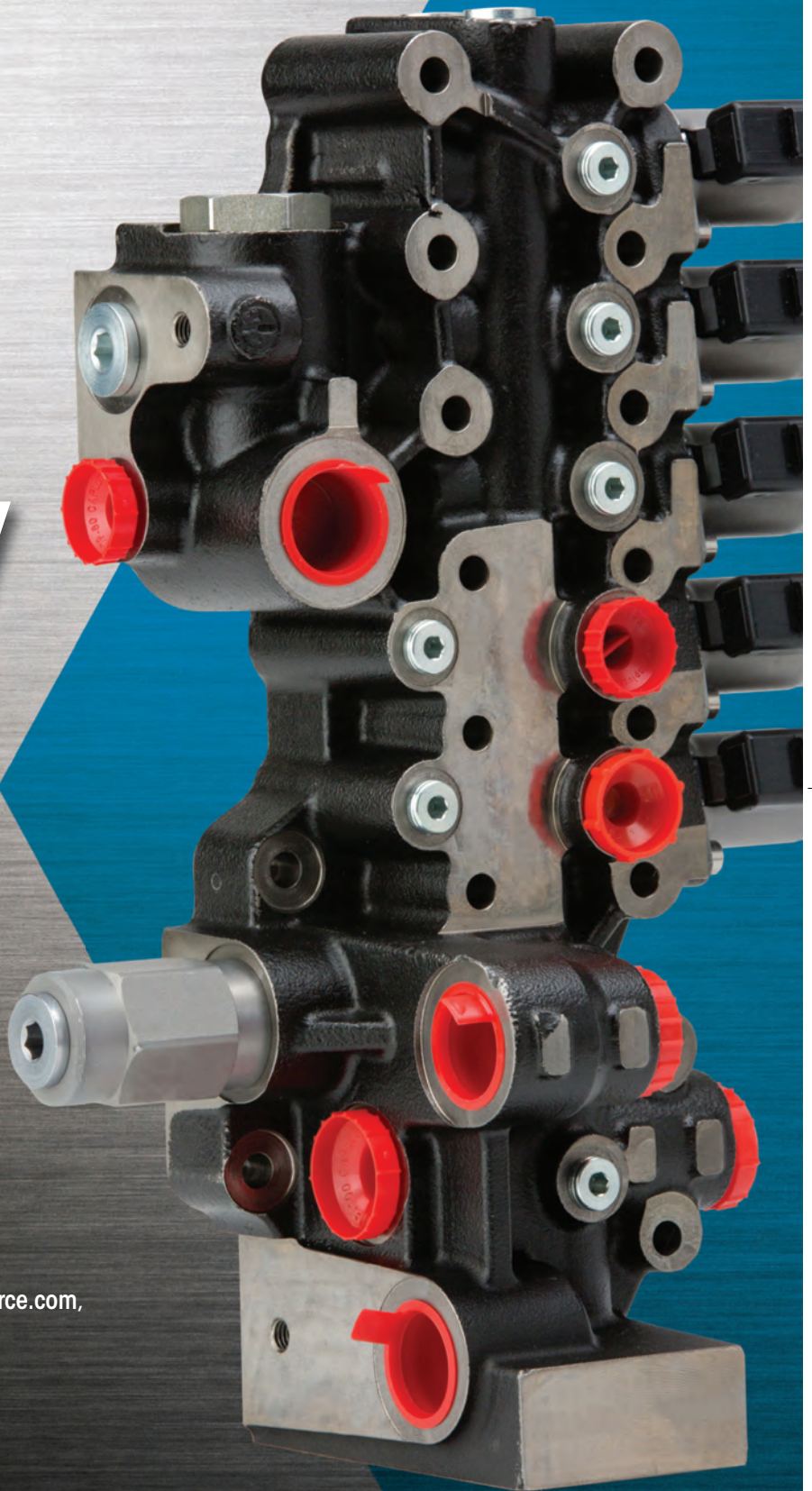
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Head turners

AHEAD OF INTERMAT 2018, iVT HAND-PICKS SIX OF THE VEHICLE DEBUTS LIKELY TO BE CAUSING A STIR AT THE SHOW AND FIVE OTHER MUST-SEE HIGHLIGHTS





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6%
lower fuel
consumption than
its predecessor

LIEBHERR TL36-7

Production of Liebherr's new range of telescopic handlers only kicked off in January this year, so privileged Intermat visitors will be the first to see the new vehicles in the flesh. A total of eight models will eventually complete the line-up – including a top-of-the range version – but the TL36-7 (pictured) is among the first five being launched and on display at the Paris show. Weighing 3.6 metric tons (4 US tons), the vehicle will have a lifting height of 7m (23ft) and powered by a Stage IV/Tier 4 Final-compliant, 3.6-liter diesel engine with a power output of either 74kW for the 3.6 metric ton vehicle or 100kW for the 4.1 metric ton vehicle.

KOMATSU PC228USLC-11

Komatsu's new short tail excavator, the PC228USLC-11, will be at Intermat this year. The machine offers 21% improved lifting performance while consuming 6% less fuel than the outgoing model. Powered by an in-house built SAA6F107E-3, Stage IV engine, the vehicle has 165hp of power available at 2,000rpm and the integrated selective catalytic reduction system reduces NO_x emissions. An advanced electronic control system is able to manage airflow rate, fuel injection, combustion parameters and aftertreatment functions. A 7in TFT-LCD widescreen color monitor displays information in 26 languages to make life easier for operators, and a new auto-idle shutdown helps reduce fuel consumption.

INTERMAT PREVIEW

3

6,000kg

load capacity

AUSA D600 AHG

Visitors to Intermat this year will be able to see Ausa's new dumper in the flesh for the first time. The completely overhauled D600AHG now has telematics as well as start/stop functionality and a number of improved safety parts. The 2,210mm-wide vehicle offers a variety of driving modes for efficient fuel consumption. It also has a power output of 55kW and a load capacity of 6,000kg.

A red and black AUSA D600 AHG dumper truck is shown from a front-three-quarter view. It has large, deep-tread tires and a high chassis. The AUSA logo is visible on the side of the dump body.

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Hydrokit designs, sells and delivers, in the shortest possible lead times, customer and machine-specific hydraulic and electrohydraulic solutions to improve performance, security and comfort of mobile and static machinery.

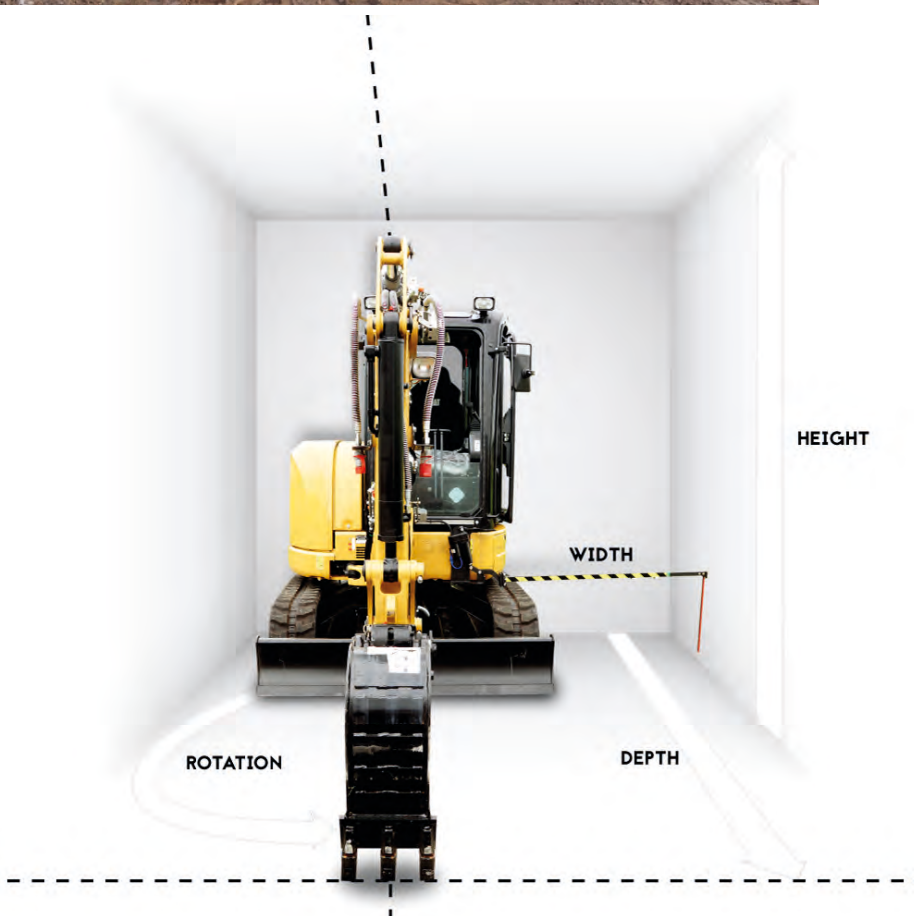
For Intermat, Hydrokit introduces its latest innovation for more efficient work on height/width/depth-limited construction sites while giving operators greater protection. With the movement limitation kit, you can 'put your movements in a box'. The control box allows in-cab adjustment of the extreme positions of boom and arm in height, rotation, depth and width, calculated from the information provided by the sensors installed on the machine.

On the stand, you will get an overall picture of what Hydrokit and its subsidiary Soerma TP are capable of. Soerma TP will present its new compact motor-grader, Easy Grader, for which Hydrokit developed the hydraulics. Its compact dimensions allow grading work in the narrowest sites such as cycle paths, footpaths and building platforms.

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SAFETY CONTROLLERS

In recent years, functional safety has been the trend that has permanently changed the way control systems for mobile working machines are developed. The introduction of the EU Machinery Directive 2006/42/EC set new requirements that machine manufacturers must comply with. Further, new revisions of C-type standards have been published to align application-specific requirements with the Machinery Directive and state-of-the-art technology.

High availability, scalability and diagnostic coverage of the working machine are essential objectives that can be achieved using programmable electronics. A certified safety PLC provides a solid foundation to implement software-based safety functions. However, the entire software ecosystem must support an OEM's technical requirements and business objectives, such as strict time-to-market needs. Since development of safety-related software is expensive and time-consuming, developers often prefer to use pre-certified software components to build an application. This makes it possible to release development resources to focus on core functionality of the machine while minimizing the effort needed to develop new safety-related software.

Therefore the availability of safety-related application libraries and an efficient toolchain to setup system configuration and develop safety-related applications, as well as a safety programmable logic controller (PLC), are key factors for a successful project. **Epec's** objective is to provide machine manufacturers with a complete solution to achieve the shortest time to market.

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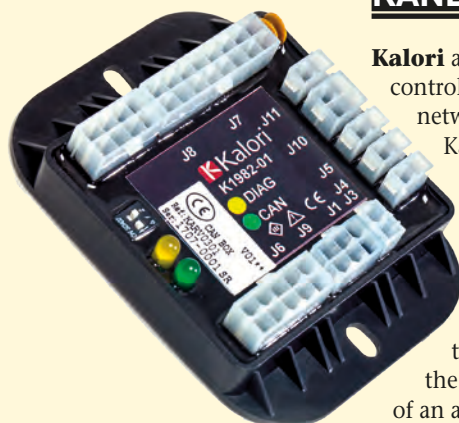
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MECALAC E12

The Mecalac E12 is arguably the pièce de résistance. Winner of the Interimat innovation award, the fully electric excavator is ideal for urban building sites, emitting no harmful emissions while boasting 146kWh capacity and an eight-hour range. For more information and a six-page case study of the vehicle, turn to page 28.

KANBOX FOR HVAC



Kalori air-conditioning systems may be controlled by a CAN-based (controller area network) communications system. The Kanbox is capable of communicating over CANopen and J1939 type networks.

With the Kanbox, manufacturers may now control all those commands relating to the running of the air-conditioning or heating system. These controls may be activated via the vehicle's own interface, meaning the manufacturer may save on the cost of an additional interface panel. It can also be controlled via some of the command modules in the Kalori catalog, like the all-new PCK3.

The Kanbox by Kalori can control the HVAC system, potentially the pressurization system, up to four actuators and the compressor,

the various temperature sensors and a number of additional peripherals. The Kanbox operates under a supply of 9-36V. It is fitted with minift type connectors and is protected against polarity inversions and over voltages. The casing is classed as IP66. It also meets the requirements laid down in REACH (1907/2006) and RoHS (2011/65/EU).

The change to CAN management systems is a natural evolution in the world of machinery manufacturers. The investment involved is, in the main, paid for by the savings made in the overall cost of control systems, and, in addition, it provides a range of additional data (diagnostics, state of connections, etc).

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RELIABLE COUPLINGS

Stucchi SpA, one of the leading companies for quick couplings and always attentive to developing products for multiple needs, offers a very wide range of multicouplings that are adaptable to the most varied applications.

Among them is the DP2, which is the most compact model of the range, containing two couplings available in the sizes $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ for a maximum operating pressure of 350 bar and flow rates up to 150 l/min.

The DP2 model finds its ideal use in operating machines where it is important to reduce the overall dimensions to a minimum, such as on the arm of mini and midi excavators where the minimum protrusion from the excavation arm is required.

DP2 multicouplings are equipped with FAP-ZN flat-face couplings that allow the connection of the hydraulic lines with residual pressure with a minimum of effort and a high degree of safety.

Their use is very simple and intuitive. After connecting, a locking device is activated to ensure that the system is properly connected and can't be disconnected accidentally. The special fixing system, consisting of a locking nut and an anti-unscrew ring, makes the DP2 multicoupling suitable for impulse pressure conditions and allows for simple assembly and maintenance.

Hall 5B Stand G014



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7m
maximum lift
height



BOBCAT E27Z

A new generation of Bobcat compact excavators is arriving just in time for Intermat with details of the 2-3 metric ton models being released prior to the show – the E27z being one of them. Offering high levels of stability, the machine complies with weight limits to ensure easy trailering. A big focus has been given to operator comfort, with more ergonomic controls, 360° view and comfortable seating.





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1,100mm
superior rotor
diameter

KEESTRACK R3/R3E

A redesigned track-mounted impact crusher unit from Kestack is set to be unveiled at Intermat 2018. The R3/R3e includes all the benefits of the diesel electric hybrid concept, the Destroyer 1011, that the company presented 12 months ago. Built to be a mobile solution for a broad range of applications, the machine has fast loading and setup times, while the wide-opening doors and flaps provide good accessibility to all of its operational components. It will be available as a diesel-hydraulic or fully hybrid version, equipped with a diesel/electric drive and electric plug-in power supply. Both versions have a high-performance impact crusher, offering crushing efficiency of up to 250 metric tons an hour thanks to a heavy-duty 920mm rotor.

SMALL-SIZED, HIGH-POWERED ENGINES

Motorenfabrik Hatz introduces its new liquid-cooled three-cylinder diesel 3H50T, a fan-to-flywheel version of the engine, as well as an open power unit (OPU) variant.

Extending the product range of H-series engines, which were specially developed by Hatz for current and future requirements on power, performance, reliability and international exhaust gas standards, the Hatz 3H50T has a displacement of only 1.5 liters and a maximum torque of 130Nm, giving the engine the highest torque in its class in the market today. The 3H50T does not have an intercooler or diesel particulate filter and this contributes to its compact size.

Even with its low weight and small installation dimensions, the performance data of the engine

exceeds many older engines in the 19-37kW class.

The 3H50T satisfies EU Stage V as well as EPA Tier IV final requirements. It is therefore an ideal choice for upgrading existing machines in the 19-37kW class to EU Stage V.

The Hatz 3H50T OPU is a plug-and-play solution that is an ideal choice, particularly for manufacturers of compact machines that need engines fully ready for installation.

With its integrated and optimal design of the radiator, hoses and cabling as well as the electronics, the Hatz OPU concept greatly simplifies design and installation.

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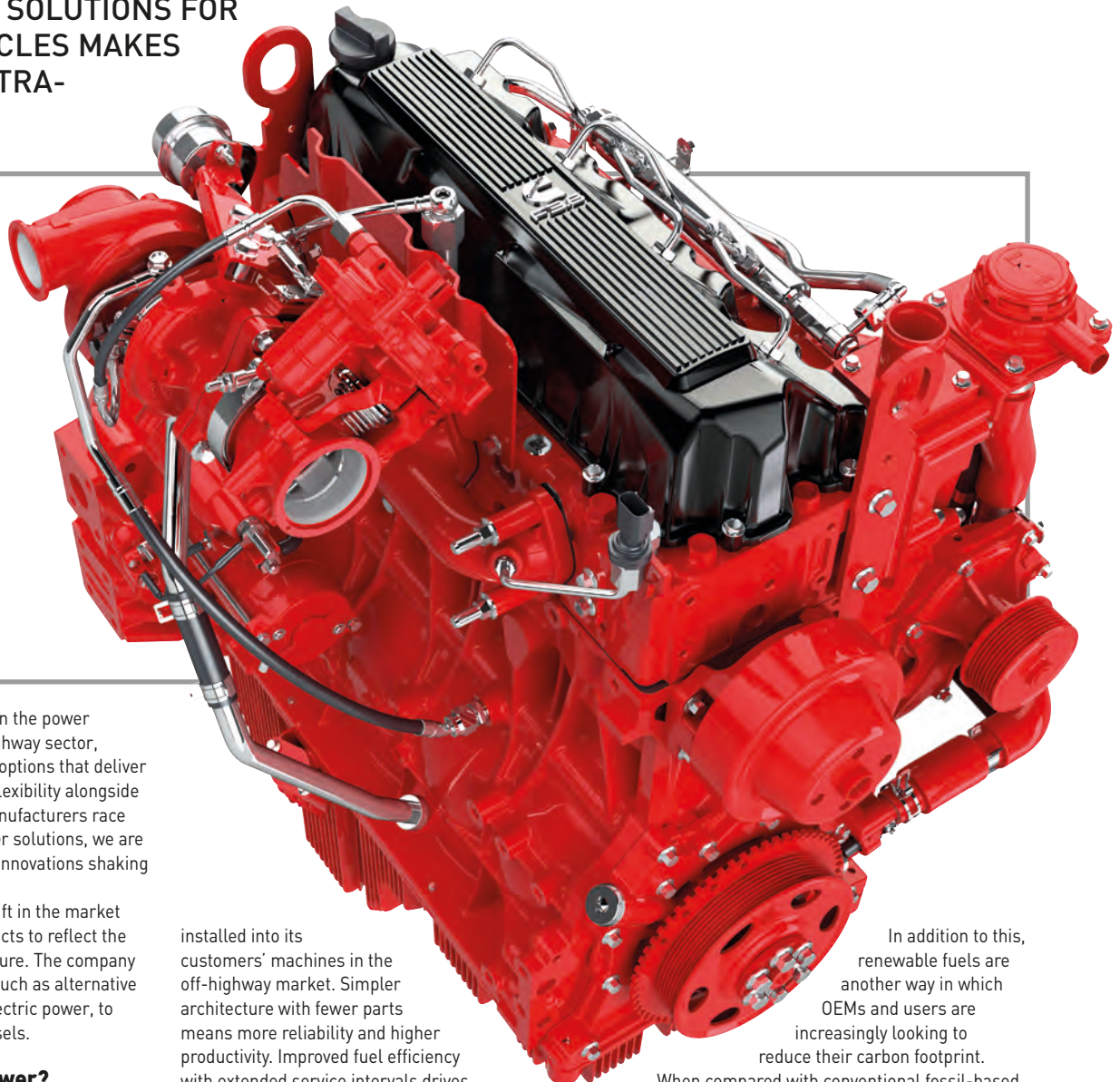
- ◆ Connection/Disconnection with both side under pressure is allowed.
- ◆ Internal pressure release valve system allows an easy connection with high internal residual pressure.
- ◆ High resistance to impulse pressure.
- ◆ Flat face is easy to clean, reducing contamination in the hydraulic circuit.
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The new F3.8 delivers machine capability and uptime while reducing the total cost of ownership



It is an exciting time to be in the power industry. Across the off-highway sector, customers are demanding power options that deliver greater efficiency, reliability and flexibility alongside reduced emissions. As engine manufacturers race to meet the demand for new power solutions, we are seeing new concept systems and innovations shaking up the industry.

Cummins is addressing this shift in the market by expanding its portfolio of products to reflect the alternative power needs of the future. The company is developing a range of options, such as alternative fuels, range extenders and full electric power, to complement its suite of clean diesels.

A future without diesel power?

With the development of electric drivelines and the increased provision of alternative fuels, will we see the end of diesel? This is unlikely. To meet environmental guidelines, engine manufacturers have adapted their engine technology to meet the most recent emission standards, resulting in diesel engines that are cleaner, simpler and more efficient.

This philosophy is epitomized in Cummins's new Stage V engines – 100 of which have already been

installed into its customers' machines in the off-highway market. Simpler architecture with fewer parts means more reliability and higher productivity. Improved fuel efficiency with extended service intervals drives lower running costs. The engines are more compact with less weight, taking less time to cool, less installation complexity and lower installation costs for manufacturers.

Cummins Stage V is the power solution for many installations, including cranes, excavators, wheeled loaders, forklift trucks, air compressors, dump trucks, drilling equipment and several other off-highway vehicles.

In addition to this, renewable fuels are another way in which OEMs and users are increasingly looking to reduce their carbon footprint.

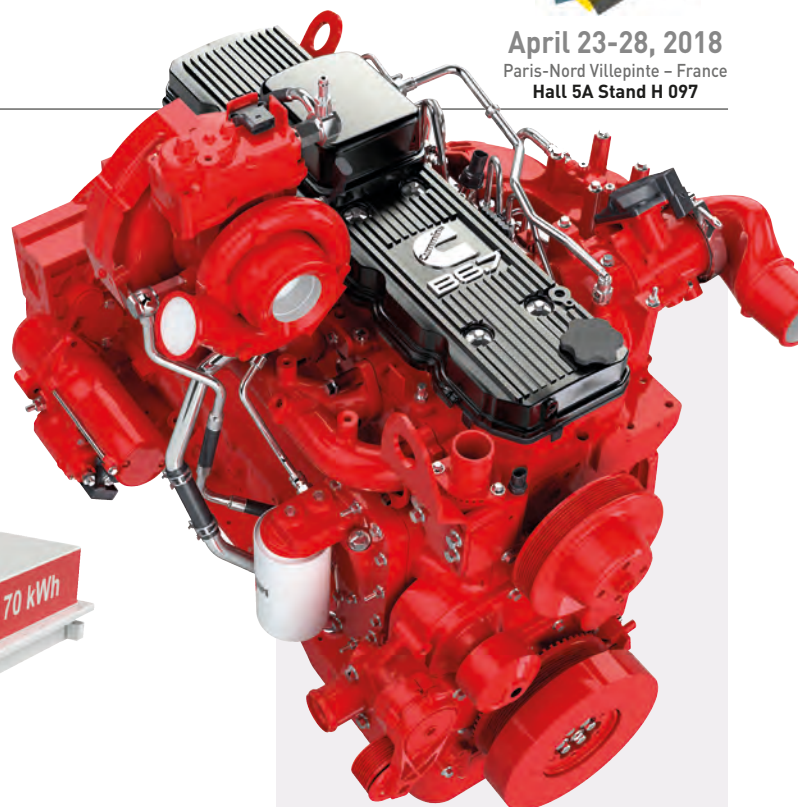
When compared with conventional fossil-based diesel, paraffinic diesel fuels offer the potential to reduce greenhouse gas emissions by 40% to 90% over the total life of the vehicle. The fuel is also very flexible, as it can be easily blended with standard diesel at varying percentages (including winter-grade fuels) and it has the same stability and cold properties as conventional diesel. Ultimately, the fuel can be stored and used in the same ways.



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RIGHT: The B6.7 is the most popular diesel engine ever built by Cummins

BELOW: The standard-sized Cummins battery enclosure provides a 70kWh storage capability with up to eight enclosure units (560kWh)



When used in compatible engines, such as the Cummins B6.7 and L9 engines, the fuel enables operators to minimize their emissions-based footprints, thereby extending the life of the diesel.

Alternative power solutions

Alongside these leaps in cleaner diesel engine technology, alternative power solutions are coming to the fore. To reflect these shifts in the market, Cummins has moved from being a diesel expert to being a powertrain expert. It now offers customers a range of solutions, from ultra-clean diesel to natural gas, renewables and even electrification.

Electric power has been championed by the automotive industry, governments and the media. However, the reality is that the benefits of it vary from market to market. One of the biggest challenges is aligning the battery capacity/size with the duty cycle of the machine and the charging capability. The more capacity needed between charges, the larger the battery has to be. Just like an engine, the larger the battery, the higher the cost. In addition, the battery needs to be packaged in the appropriate position in the equipment and its weight impact has to be considered.

Despite this, electric drivelines are ideal for operators where even lower emissions are required to improve air quality, particularly in urban and portside locations. To cater for this emerging market, Cummins has been building experience in a range of electrification concepts. These include parallel hybrids, range extenders/plug-in hybrids and full electric, to provide customers with the best solution for their on-highway and off-highway machines. Cummins' range extended electric vehicle driveline (REEV) is one such electric power solution, with the working concept being unveiled at Intermat 2018.

The Cummins REEV is designed to replace a standard driveline using larger Cummins or competitor engines up to nine liters in capacity. The system is essentially a hybrid, with battery power combined with a compact engine generator that utilizes a four-cylinder Stage V F3.8 engine. The system uses a high-efficiency traction motor that provides a continuous torque of 1,850Nm, eliminating the need for gear shifting and dramatically reducing powertrain noise. Crucially, this system has been designed to deliver an instant peak torque boost of 3,400Nm when the application reaches difficult working conditions.

Natural gas engines also offer ultra-low emissions, low noise, excellent torque and high fuel efficiency. The truck and bus market has seen successful natural gas installations, and Cummins has developed significant experience in this area. Right now, however, the level of investment needed for off-highway adoption of natural gas engines is proving a challenge for manufacturers. Should OEMs sufficiently invest in the technology, Cummins is ready to work with them.

Conclusion

Power solutions for off-highway applications are not one size fits all. Users require a range of solutions to meet variations in types of industrial equipment, their differing load factors and duty cycles. With a range of power solutions to choose from, OEMs obtain greater flexibility and reduced emissions. While Cummins ventures into the battery and electric driveline technology world, ultra-clean diesel engines look likely to remain the go-to power source. **IVT**

Hugh Foden is executive director of off-highway business at Cummins



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April 23-28, 2018
Paris-Nord Villepinte - France
Hall 5B Stand 023

Data-driven precision

AN INTELLIGENT LOAD MONITORING SYSTEM IS ENHANCING SAFETY AND IMPROVING ACCURACY FOR INDUSTRIAL VEHICLES

Initially targeted for telehandlers and other lifting applications, Dana's Spicer Smart Suite intelligent load monitoring system (ILMS) uses patented and proprietary mechanical, electronic, machine-learning and software technologies to evaluate vehicle stability in every dynamic condition and to improve operator safety.

Beyond preventing vehicle tip-over incidents, ILMS also monitors productivity by estimating lifted loads and driveline operative conditions, including operator misuse. This helps to reduce the risk of vehicle breakdowns, improve productivity and precision, and enhance the long-term durability of powertrain systems.

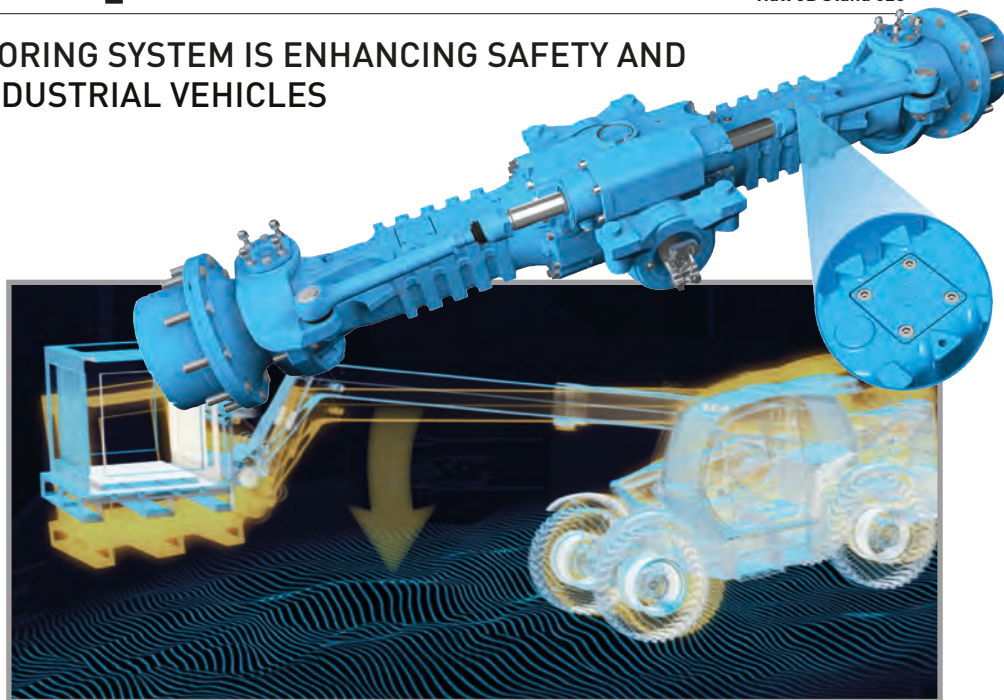
The Spicer Smart Suite ILMS physically integrates with mechanical axles typically used on working machinery, and measures and collects real-time data through the embedded sensors. Proprietary software uses artificial intelligence and machine learning algorithms to elaborate the data and provide insightful information about vehicle stability. It can even anticipate the risk of a vehicle tip over before it occurs.

This information is distributed on the vehicle network through the CANbus, while other connected vehicle systems can use it to take specific actions to prevent operator incidents, such as limiting vehicle speed or operating/facilitating the extension of the boom.

Forward-thinking technology

The Spicer Smart Suite ILMS represents a significant advancement in technology compared with other marketed systems, offering insights far beyond the requirements of the European Union's EN15000 regulation. The EN15000 requires vehicle stability monitoring only when the vehicle is stationary, but the Spicer Smart Suite ILMS provides reliable monitoring in all vehicle working conditions, including steering, climbing, loading, and other dynamic conditions, potentially creating a new standard and level of expectation for this capability.

Beyond vehicle stability, the proprietary algorithms of the Spicer Smart Suite ILMS can provide other insightful information from the same embedded sensors. For instance, lifted load weight



The Spicer Smart Suite ILMS uses patented and proprietary data-collecting technologies across the vehicle to prevent tip-over incidents, estimate static loads and supply intelligent calibration management

can be estimated and used to measure vehicle productivity. Thanks to the deep integration into the axle structure, Spicer Smart Suite ILMS can also monitor driveline operating conditions. For example, it can detect when the axle has been subjected to external shocks or operator misuse. This information can be used for predictive vehicle maintenance, reducing vehicle downtime and optimizing the efficiency of vehicle usage.

By recognizing, learning, and anticipating vehicle and operator behavior, this system can significantly reduce the need for vehicle calibration and enables operational parameters to be customized by taking into account specific machine characteristics, engineering tolerances and operator tendencies.

Traditional load monitoring technology collects limited measurements from a single remote-mounted or retrofitted load cell on the rear axle. These cells do not perform reliably in dynamic conditions and offer less than optimal integration with mechanical and electrical systems. The Spicer Smart Suite ILMS technology enhances the intelligence drawn from drivetrain components through an integrated solution that includes: data collection devices, such as load cells and other sensors, that capture data from key drivetrain operating processes; onboard computing capabilities

that consolidate, manage, and analyze data; and compatibility with common vehicle communication protocols and telematics systems.

Additional expertise

Dana is also testing a range of premium functions, including vehicle usage records, which document load cell sensor data, vibration and shock absorption, and other historical information. This data collection can benefit the vehicle rental market in terms of liability, maintenance, and cost considerations. In addition, mechatronic systems that will leverage intelligence from the drivetrain to perform key functions and operations independent of operator intervention are under development.

ILMS is the first technology from Dana's Spicer Smart Suite portfolio that leverages the Internet of Things and Industry 4.0 trends to support the company's evolution into the age of smart equipment. At Intermat, taking place in Paris from April 23-28, Dana will showcase its wide range of advanced drive and motion systems for the construction industry. **IVT**

Giulio Ornella is head of fluid power, electronics and advanced engineering for off-highway drive and motion technologies at Dana Incorporated



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April 23-28, 2018
Paris-Nord Villepinte - France
Hall 5A Stand D021

New engine technologies

TWO EXPERTS IN THEIR OWN FIELDS HAVE JOINED FORCES TO SET NEW BENCHMARKS IN POWER, PERFORMANCE AND EFFICIENCY

▶ In 1992, Rubble Master introduced its first crusher for the recycling of asphalt, concrete debris and materials left over from brick production. Today the OEM continues to offer an excellent alternative to heavier crushers for big applications, including mining, with its compact yet powerful RM 100GO! and RM 120GO! impact crushers fitted with John Deere Tier 3/Stage IIIA or Final Tier 4/Stage IV PowerTech E 9.0L engines.

A crusher requires a good engine response to maintain a constant speed under highly fluctuating loads. Thanks to their packaging and leveraging of emissions technologies for a wide variety of applications and emissions needs, John Deere engines are ideal partners for Rubble Master. Both of the John Deere engines used in the crusher units offer customers the reliable emissions-compliant power needed in tough applications.

Optimizing aftertreatment packaging and reducing its weight are important factors for many applications. From the technology side, John Deere has been working to leverage new catalyst technologies and emissions control calibrations to enable the downsizing of aftertreatment systems. The company's latest aftertreatment solutions deliver greater package flexibility and offer easier installation thanks to a reduction in size and weight.

Businesses such as Rubble Master are already experiencing the benefits of reduced size and weight in current Final Tier 4/Stage IV John Deere engine models. The RM 120GO! track-mounted impact crusher from Rubble Master can reduce up to 350 tons of demolition waste in an hour, despite weighing just 35 tons. Furthermore, impact plates enable the operator to switch between recycling and natural stone applications quickly, increasing productivity and flexibility.

New technologies in action

The RM 100GO! track-mounted impact crusher can handle up to 250 tons per hour, crushing construction and demolition waste, concrete, asphalt, glass, coal, natural rock and even the reinforced concrete used in the production of high-quality construction materials.

Capable of recycling and processing materials on site, Rubble Master's John Deere-powered



RUBBLE MASTER

With the RM 100GO! and RM 120GO!, customers can opt for either a Tier 3/Stage III A or Final Tier 4/Stage IV PowerTech E 9.0L engine

impact crushers bring a quick return to small- and medium-sized recycling contractors.

With years of expertise in application integration, John Deere's wide product offering gives OEMs more options for matching power and performance to exact machine requirements. As both an engine and vehicle manufacturer, the company can leverage its experience in the field to optimize its products on a systems level rather than in terms of single components – leading to enhanced performance, durability and packaging.

John Deere Power Systems pioneered advanced emission technologies for Tier 3/Stage III A, and

based its Final Tier 4/Stage IV on these proven technologies. The company is ready to lead customers through the upcoming Stage V transition, thanks to its considerable experience in diesel particulate filters. In fact, John Deere has more than 900 million hours of experience in using its own emissions technology in a variety of applications.

John Deere Power Systems manufactures and markets 30kW to 448kW (40hp to 600hp) industrial diesel engines and 56kW to 559kW (75hp to 750hp) marine diesel engines for use in a variety of off-highway applications. The company will highlight its latest innovations at Intermat Paris, on Stand D021 in Hall 5A. **IVT**

Patrick Thil is manager OEM engine sales for European, Africa and Middle East (EAME), Asia and Australia, John Deere Power Systems



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Preparing for Stage V

STRICTER OFF-HIGHWAY EMISSIONS REGULATIONS WILL COME INTO FORCE NEXT YEAR AND EXTENSIVE TESTING IS SHOWING OEMs WHICH NEW ENGINES WILL BE BEST FOR THEIR VEHICLES

▶ In 2019, the European Stage V emissions standard for off-highway engines will come into effect. Scania Engines showcased its solutions in April 2016, and since then, field trials have been run on the latest equipment to validate engine hardware, software and calibration. Construction equipment manufacturer Doosan Infracore Norway, for example, has been testing a 9-liter, five-cylinder Scania engine for the past five months and a 13-liter, six-cylinder engine for the past two.

Establishing the most effective concept

Development of Scania Engines' Stage V solutions has been ongoing for the past three years, with many concepts having been evaluated using computer simulation and testing.

The concepts have been assessed, according to five main criteria: handling of exhaust emissions, performance and response, fuel efficiency, cost, and engine lifetime.

Van Davenport, Scania Engines' lead calibrator for Stage V engine calibration, says, "We looked for worst-case scenarios for different applications, including excavators, stone crushers, harvesters, compressors and front loaders, and came up with a solution that would work for all areas."

As a result, Scania Engines caters to each application's specific requirements, be it engine response or fuel efficiency.

"We have learned a great deal from our Stage IV- and Tier 4 Final-compliant products, having looked for improvement areas," Davenport says. "For Stage V we focused specifically on thermal management in the aftertreatment system, transient response and fuel consumption."

Thermal management entails keeping the temperature at an optimal level in the aftertreatment system, regardless of the surrounding and operating conditions, while transient response is about how well and how fast the engine builds torque.

The key to success has been the integration of the throttle handling with the variable-geometry turbo (VGT) control strategies. The VGT also works as an exhaust brake.

Mark Scott, group manager for the calibration and performance team at Scania Engines, says, "Testing in cell and test rigs has shown that the strategies



Development of a Stage V solution began three years ago

RIGHT: Doosan Infracore Norway is testing two Stage V engines

employed – including the use of both hardware and software – to ensure fast, transient response have been very successful. It is possible for us to test consistently, even at high altitude."

True to Scania Engines' commitment to continuous improvement, parts of the job had already been done, the first generation of a similar system having been introduced in 2011, when the integrated Euro 6 exhaust gas aftertreatment system for trucks and buses was launched.

Fitting a wider range of applications

The development team for the Stage V platform has further refined the components and designed a distributed system to make the platform fit a wider range of applications.

Another very successful factor has been the use of Scania's own engine management system,



which gives to engineers complete control of an engine's behavior.

"We already work closely with original equipment manufacturers on the Tier 4 Final products," Davenport says. "We will continue to focus on and improve our cooperation."

Scania Engines' Stage V-compliant industrial engines range from the 9-liter five-cylinder and 13-liter six-cylinder in-line engines to the 16-liter V8 engine, covering output from 202kW to 566kW. **IVT**

Anders Nordner is technical writer at Scania



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Hall 5A Stand F 046

A slow and steady drive

A NEW HYDRAULIC HYBRID VEHICLE DRIVE SYSTEM HAS BEEN DESIGNED FOR SLOW, CONTROLLED USE

By strengthening its range of full systems, Poclain Hydraulics is bringing more value to its customers. The company is leveraging its efforts through a strategic restructuring that will enable it to focus on system solutions.

Poclain Hydraulics' CreepDrive range, with a new dedicated motor and pumps, all from its high-performance range of products, is an example of the company's strategic focus. The expanded CreepDrive range will address the needs of a wider range of applications. The range will be introduced at Intermat Paris in April 2018, and available to buy in mid-2018.

Constant hydraulic control

A hybrid mechanical hydraulic transmission from Poclain Hydraulics, the CreepDrive system enables vehicles to work at very low constant speeds regardless of the engine speed, thereby giving auxiliary systems the power they need to work effectively. When the system is disengaged, the vehicle is able to drive at normal on-road speeds with no mechanical transmission efficiency losses.

The complete CreepDrive range contains two motors, a variety of PW pumps and plug-and-play control kit, including the CANbus communication.

The new motor has two speeds over a wide range of displacements. Other new features include a reinforced shift cylinder and shaft seals as well as an extremely robust design. Compared with the existing motor, this new motor has double the speed and triple the torque. Despite this significant performance improvement, the motor length has only increased by 50mm (2in) and is lighter than comparable products to meet the needs and requirements of third parties who are installing the system.

Integration into a wider range of vehicle applications, including medium commercial vehicles – where constant speed and accurate positioning are essential – is now easier. CreepDrive removes added stress on braking and clutching that occurs when vehicles are working at low speeds, as well as the additional maintenance required to keep those systems working properly. Replacing friction braking with hydrostatic braking acting as an integral decelerator reduces the need to feather the brakes.



ABOVE: The CreepDrive system is designed for vehicles that operate at very low speeds

BELOW: Shifting transmissions can be achieved simply by activating a switch



This enables greater precision and less opportunity for error, helping operators increase safety and productivity.

In addition, radial technology eliminates the need for an additional reduction stage and offers some of the highest efficiencies on the market. This reduces fuel consumption and noise, which makes the system more suitable for urban applications. Additional applications include: road maintenance and marking/stripping, bridge inspections, rail track maintenance,

airports, road sweepers, mulching/chipping, snow cutting, suction dredging, and slinging.

Operational tips

The vehicle brake can be applied to enable hydrostatic ground drive and the mechanical transmission can be set to neutral while the engine power take-off (PTO) is engaged to drive the pump that supplies flow to the system's hydrostatic motor. A switch located in the cab engages a pneumatically controlled mechanical clutch that disengages the mechanical transmission and engages the hydrostatic transmission.

The driver can set the engine speed to the desired working RPM and, after releasing the brake, can move the joystick in the direction required.

Consistent low working speeds of 0-9mph (0-14km/h) are achievable in forward and reverse directions. When traveling at on-road speeds, the clutch is disengaged, thereby allowing the mechanical transmission to continue operating.

The full CreepDrive system will be on display at the Poclain Hydraulics Intermat booth in Hall 5A – Stand F046. **IVT**

Bruno Lacheteau, director of trucks and bus markets, Poclain Hydraulics



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▶ NAF AG is a global leader for bogie axles, with a payload range of 10-50 metric tons and optional patented solutions, such as the company's Permanent Bogie Balancing System for rough terrain and the harshest conditions.

The NAF product portfolio features steering, rigid and bogie axles, as well as gearboxes for applications in forestry, agriculture, mining, material handling, construction, airport and off-road heavy-duty transport. With NAF's modular system, it is possible to combine technical features, such as a planetary gear drive with a patented turbo brake, as well as a multiple disc differential lock for perfect traction control.

Industrial solutions

In the construction sector, NAF specializes in drive solutions for articulated dump trucks of up to 45 metric tons and motor graders with up to 350hp.

Due to its long-term experience with bogie axles and wide range of suitable components, NAF is open to customized solutions.

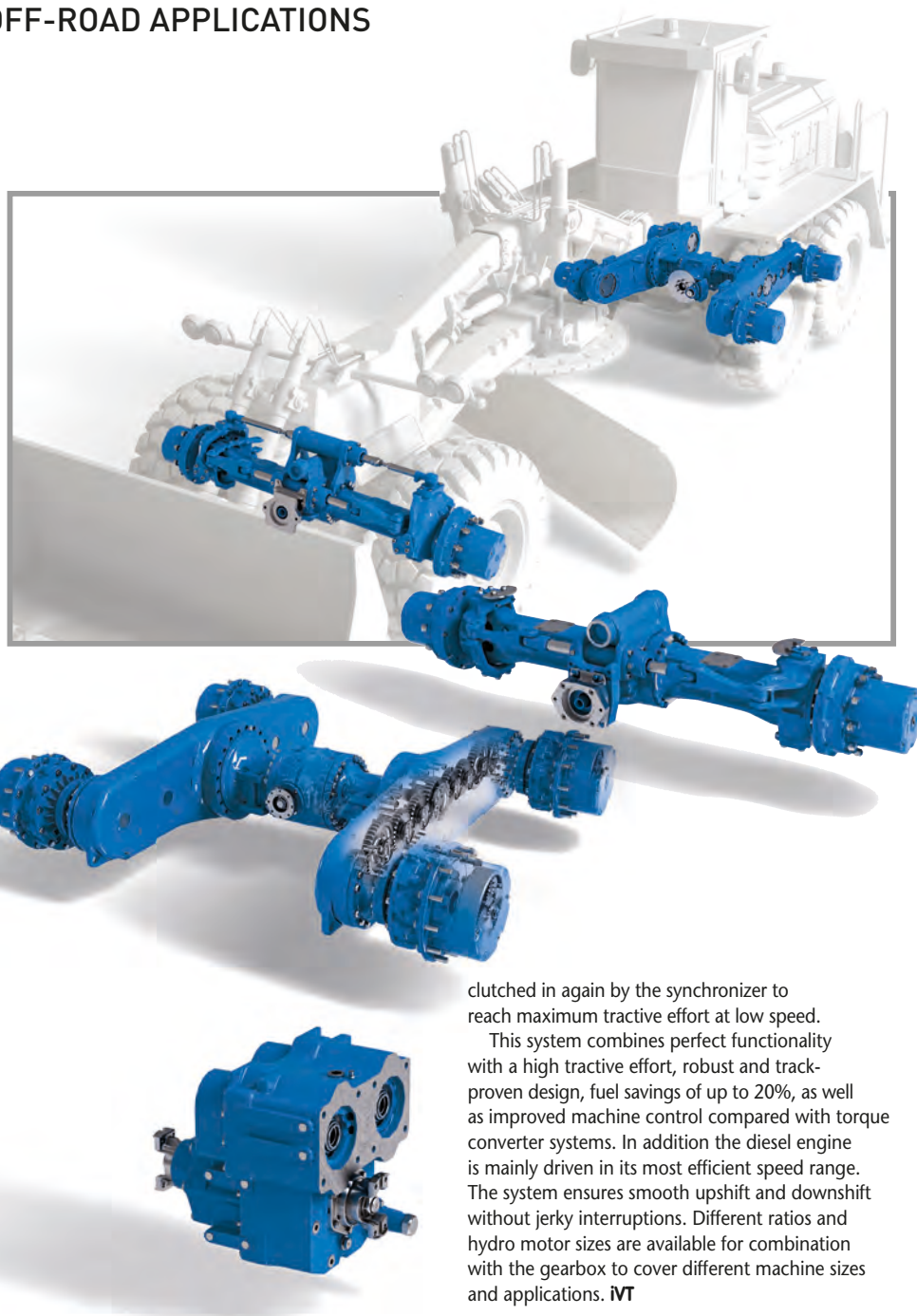
NAF's modular designs allow it to offer the cost advantages of a standardized product line, but with a high degree of flexibility and faster project completions.

NAF focuses on strong and reliable drive solutions for heavy motor graders. For applications with a top-to-rear bogie axle, NAF supplies an all-wheel drive with a directly driven front axle, including a side tilting and two-motor gearbox for a full hydrostatic system.

Multifunction gearbox

The patented DualSync gearbox can provide hydrostatic continuously variable transmission (CVT) functionality for the entire speed range. The configuration allows two operating modes: simultaneous use of both motors for high tractive effort and perfect control at low speed; and fuel saving, single-motor mode for high driving speeds.

Both motors that drive NAF's mechanical DualSync gearbox are connected with different ratios. When the second motor (with the higher ratio) reaches its speed limit, it is declutched by a synchronizer ring and the first motor takes over up to maximum speed. When reducing speed, the second motor is smoothly



clutched in again by the synchronizer to reach maximum tractive effort at low speed.

This system combines perfect functionality with a high tractive effort, robust and track-proven design, fuel savings of up to 20%, as well as improved machine control compared with torque converter systems. In addition the diesel engine is mainly driven in its most efficient speed range. The system ensures smooth upshift and downshift without jerky interruptions. Different ratios and hydro motor sizes are available for combination with the gearbox to cover different machine sizes and applications. **IVT**

Peter Illig is head of sales and marketing at NAF Neunkirchener Achsenfabrik, Germany

ABOVE: Possible drive solutions for motor graders



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Scientific seating

A NEW MODULAR RANGE OF HIGH-PERFORMANCE MECHANICAL SEATS FOR INDUSTRIAL AND CONSTRUCTION VEHICLES IS MAKING MACHINE OPERATION SAFER AND MORE COMFORTABLE

United Seats, based in Zwijndrecht in the Netherlands, is the dedicated, own-brand range from EBLO Seating.

EBLO has more than 35 years' experience in designing, manufacturing and providing machine drivers and operators with ergonomic seating solutions. United Seats supplies to more than 40 OEMs in the construction, agricultural and forklift sectors, as well as the aftermarket.

With such experience, the company understands the need to provide comfortable seating, which in turn leads to greater productivity for equipment operators and, more importantly, a reduced risk of injuries and accidents.

Meeting customer demand

As United Seats has a core group of customers who produce forklifts, wheel loaders, tow tractors, telescopic handlers and other industrial vehicles, it needed to bring in a new generation of low-profile, low-frequency seats to maintain its current portfolio and to serve new customers and sectors.

Design work on the range – initially on the MGV35 model – began two years ago and was followed by product testing.

Adjust for comfort

The MGV35 low-profile suspension seat has an SIP (seat index point) of only 220mm (8.6in), yet features a high-performance mechanical suspension with a 50-155kg (110-342 lb) weight range, and has a vertical range of 80mm (3.1in). These ride characteristics have enabled the MGV35 to meet an array of international standards, including EN13490 and IT1, IT2, and EM1 to EM9. This makes the MGV35 an incredibly versatile compact seating product.

The rotary weight adjuster is smooth and the operator can view the weight gauge while adjusting the seat. Such an easy-to-use weight adjuster lessens the need for the operator to request an air seat option. The mechanical suspension of the MGV35 series is also durable and particularly robust for exposed, 'open cab' vehicle applications. In the long run, it is easier to service than an air seat.



TOP: The MGV35-MGV55 family

RIGHT: The MGV35 model seat cushion offers a high level of comfort

The standard but ergonomically designed MGV35 is stylish, well-suited to modern, new, compact machines and comes in a 460mm (18in) width version that includes a retractable seatbelt. It also comes with a deluxe Delta contact switch, which detects the operator's presence across the whole seat cushion surface – vital because, on some machines, operators sit on the edge or sides of seats while operating implements such as masts and buckets.

Mix-and-match add-ons

As the first model was introduced to supply a major forklift OEM, careful consideration was made to

create a flat cushion that allows for ingress/egress and which helps to prevent premature wearing out of the cushion. The seat and back cushion are easy to replace when restoration is necessary and the backrest recliner is fully retractable with a forward fold-flat feature. To meet users' varying needs, the seat comes with a full range of options such as armrests, back extensions, heated seats and different fabrics. **ivt**

David Hale is US business manager, EBLO Seating, and Evert Mallie is CEO and technical ergonomist, EBLO Seating



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Serving all requirements

ONE COMPANY REMAINS POPULAR AMONG ITS CUSTOMERS THANKS TO ITS CAPABILITY TO PROVIDE STANDARD, AS WELL AS TAILOR-MADE, AIR-CONDITIONING SOLUTIONS

▶ Siroco, an international supplier of thermal solutions, is a brand chosen by its customers because of its in-depth knowledge of technical issues and its ability to resolve them effectively.

"Our customers, who are manufacturers of forklift and handling equipment, need to warm up and cool their cabs with either standard products or specific solutions," says Julien Brochier, sales manager at Siroco. "We have to engineer solutions for vehicles that work in a range of temperatures – from -25°C (-13°F) in a climatic chamber, to 50°C (122°F) outdoors in a moist and dusty environment. Every project is challenging, but that is what keeps us motivated."

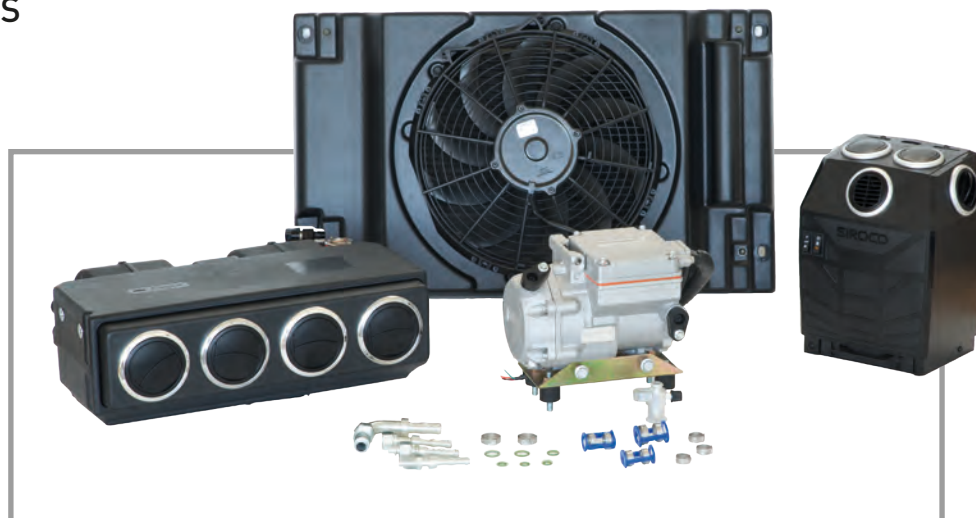
Thermal approach as a whole

"The process for implementing heating and cooling units in forklift cabins is not straightforward, especially for air inlets/outlets and hydraulic connections. Therefore drafting specifications is an important step, especially in regard to the definition of interfaces. On one hand, depending on the range level, Siroco offers thermal solutions that are easy to set up. On the other, it offers systems that can regulate heating capacity or control the speed of electric units.

To meet specifications, Siroco has the advantage of being able to define a thermal approach as a whole. "We not only develop heaters and coolers, but also integrate all functionalities of heating, ventilation and air-conditioning [HVAC] systems, including climatic control, air distribution, defrosting and air filtration," says Brochier. The real challenge is designing a compact and powerful product that is easy to integrate into the cab. It is therefore sometimes difficult to suggest a standard solution, which is why Siroco's specific solutions have become so well established.

20 years of success

"Although we are capitalizing on 20 years of specific developments for lift trucks, we are also putting forward new solutions to our customers," says Brochier. "Siroco can support them in modernizing their cabs." For each project, a specific strategy is adopted and supported by tests in a climatic chamber, using prototypes or by field monitoring.



ABOVE: Siroco's thermal and electric air-conditioning kits for forklifts: the Cierzo condenser, Austral Performa evaporator, E-Sonora electric heater, and electric compressor and fittings

BELOW: The new Sanoa air-conditioning unit is available with two different front panels – with sleeves or with air diffusers

"Depending on specifications, it takes six to 12 months to develop complete thermal solutions," says Brochier. "Our goal is to reduce development times, without rushing. In terms of time, accurate specifications are the key to the success of a project. We use rigorous standard designs and performing components that are already approved and scaled for customer projects."

New off-the-shelf products by Siroco do not offer specific solutions without reliable, effective and cost-saving elements. "As well as a wide range of

standard products, we work with components and subsets designed and approved by our department Siroco Engineering," says Brochier.

Siroco has recently developed an advanced electric control panel called the CP2, intended for use with HVAC systems, for both diesel internal combustion engine (ICE) and electric vehicles.

Another product is Sanoa, a best-in-class air-conditioning unit. The HVAC version offers 610m³/h nominal airflow and a 6.3kW cooling capacity. The evaporative emission control version offers the same nominal airflow but a 7.7kW cooling capacity.

A third product is the compact and powerful TS700 – a new centrifugal blower that offers a performance of 700m³/h. Thanks to its excellent performance/size ratio, it is ideal for cooling a small cabin and includes an air filter.

Using parallel flow technology, the two Cierzo condensers offer 5.6kW or 8kW of dissipated power. Supplied with or without a filter drier, the condensers work well with Siroco's air-conditioning units.

Committed to customer success

"In continuous pursuit of enhanced performance, we ensure our customers' specific needs and high standards are met. We are committed to the success of their projects in thermal comfort," says Brochier. **IVT**



Sylvain Reydellet is managing director at Siroco

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Faster, a manufacturer of quick-release hydraulic couplings, is hosting a forum dedicated to global construction equipment manufacturers.

The event will focus on showing what a difference the quick-release coupling can make to a machine, and will provide a road map to further innovation of the hydraulic components. The star guest of the event will be race engineer and F1 expert Giancarlo Bruno. Presenting his unique perspective, Bruno will show how important the integration of each single component is to reaching maximum performance on an F1 car.

Connecting Equipment World will offer engaging technical discussion, with all relevant OEMs represented, making it a not-to-be missed

occasion for networking and the sharing of expertise.

The event will take place in Milan, Italy, on May 17 and 18, 2018.

On the first day, attendees will gather in the heart of Milan, in an exclusive location equipped with technological devices for the benefit of the discussion and the workshops. At the end of the technical work, customers are invited to a private viewing of Leonardo Da Vinci's most famous painting, *The Last Supper*. On May 18, there will be a visit to Faster's plant in Rivolta d'Adda, to look closely at QRC production.

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Quote Ref: **516**



Compact magnetic angle sensor

Plastic sensor housings may be leakproof for a short time in harsh environments. In the long term, however, humidity will penetrate the inside of the sensor housing due to the hygroscopic properties of the plastic material, eventually destroying the sensor electronics – even with a high IP protection rating, such as IP67.

ASM Sensors presents a sensor designed for harsh conditions but still offering an exceptionally compact housing. Magnetic angle sensor Posirot Pras29 comes in

a completely closed, laser-welded, hermetically-sealed 316L stainless-steel housing. The

housing is only 10mm thick, 45.5mm long, 49.5mm wide and completely potted, with a special sealing compound also covering the cable area, to prevent longitudinal water ingress along the cable. Shielded

against electromagnetic disturbances, the sensor can be used even in the presence of strong electromagnetic fields.

The sensor measures rotary position from 0° to 360°, utilizing a multiple Hall Effect sensor array and a position magnet. The protection class is IP67. Analog outputs are available either with 0.5 to 10V, 0.5 to 4.5V or current 4 to 20 mA. The analog sensor has a linearity of ±0.5%.

Due to the robust, hermetically sealed, stainless-steel housing, the sensor is resistant to shock, vibration and dirt, while able to withstand temperatures from -40 to 85°C (-40°F to 104°F). Posirot Pras29 magnetic angle sensor is therefore perfectly suited for wet environments or those with fluctuating temperatures, such as industrial vehicles, mobile machines or food and pharmaceutical processing machinery.

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Quote Ref: **517**



High volume flow screw-in cartridges

A complete standard program of proportional screw-in cartridges is available in size M42x2. Comprised of spool valves, pressure valves and flow valves, the range is designed for maximum pressures of up to 400 bar. With volume flows of up to 400 l/min, they are also optimally suited to controlling large fluid amounts.

Wandfluh has many years of experience in proportional technology, and thanks to its high resolution and low hysteresis, the valves are suitable for demanding applications. The exchangeable coil simplifies the logistics – as the solenoid coil can be retrofitted, proportional screw-in cartridges

offer a very flexible system. Different plug and voltage alternatives are available ex-stock according to individual adaptations, all with the customary Wandfluh flexibility. In addition, the performance of the valves has been increased by the improved solenoid coil – achieving a salt-spray resistance of as much as 500 hours. Ambient temperatures of up to 70°C (158°F) can be accommodated without any performance loss.

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Quote Ref: **518**



Clever self-priming axial piston pump

Kawasaki has been producing the K3VL axial piston pump range for more than 15 years, continuously developing new features and control options to complement the range. The 200cc frame version of the pump was released in 2006, with other frame sizes later added to the range.

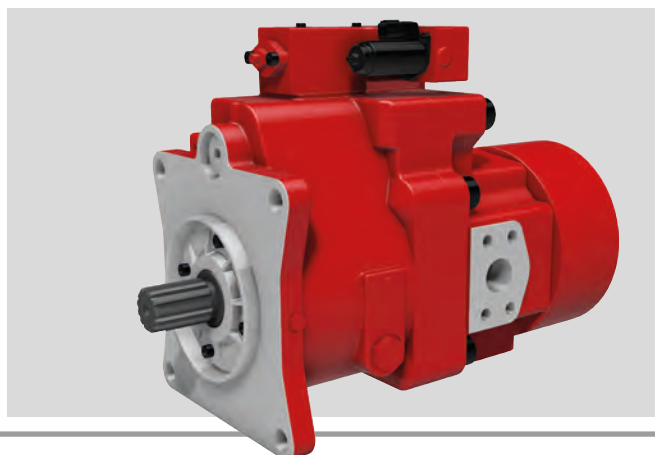
The latest addition is the K3VL200H. This variant allows for higher self-priming speeds with the integration of an impeller to the inlet passage of the pump. Initially for high-speed operation, or speeds above 1,900rpm, it was necessary to boost the inlet of the pump via external devices within the system. The K3VL200H removes the need for a system-boosted inlet by providing the boost pressure within the pump.

This increase in self-priming speed capability enables simpler installations of the K3VL200H to operate at more than 1,900rpm. Furthermore, to save power, modern diesel engine speeds are being reduced, which means the need for step-up gear boxes or larger pumps to maintain system performance is growing. The K3VL200H is there to fulfil this role.

The K3VL200H is available with the same additional options as the K3VL200, among them load sensing, torque limiting (including power shift) and displacement control, including a range of through-drive options.

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Quote Ref: **519**



Heavy-duty range of hydraulic PTOs

Twin Disc makes heavy-duty productivity possible with the addition of three new hydraulic PTOs. The HP500, HP800 and HP1200 cover higher power requirements: 500hp, 800hp and 1,200hp.

Alongside the existing PFI-60 (275hp) and PFI-120 (560hp), they offer Twin Disc's renowned quality in rugged-duty, high-horsepower hydraulic PTOs.

The compact but powerful PFI-60 and PFI-120 can mount to an engine, remote mount with shaft input, and mount to the input or output of the pump drives. They also have a shaft or pump mounting pad as options.

Replacing mechanical PTOs in heavy-duty applications improves the torque modulation and cushioning of hydraulic clutches to reduce driveline startup, acceleration, deceleration and shutdown loads. Twin Disc Hydraulic PTOs contain an oil-filled, multiple-disc, hydraulically actuated, self-adjusting clutch.

Typical heavy-duty applications for hydraulic PTOs include crushers, grinders, mulchers, dredgers, pumps and compressors.

In addition to superior driveline equipment protection and performance, Twin Disc hydraulic PTOs offer manufacturers the

comfort, convenience and safety of remote actuation and control, as well as flexible mounting options for easier equipment integration.

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Quote Ref: **520**



Unique variable hydraulic torque divider

HydraForce continues to innovate in hydraulic traction control, extending the HTD line with the patent-pending HTD10-E50 variable hydraulic torque divider (HTD). The HTD is a unique pressure control that balances loading across two drive motors. It solves several problems that have always plagued hydraulic propelling applications: heat build-up, energy waste, and inefficiency.

The traditional approach to traction control relies on pressure-compensated flow divider/combiner valves that operate on a significant pressure drop, and require additional valving to accommodate steering differential. A 100 l/m four-wheel drive system can add as much as 3.3kW to a vehicle's cooling load.

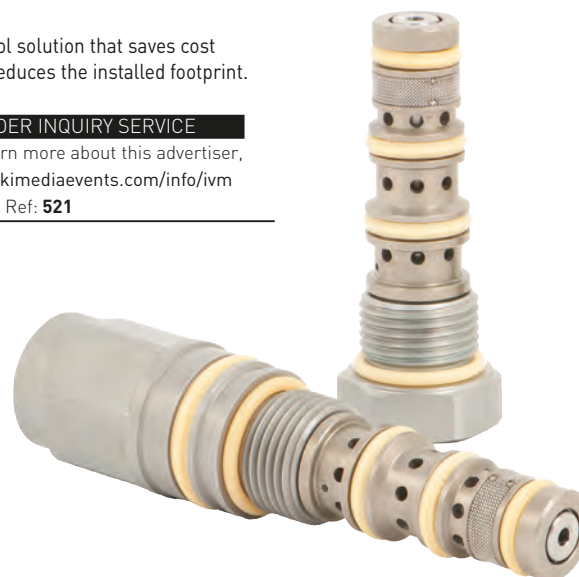
The HTD is completely different. In an HTD drive circuit, a series flow arrangement provides primary traction control. The HTD sits between the two drive motors, regulating pressure to ensure both motors apply equal tractive effort. This valve either relieves, or provides makeup flow allowing the two wheels to turn at different speeds. For vehicles with different front-to-back load characteristics, the HTD10-40 allows alternative ratios, and the new HTD10-E50 uses an internal pilot stage relief, allowing the system to respond with a variable ratio depending on overall load.

HTD valves eliminate the energy waste and heat build-up of flow dividers, and sized for the differential flow only, offer an effective traction


control solution that saves cost and reduces the installed footprint.

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Quote Ref: **521**



New integrated position sensors

 The new SGH25 wire-actuated encoder from **Siko** is characterized by a measurement range of up to 2.5m (8.2ft) and a long service life.

The wire-based position sensor is suitable for applications that use mobile machines – for example, dumper trucks, excavators and agricultural machinery – where it measures the position of hydraulic and telescopic cylinders, and communicates that information to the machine control system via integrated communications protocols.

The robust SGH25 was developed specially for use in extreme conditions in mobile hydraulics that are mainly used in agricultural machinery and construction machines.

The resilience required for this has been designed and tested both electronically and mechanically for the service life of a cylinder. Other sensors in the range include the SGH10 basic model, which has a measurement range of up to 1m (3.2ft), and the SGH50, which covers large measurements of up to 5m (16.4ft).


The range can be integrated directly into hydraulic cylinders. A newly developed plastic extends maximum fluid temperature from 85°C (185°F) to 105°C (221°F).

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Quote Ref: **522**



Out of the box cloud management

 Connected machines are about to shape the future of farming, construction and other fields where special machinery is needed.

As a leading provider of functional safety in the domain of off-highway vehicles, **TT Control** offers cloud and IoT solutions as well as advanced connectivity platforms.

TT Control's complete out of the box cloud management platforms provide true plug-and-play functionality. The TT Connect Cloud Service management platform helps customers monitor and manage vehicles and fleets. It enables machine OEMs and fleet owners to access machine data with a fully customizable, intuitive front end.

TT Connect Cloud Service unlocks the benefits of digitization in the off-highway market, such as complete machine management, data analysis and operational cost savings. The company's IoT gateway, TT Connect

Wave, is a high-performance, ruggedized IoT gateway designed to connect a vehicle or machine to the cloud via wireless or cellular interfaces.


The company also offers connectivity platforms for the management of network architectures of vehicles and other machines in rugged operating environments.

TT Connect 616 is designed for application development and support of Ethernet in vehicle network architectures, including advanced technologies such as TSN (time-sensitive networking). The platform combines and manages all in-vehicle interfaces, among them CAN-FD, FlexRay, LIN and Ethernet.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **523**

Versatile and compact rotary sensor

 **Curtiss-Wright Industrial's** NRH305DR is a no-contact rotary position sensor offering an optimal combination of performance, safety and cost for OEMs designing vehicles and control systems.

Sharing many of the same features/benefits as the NRH300DP, the NRH305DR enhances system performance by incorporating two completely independent power supplies and output channels for full electrical redundancy, operating from a 5Vdc regulated supply.

An 8mm low-profile sensor body, small footprint and fully-encapsulated, IP68/IP69K-rated design ensures the sensor offers exceptional levels of performance. Its separate magnet assembly can have a permissible air gap between 1.5mm and 8mm (depending on magnet style) and can accommodate up to ±2mm radial offset to ease setup/installation.

Versatile, factory-programmable electronics can be easily set to one of two analog voltage output ranges or one of three PWM frequencies. Additionally, the polarities of each of the analog outputs can be independently set, with onboard diagnostic functions ensuring the outputs are put into safe, pre-defined states should an internal sensor error be detected.

The NRH305DR uses proven, wear-free Hall-effect sensing technology and features a number of magnet arrangement options, including an over-molded magnet carrier that simplifies the interfacing of the magnet and sensor during installation. Optional bolt, plug or loose carrier variations are also available.

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Quote Ref: **524**



Advanced off-highway controls

 The latest control product to be launched by **Deep Sea Electronics** is DSEM643, which offers a sophisticated level of programmable control for smaller applications, or to expand the I/O options of the larger DSEM640.

The product is highly versatile, suiting a wide range of mobile applications with programming via CODESYS 3.5.

Designed to provide superior protection against dust and water ingress, the unit carries an IP67 rating and also incorporates a breather to allow the DSEM643 to equalize pressure and reduce condensation while filtering out liquids and other contaminants.

This rugged design enables the product to be mounted outside, in a completely unprotected environment, direct onto the chassis if required, and used in widely varying climatic conditions from -40°C to 85°C (-40°F to 185°F) at full load. The ruggedized design includes an aluminum die-cast housing and the module passes

stringent EN, ECE and ISO testing for shocks and bumps, vibration, salt spray, EMC and electrical safety. The controller also has E11-R10 type approval.

For optimizing bus networks four independent CAN interfaces are available, each one compatible with J1939, CANopen and RawCAN, offering a versatile framework for complex network designs.

Integral to the unit is a powerful 32 bit microprocessor with a 220MHz clock speed and 4MB of application memory, providing outstanding performance and operating response times.


The DSEM643 also features Ethernet connectivity, 16 configurable inputs with digital and analog capability and 18 configurable outputs with digital, PWM and PWMi capability.

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Quote Ref: **525**



Emission-compliant, powerful engines

 **Kohler** presents its updated diesel engines platform, designed to meet the requirements of a market that demands more application flexibility and compliance with the various emissions limits, along with performance and productivity.

Kohler Flex is the range of solutions for emission control that Kohler has designed to enable each configuration of the KDI platform to comply with all emissions standards and regulations worldwide.

At the heart of Kohler Flex there is the clean combustion of KDI

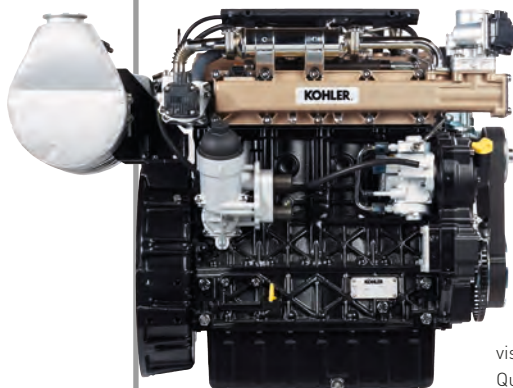
engines that enables the adoption of a compact, state-of-the-art diesel particulate filter (DPF) to meet Stage V emission standard.

Kohler Flex combines the clean in-cylinder combustion of KDI engines, made possible by high-pressure common rail (2,000 bar), four valves head, turbocharger, cooled exhaust gas recirculation, and the most compact aftertreatment devices (dissolved organic carbon, selective catalytic reduction and DPF) to comply with all emission requirements. Each combination of Kohler Flex has been designed in line with the all-in-one philosophy, with the objective of minimizing change for engine installation into existing packages.

These efficient and reliable systems can be deployed in many combinations to achieve effective emissions solutions for the different markets.

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Olympian

The new

Construction projects for Olympic Games are some of the biggest in the world. They invariably involve the creation of brand-new arenas and stadiums and even entire urban districts. Occasionally a building project somewhere else in the world can lay claim to being larger, but one characteristic distinguishes Olympic projects from many others: its immovable deadline. As the end date approaches, the atmosphere on the construction site becomes increasingly stressful. And, with a large number of machines and workers excavating, building and moving material, the rate of accidents tends to be higher than on other construction sites. In the lead-up to the last summer Olympics, in Brazil in 2016, 11 construction workers died. Two years earlier, more than 60 workers died during construction for the Sochi Winter Olympics in Russia, with some reports putting the true figure in the hundreds. These are shocking statistics that the organizers of the Paris Olympic Games in 2024 will be anxious not to repeat. Hence the creation of this CMC concept wheel loader, developed to enhance safety through design and reduce accidents on the construction sites of Paris 2024.

REVIVING A BRAND

Alberto Seco's concept revives the distinctive red and white livery of CMC (Constructions Mécaniques de Carvin) vehicles – cult icons of French industrial vehicle history, produced in the manufacturing facilities of the Poclain vehicle division.

The first wheel loader models were launched in 1971, followed by tracked models. Production of dozers was planned and some prototypes were built, but the mid-1970s recession forced the sale of the Poclain construction vehicle arm to Case and led to the disappearance of the CMC brand.



AS THE CONSTRUCTION WORLD GATHERS FOR INTERMAT PARIS, THOUGHTS WILL INEVITABLY TURN TO FRANCE'S NEXT HIGH-PROFILE MEGA PROJECT – CONSTRUCTION FOR THE PARIS 2024 OLYMPICS. WITH THAT IN MIND WE PRESENT A CONCEPT MACHINE TO MAKE THE BUILDING SITES SAFER

Arms

- Lower arms curved to maximize visibility in lower front area, even when arms are raised
- There is an open view between the middle sections of the arms, even when the bucket is raised
- Center of gravity for arms is lower than conventional loaders, for outstanding front stability
- Inverted Z-linkage prevents loading/unloading mechanism and cylinder from obscuring the operators' view.

Cab

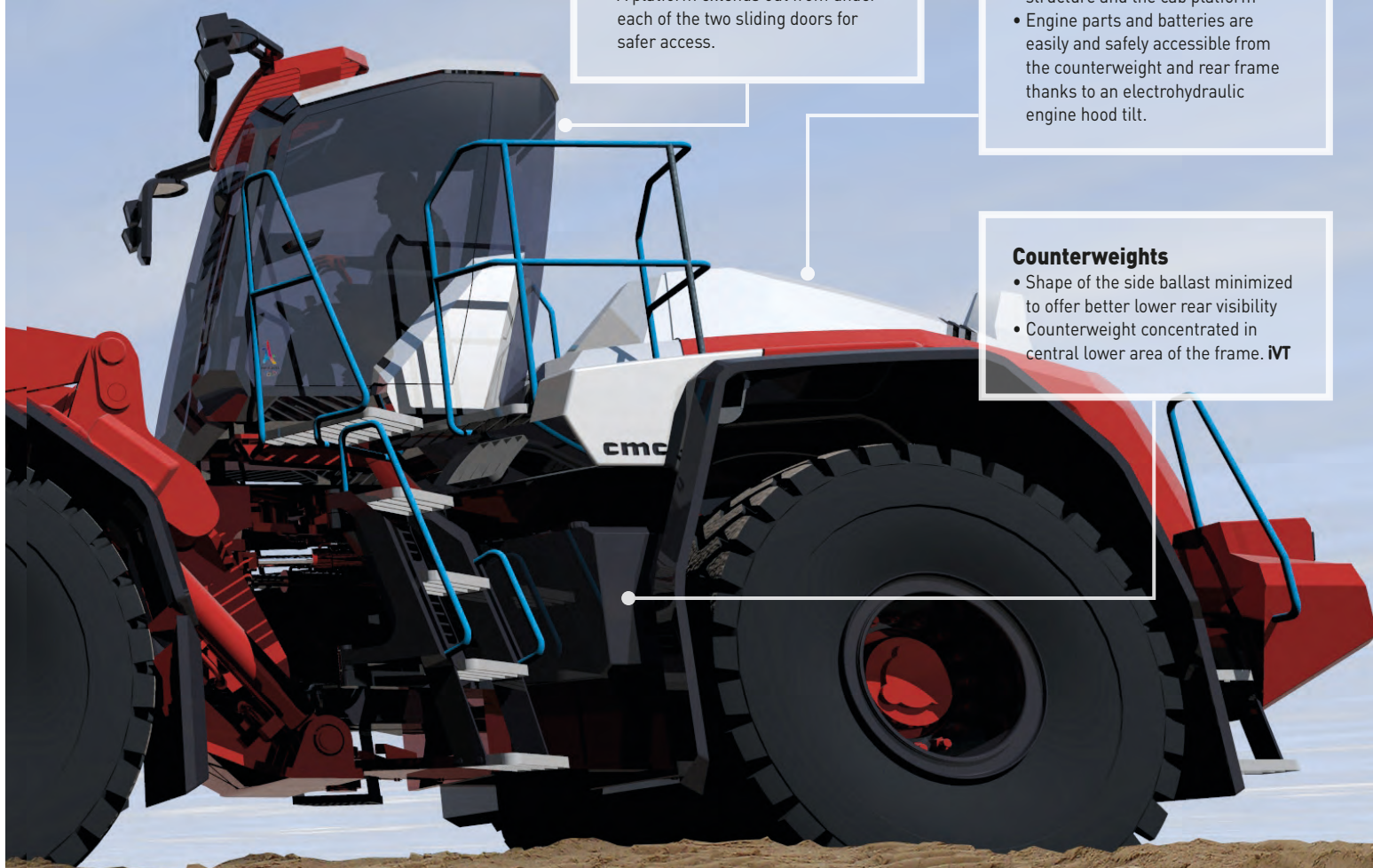
- Two conventional posts plus two double posts
- Windshield is tilted back to improve upward visibility
- Backward sloped glass rear area improves visibility toward lower points
- Gently sloped steps on both sides
- Step structure can be tilted to access mechanisms during maintenance and cleaning
- Bright rails run all around the loader, easy to spot in distinctive bright blue
- A platform extends out from under each of the two sliding doors for safer access.

Hood and mechanisms

- DOC and DPF units placed longitudinally to avoid increasing the height of the hood, maintaining maximum side visibility
- Rear fender structure has been cut in the corners to improve lower rear visibility
- Fuel, AdBlue or hydraulic oil tanks are accessible from the steps structure and the cab platform
- Engine parts and batteries are easily and safely accessible from the counterweight and rear frame thanks to an electrohydraulic engine hood tilt.

Counterweights

- Shape of the side ballast minimized to offer better lower rear visibility
- Counterweight concentrated in central lower area of the frame. iVT



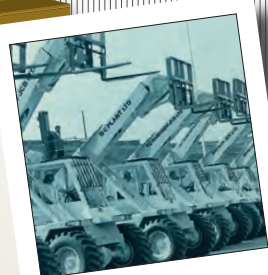
NEW HEIGHTS



When JCB changed the face of farming



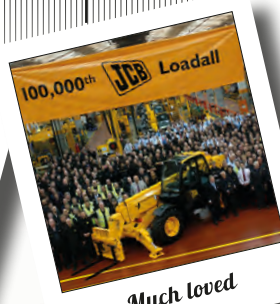
70s memories



A new era



An '80s classic



Much loved



Future-proofing

JCB Agriculture marked the end of 2017 by celebrating the 40th anniversary of its Loadall telescopic handler. Launched on October 20, 1977, the campaign for the groundbreaking new vehicle featured the slogan 'Obsolescence day is coming', indicating that the new vehicle would make traditional masted forklifts – a mainstay of 1970s farms – obsolete.

Forty years on, true to the prediction, telehandlers have become essential agricultural equipment, while masted forklifts are, at best, a secondary consideration, if not entirely done away with.

Even so, many in the industry were unsure why a telescopic handler would benefit their business and JCB chairman Lord Bamford is the first to admit that the changeover was a gradual process. "When we launched the Loadall in 1977, we sold just 64 machines," he says, "but we were very confident that the telescopic handler would grow in popularity simply because it made jobs so much easier on construction sites and on farms."

"The concept soon took off and the faith we put in the telescopic handler four decades ago has been repaid. It's wonderful to celebrate 40 years of success of the Loadall, with production hitting historic levels."

Production, in the early years, was as little as four units built per day, with even JCB employees seeing the Loadall as the poor relation of the backhoe loader.

It took the company three decades for the first 100,000 machines to be sold, but only a further 10 years to reach the 200,000 benchmark.

The two-wheel-drive launch vehicle had a 6.4m (21ft) lift height and lift capacity of 2.25 metric tons. Fast-forward to today and a wide range of telescopic handlers are produced by JCB, with models capable of carrying loads exceeding 6 metric tons up to a height of 20m (65.6ft).

One of the ways JCB marked the Loadall's milestone was by exhibiting a special limited edition 541-70 Agri Pro at the LAMMA show, Peterborough, UK, in January 2018.

This distinctive machine was shown with a yellow and black engine cover, and the rear of the heavy-duty chassis is also painted black, while 'JCB Loadall 40' graphics on the boom and engine cover highlight the significance of the special edition.

The same special graphics are also available on a limited edition version of the new Loadall 560-80 Agri Pro and the high-level specification of both machines includes normally optional bright LED road lights as standard. **ivt**

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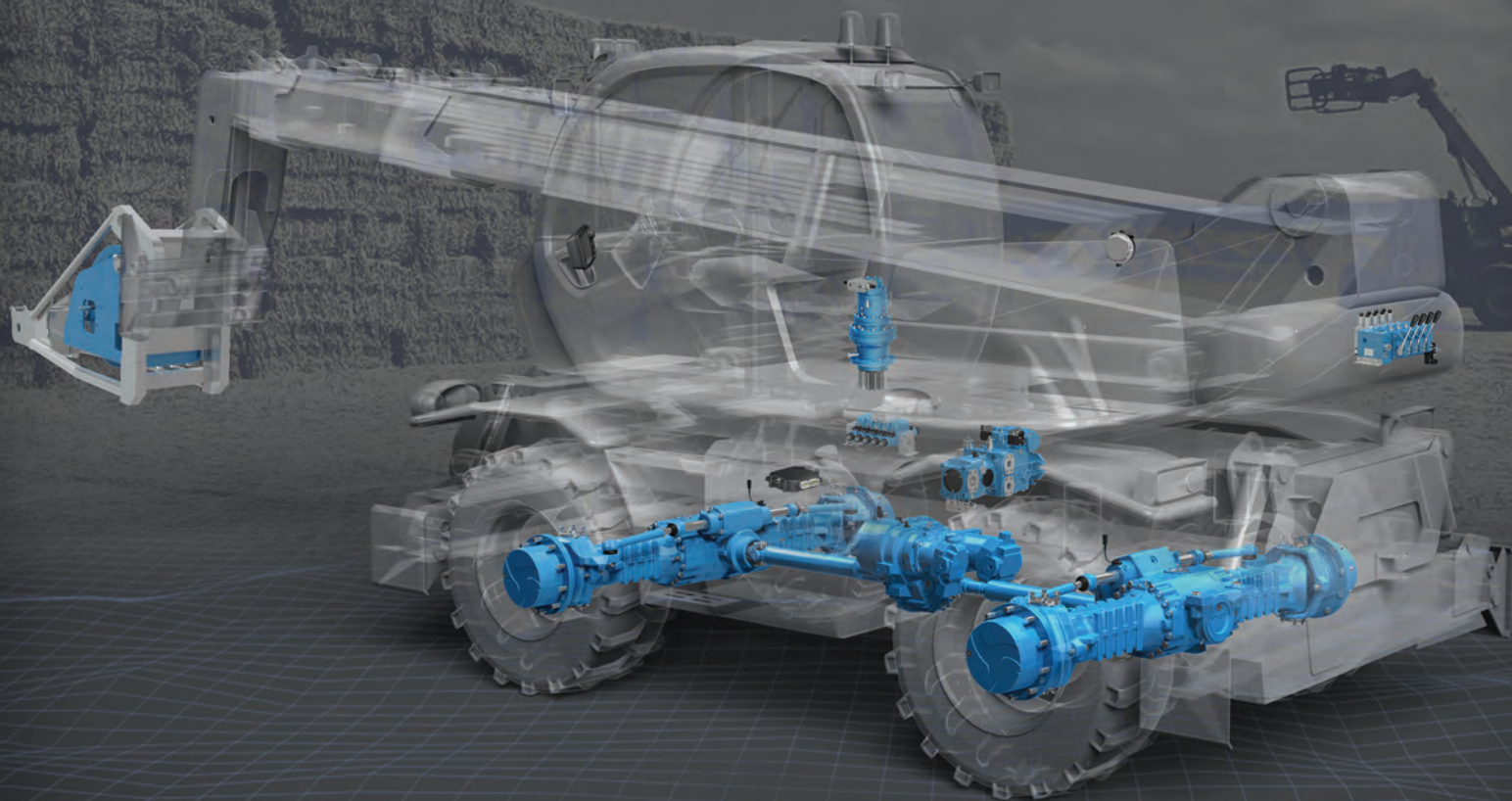
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FOREWORD

One of the most exciting things about working in the industrial vehicle industry in 2018 is the pace of change. Back in May 2017, I attended the London launch of Volvo Construction Equipment's latest prototype vehicle – the EX2 – the world's first all-electric excavator. It was an impressively innovative machine: the engine had been replaced with two lithium-ion batteries, which were billed to generate 38KWh of power. In place of a traditional hydraulics was all-electric technology, incorporating electromechanical linear actuators, to help to optimize the transmission chain. (When, at one point during the demonstration, a patch of oil was spotted under the vehicle, Volvo CE staff were relaxed, confident that it couldn't be a leak of hydraulic fluid – because there wasn't any in the vehicle to leak!). Overall, the EX2 was said to be able to deliver a tenfold increase in efficiency, while also reducing noise levels by as much as 10 times, compared with a similar-sized ICE excavator.

Despite the impressive credentials, Volvo pointed out that, "At this stage, the EX2 is purely a research project and there are currently no plans for industrialization." When I told others in the industry about what I had seen, some wondered why Volvo CE was being so open and not keeping cutting-edge research under wraps, when the vehicles it was producing were clearly so far from being ready for market...

Fast-forward to the present day, just nine months later, and rivals at Mecalc have also built an all-electric excavator – the e12. And this time there are no caveats. This is not being billed as a concept. Engineers at Mecalc say their design is market ready and will be launched in 2019. Can they really have solved all the problems that held Volvo CE back

from announcing a full launch last year? Turn to page 28 and you can make your own mind up as we get a first look at what's inside the e12 and the performance it will deliver. If you want to find out even more, the vehicle will be on display at Mecalc's stand at the Intermat show in Paris this April 23-28. Read our full preview of the event from page 62.

Intermat isn't the only industry event you might be preparing for. As the weather warms up, so show season is upon us again. Those in material handling may be skipping construction vehicles in Paris in favor of lift-trucks on show in Hannover – CeMAT takes place exactly the same week, so you will struggle to do both. You can find out more about what's happening at this alternative event on page 18. Across the Atlantic, the following week, Brazil hosts the world's third-largest agricultural machinery show, Agrishow (there's more on page 16) and here in the UK, June sees the construction, quarrying and recycling industries heading to Buxton, in the Peak District, for Hillhead (more on page 14).

At each event there are certain to be new vehicles, new innovations and new connections made. At Agritechnica last year, for example, New Holland debuted a new methane tractor prototype. Could it be that our excitement about electric vehicles misplaced? Could methane really be the industrial vehicle fuel of the future? Find out more in our cover story on page 40. As the pace of technological progress continues to accelerate, I can't help wondering what prototypes will be unveiled next... and how quickly such machines might become everyday realities.

Tom Stone, editor, iVT International

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JOHN DEERE



Easy does it

ROAD ROLLER OEM **HAMM** IS SIMPLIFYING THE CONTROL OF VEHICLES ACROSS ITS RANGE WITH AN INTUITIVE OPERATING CONCEPT KNOWN AS EASY DRIVE

The high-tech design of modern construction machines enables more functions to be carried out than ever before.

Whether these functions are recognized and used by drivers, however, is crucially dependent on the quality of the operating interface. So that drivers of Hamm rollers can use all vehicle functions to their full extent, Hamm engineers attach the utmost importance to simple, intuitive operation. No easy task, since the modern rollers are complex tools, but they have succeeded with Easy Drive. The concept was first realized in the DV+ series tandem rollers in 2015 and has since been introduced in HD+ series tandem rollers, H series compactors and, since the start of 2018, it has been included in the GRW series pneumatic tire rollers.

INTUITIVE OPERATION

The operation of modern construction machines frequently overtaxes

drivers with a surfeit of switches, displays and buttons. A common problem is a lack of clarity in how to adjust important settings. Moreover, tedious searching in the depths of the operating menu is a stress factor for operators. Easy Drive enables drivers to respond quickly and correctly, even without extensive previous knowledge. This is made possible through a minimal number of intelligently arranged switches, good visibility in the operator's platform, and short learning and familiarization times.

A SINGLE CONCEPT FOR ALL ROLLERS

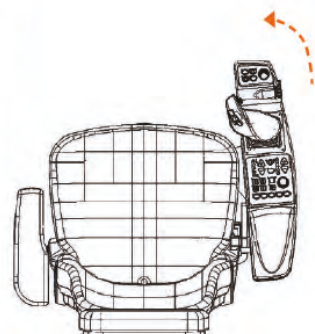
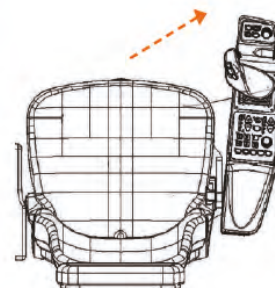
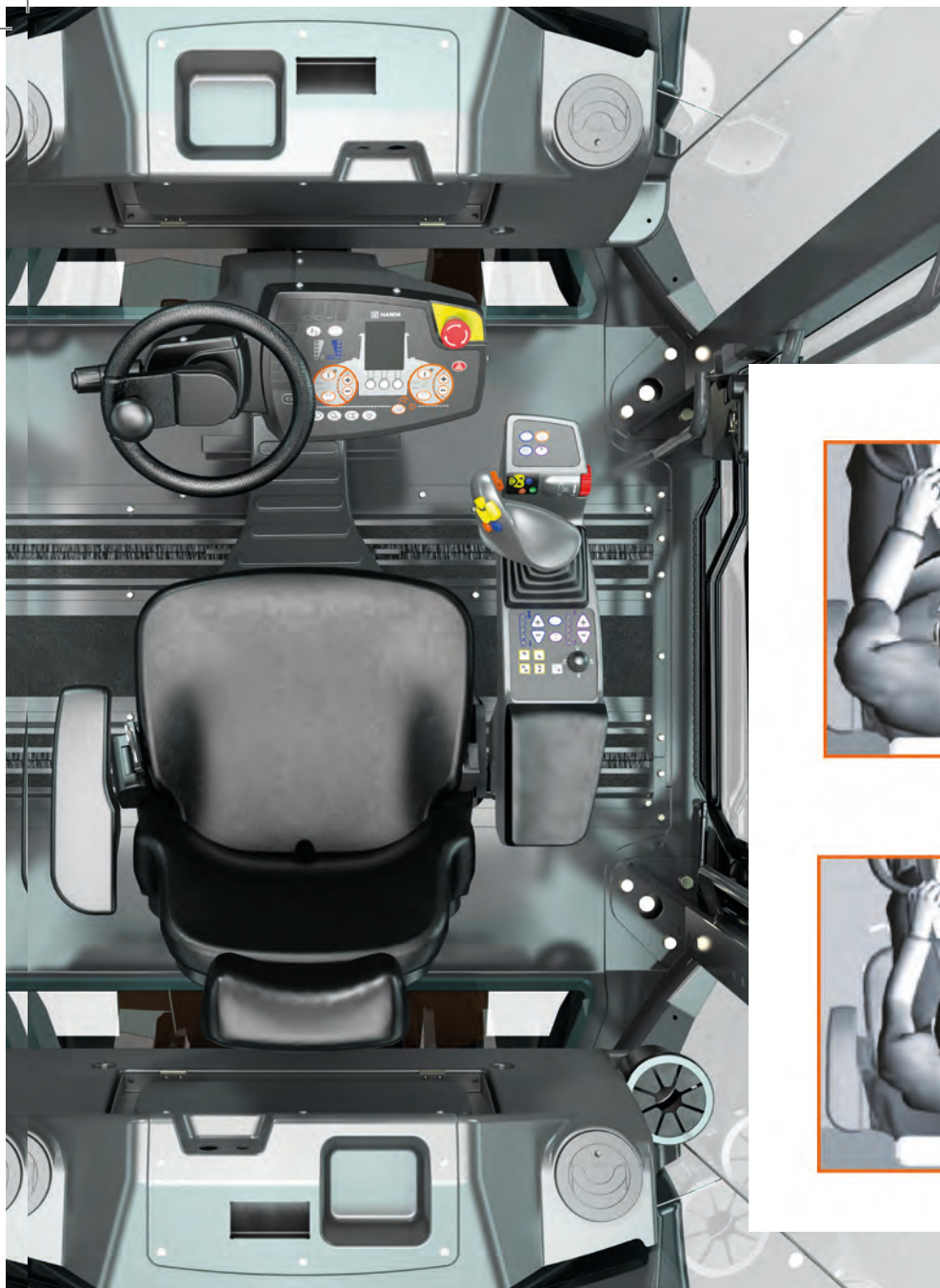
Whichever Hamm Easy Drive vehicle an operator is using, identical colors are used on buttons and switches to indicate that they belong to the same function group. There is also a uniform design, adapted to the specific functions of the individual machine series.

At the same time, the operating elements for the same



WHAT'S NEW

Hamm's Easy Drive design makes control layouts intuitive and comparable across its range



“WE MAKE LIFE EASIER FOR OPERATORS – WHEN SWITCHING TO A DIFFERENT MACHINE TYPE THEY CAN INSTANTLY IDENTIFY IMPORTANT FUNCTIONS”

Dr Axel Römer, head of development and design, Hamm



WHAT'S NEW

Vehicle/cab comparisons



functions will always be in the same position on the operator's platform. Dr Axel Römer, head of development and design at Hamm, explains the fundamental thinking behind Easy Drive: "We make life easier for operators – when switching to a different machine type they can instantly identify important functions. This enables top-quality work right from the start and quickly builds up confidence."

SIMPLE AND CLEARLY LAID OUT

The centerpiece of Easy Drive is its clear operating structure. Steering is always done by means of a steering wheel. All other essential functions are operated via the joystick with

its clearly visible buttons, and the multifunction armrest. Here, all operating elements are arranged according to the principle: the more frequently an element is operated, the closer its position to the joystick. At the same time, the operation is designed to be entirely language-neutral. Thanks to the color coding of all operating elements, Hamm achieves unambiguous assignment and a clear overview.

ERGONOMIC AND FLEXIBLE

With the help of universities and ergonomics specialists, as well as roller drivers from different countries, Hamm has ergonomically optimized

the operating concept. The results speak for themselves: drivers can turn the seat in the tandem rollers in either direction and move it from side to side, as standard. What's more, the position and suspension of the seat, the position of the armrests and the dashboard inclination are adjustable on Easy Drive rollers. Thanks to the wealth of adjustment options, every driver will quickly find a comfortable sitting position.

It is also worth noting that the new Easy Drive designs boast additional ergonomic features such as: a wide stepway; spacious operating area; folding armrests; a forward-tilting steering column; document compartments around the seat; and 12V sockets for cell phones or cool boxes. **ivT**



Award-winning design

The Easy Drive operating concept has been exceptionally well-received by drivers. It has also won several awards, including the internationally renowned iF International Forum Design award for first-class product design, the Universal Design Expert Favourite (decided by a jury of experts) and the Universal Design Consumer Favourite (decided by 100 users). This recently established design award highlights products that are flexible, easy and intuitive to use and reducing complexity in operations.

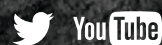
LEFT: Hamm's ergonomically optimized Easy Drive operator display for use in its vehicle cabs

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WHAT'S NEW

iVT is 25!

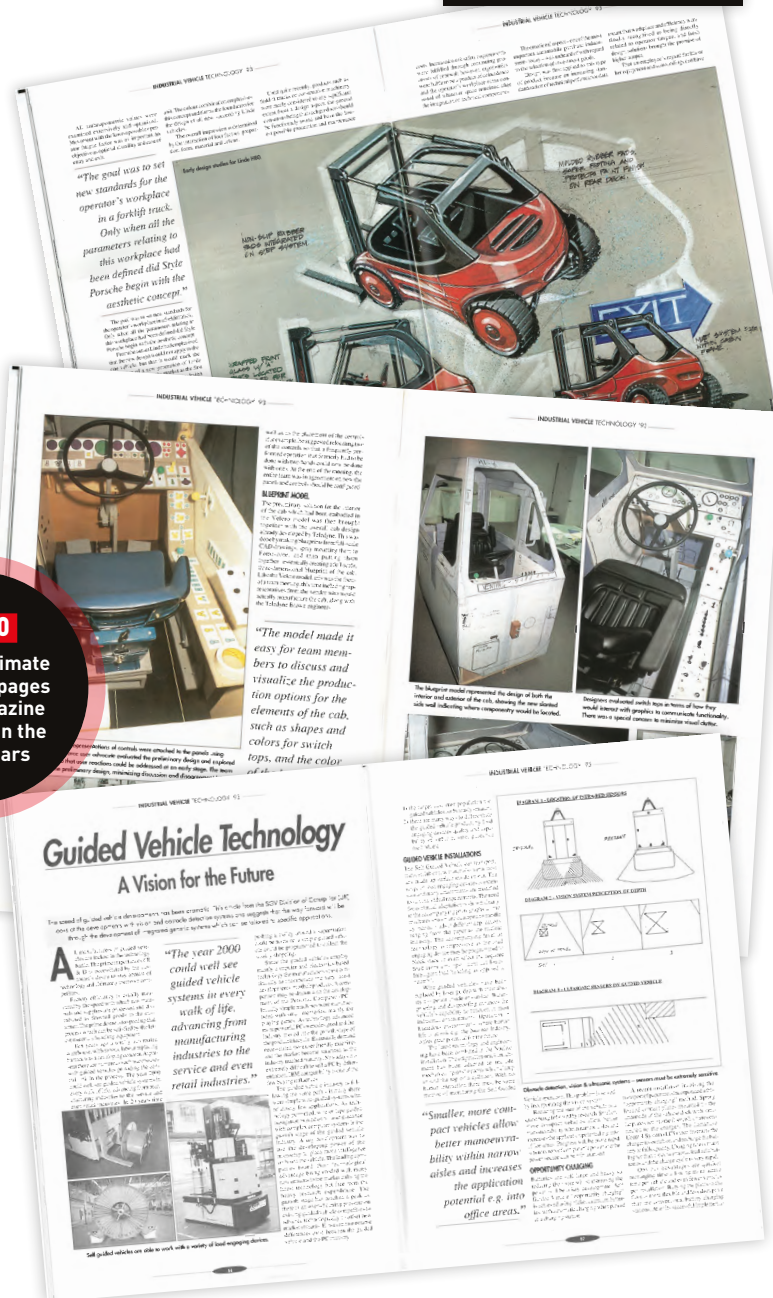
WE MARK THE BEGINNING OF A YEAR OF CELEBRATIONS WITH A QUICK LOOK BACK AT OUR VERY FIRST EDITION



16,500

The approximate number of pages of iVT magazine published in the last 25 years

From the archives
Industrial Vehicle Technology
International '93 (Issue 1)



Industrial Vehicle Technology International magazine was launched in 1993 – and was an instant hit right across the industry. Before it came into existence, there was no regular magazine anywhere in the world aimed at industrial vehicle engineers and designers.

The first edition focused primarily on the lift-truck and material handling industries, but there was also significant interest from readers in news of off-highway industrial vehicles. Accordingly, when the time came to publish a second edition the following year, the decision was made to create not one title, but two: the *Lift-truck and Materials Handling* edition '94 and the

Off-Highway edition '94. Both annuals are still published today, the former now taking the title *Advanced Lift-truck Technology International*.

By 1998 interest had grown to such an extent that the decision was made to launch a quarterly edition – *iVT*. A decade later, *iVT China* followed. And so the stable was complete.

Looking back at the first issue is a fascinating exercise. It is a window on a bygone, almost completely pre-digital, era. Just as the magazine pages themselves were put together without any help from desktop publishing software, so the vehicle concepts within are drawn and built by hand. It's particularly striking to see how

a concept model for one lift-truck was made with cardboard, balsa wood, glue, tape and marker pens.

Other entries are more familiar. The prediction in a feature on AGVs that autonomous vehicles could be finding their way into all industries 'by the year 2000' is amusing to read now, 25 years later, but will our continued optimism about such systems seem equally unfounded in another 25 years? Only time will tell.

In this, our 25th year, we promise to bring you more snapshots from the past and glimpses into the future – but more than that, some of the best standalone content this magazine has ever seen. The party is only just getting started...

25 YEARS
iVT
INTERNATIONAL
INDUSTRIAL VEHICLE TECHNOLOGY

NEXT ISSUE

The celebrations continue throughout the June issue of *iVT* – our Special Anniversary Edition. Don't miss it!

NOTHING BUT THE LATEST AND NEXT-GENERATION COMPONENTS, SERVICES AND TECHNOLOGIES!



13 - 14 FEBRUARY 2019 COLOGNE, GERMANY

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From one of the world's leading
independent trade show organisers

Loading up

Three new machines have been announced that will make it easier to move material of all sizes around different worksites

VOLVO'S IN-HOUSE DEVELOPMENTS

Volvo CE is developing a range of rigid haulers in-house, signaling the end of the Terex Truck-branded models.

The line-up will include 45-, 60- and 72-metric ton versions, with the flagship R100E model weighing in at 100 metric tons. The vehicles will initially be available in less-regulated markets, before being offered more widely.

Thomas Bitter, senior vice president of the marketing and product portfolio at Volvo CE, said, "The E-Series R100E is a completely new 100 metric ton rigid hauler that combines a wealth of market and customer knowledge with proven components, new technologies and a striking new design – all providing a cost-effective and productive solution to fulfill the needs of today's mining and quarrying customers."



CAT GOES ELECTRIC

Caterpillar is currently validating a battery electric load-haul-dump loader at a mine site in Canada. The prototype is a fully electric version of its diesel-powered R1300G, with the electric powertrain supporting the mechanical drivetrain.

Originally built early last year at Caterpillar's Peoria proving ground in Illinois, the intention is to bring a final design to market derived from the lithium-based energy storage proof of concept.

"We tried hard to break this machine and technology before sending it to Canada in September," said Jay Armbrurger, Caterpillar's product manager with responsibility for underground technology.

"With the results we've seen so far, we're confident this R1300G proof of concept is giving us the answers we need to develop a machine that is safe and lives up to the Cat brand promise of durability and reliability."



GEHL UPS THE POWER

Gehl has developed its most powerful skid-steer loader to date. The 4200V, with an operating weight of 5,291kg, is currently the largest machine of its type on the market and offers 1,905kg of rated operating capacity – an increase of more than 90kg on the outgoing model.

Featuring a Deutz-developed Tier IV-certified engine, the vehicle offers 120hp of power and 479Nm of torque, with a top speed of 18.7km/h (11.6mph).

Built to handle the toughest applications, the 4200V excels in demolition, heavy construction, and road building and infrastructure," said Nathan Ryan, Gehl global product line manager, skid-steer loaders.

"The 4200V comes fully equipped to run high-performance attachments in a spacious operator station with standard high-flow auxiliary hydraulics and 14-pin connector."

BIN HYDRAULICS! **NO MORE OPERATORS!**

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MEDIA EVENTS

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Show of strength

The Man Engine, a 10m (33ft)-tall mechanical puppet to be on display at Hillhead 2018



HILLHEAD 2018 EXPECTED TO BE BIGGEST YET

Hillhead 2018 is building up to be the biggest in the event's history.

Taking place at the Hillhead Quarry near Buxton, England, from June 26-28, the working construction and quarrying event is expecting over 500 exhibitors for the first time in its history.

In anticipation of the large numbers of visitors expected, the organizers have decided to extend the main pavilion by 70m (230ft) to make approximately 60,000m² (646,000ft²) of stand space available.

Event manager Harvey Sugden said, "The level of rebooking has been exceptionally high and it is

fantastic to see so many companies coming back to us year-on-year. It emphasizes the importance of the show to the industry, which is a real highlight in the calendar for visitors and exhibitors alike."

Visitors to the show will be joined by the UK's largest mechanical puppet. The Man Engine takes its name from the mechanism of reciprocating ladders and stationary platforms that traditionally transported miners up to the surface from the mine. Powered by a Volvo L220 wheel loader, the 10m (33ft)-tall mechanical puppet will be in residence for the duration of the show.



UK MINERAL PRODUCTS INDUSTRY IN BRIEF

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£82,000

PRODUCTIVITY OF EACH WORKER IN 2014 (1.6 TIMES THE NATIONAL AVERAGE) (US\$114,000)

3.4 MILLION

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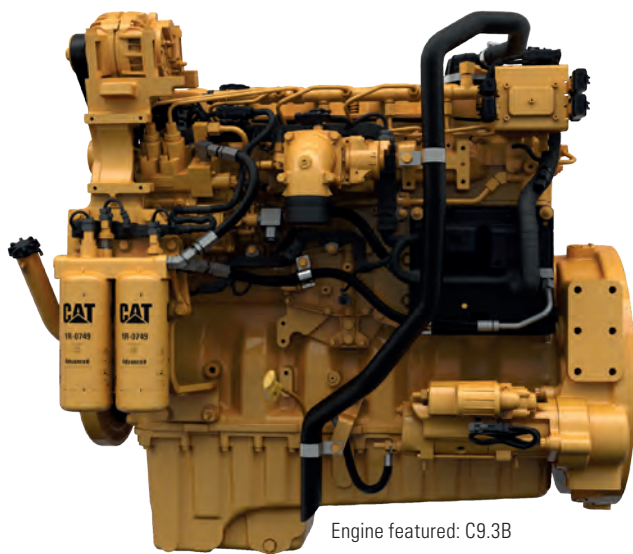
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Source: Mineral Products Association



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Farming fiesta



BRAZILIAN AGRICULTURE IN BRIEF

960 MILLION
ACRES OF FERTILE LAND
(388 MILLION HECTARES),

CROP VALUE
US\$65.56BN

ARABLE LAND ACROSS
ENTIRE COUNTRY
31%

AGRICULTURAL
PRODUCTION VALUE
US\$65.56M

10%
OF NATION EMPLOYED
IN AGRICULTURE

AGRICULTURAL
CONTRIBUTION TO GDP
5.5%

Sources:
fao.org
apexbrasil.com
isaaa.org



159,000

The approximate
number of visitors
expected to attend
Agrishow in 2018

AGRISHOW

Time to shine for the Brazilian agricultural industry

The Brazilian farming industry is gearing up for the most significant event in its national calendar – the third biggest agricultural technology fair in the world.

Now in its 25th year, the 2018 Agrishow (April 30 to May 4) is expected to have 800 brands on display, with over 159,000 agricultural professionals representing 70 different nations descending on the show site near the city of Ribeirão Preto in the southeast of Brazil.

Hosted by Informa Exhibitions, Agrishow was conceived by ABAG

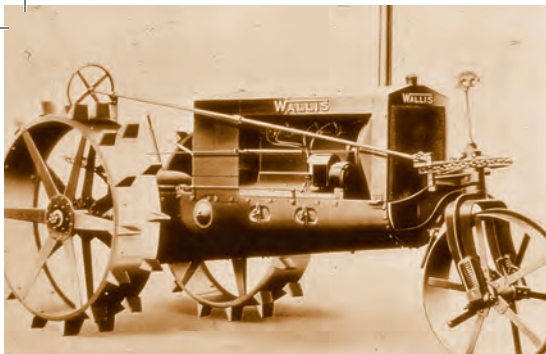
(Brazilian Agribusiness Association), ABIMAQ (Brazil's Machinery and Equipment Industry Association), ANDA (National Association for Fertilizer Dissemination), FAESP (Agriculture and Cattle Federation of São Paulo State) and SRB (Brazilian Rural Society).

Business at last year's show reached R\$2.2bn (US\$676m) but organizers are expecting to exceed that this year.

A field demonstration site will give visitors the opportunity to test the various innovations on display for themselves.



Brazil's Agrishow is mainly held in the open air, as visitors can normally expect sunny skies. This year it will cover more than 440,000m² (4,700,000ft²)



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HANDLING THE FUTURE

MANFRED KUTZINSKI, DIRECTOR OF CEMAT GERMANY, EXPLAINS WHY THIS YEAR'S SHOW WILL PROVIDE KEY INSIGHTS INTO HOW THE INDUSTRIAL SECTOR CAN BE DIGITIZED



**CeMAT
Germany
April 23-27, 2018**

For more information
about how to attend CeMAT
2018, visit: www.cemat-hannovermesse.com

'Connect and collaborate' is a noticeable, key theme that will be present at CeMAT Germany, one of the world's largest materials handling, intralogistics and supply management shows, which is taking place from April 23-27, in Hannover, Germany.

For the first time ever, CeMAT will run alongside Hannover Messe – a huge, annual industrial technology fair that has been hosted in Hannover since 1947. In 2011 Hannover Messe coined the phrase Industrie 4.0 – a term that explains the current digital revolution in the industrial sector, which is resulting in data sharing between, and the automation of,

machines and vehicles. In an era where sensors play an ever-increasing role in the industrial vehicle market, it makes sense for CeMAT 2018, having collaborated with Hannover Messe, to keep the shows' themes in line with Industrie 4.0, as well as incorporating it, along with other prominent trends in the industry, such as logistics.

"Traditionally CeMAT has always been a show in its own right, but since the introduction of Industrie 4.0 there has been a crossover with the topics it covers," says Manfred Kutzinski, director of CeMAT. "It makes sense to bring these topics together – logistics and industry – while combining the CeMAT and Hannover Messe shows."


"We'll cover the bigger picture of supply chains, from transport to production – the entire process."

With visitors expected in the tens of thousands, at least 40% are expected to have ventured from countries outside Germany. "In the past few years in particular, we've seen more visitors from the USA attending the show because they're aware of its size and what it has to offer," says Kutzinski. Exhibitor-wise, 700 companies – more than 50% of which will be international brands – will be showcasing their latest innovations.

Key elements

Show highlights for delegates include the stands of, and presentations from, major forklift vehicle companies. "Toyota, Jungheinrich and Still are just three of the large organizations that will have huge pavilions with wooden roofs covering their open-air sites," says Kutzinski. To give an idea of the scale, he reveals that the Jungheinrich pavilion will be 5,000m² (1.2 acres).

As well as learning about companies' best and newest products at the exhibition, delegates can also expand on their industry knowledge at keynote speaker sessions and forums. "We've run forums in the past, but this year there will be a focus on slightly different topics," says Kutzinski. "We will have a Logistics 4.0 forum and an Industrie 4.0 forum, as well as discussions that will cover how the port industry – including the industrial vehicles that it involves – can be digitized in the near future. iVT



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1,700MM**

**MAX. LOADING
CAPACITY
1.6 TONS**

SHOW HIGHLIGHT: MANITOU

AN ERGONOMIC RANGE

CeMAT Germany will see Manitou launch six new industrial models designed with ergonomics and performance in mind. These new models will be within a weight range of 1.2 tons (1.3 US tons) to 2 tons (2.2 US tons).

With a maximum loading capacity of 1.6 tons (1.8 US tons) and a height of 12m (on the heavy-duty version), the compact ER16 reach truck boasts a turning radius of just 2,700mm (8.8ft). Designed for operation with the driver standing up, it is ideal for use in applications such as storage and warehousing.

Visit Manitou: Open-air site (FG), Stand K62

WHAT'S NEW

CEMAT PREVIEW

CeMAT



Logistics 4.0 meets Industrie 4.0

23 - 27 APRIL 2018 • HANNOVER • GERMANY

CeMAT



SHOW HIGHLIGHT: **MAGAZINO**

ROBOT TAKEOVER

German robotics company Magazino will be showcasing the second version of its new, fully autonomous Soto robot. Using 3D imaging technology, it can collect objects from 5cm to 2.5m (2in to 8.2ft), store them, and carry them to their assigned destinations. Soto is suitable for use in warehouses and factories and will be available on the market at €50,000 (US\$61,340).

Visit Magazino in Hall 21, Stand G42

SHOW HIGHLIGHT: **BAUSER**

ESSENTIAL DISPLAYS

Bauser will be exhibiting its standard and customized hardware and software solutions based on CAN, CANopen and SAEJ1939 – including battery and time controllers, panel instrumentation and hour meters. One such solution is the Type 909, a 3.5in (8.9cm) thin film transistor (TFT) liquid crystal display (LCD) in color with four push buttons and up to five colored warning lamps. It offers digital and analog inputs, as well as a CAN interface with CANopen or SAE J1939 protocols, and it is can operate in temperatures ranging from -30° to 85°C (-22° to 185°F).

Visit Bauser in Hall 26, Stand 27



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SHOW HIGHLIGHT: **ELOBAU**

ERGONOMICS AND SENSORS

At CeMAT 2018, Elobau will be showcasing its modular MA225 armrest and a new range of ultrasonic sensors. Thanks to its innovative and modular design, the armrest can be arranged to create a customized operating system for the functions required of the respective vehicle. The new ultrasonic sensors are precise, versatile, reliable, and suitable for use in a wide variety of applications.


Visit Elobau in Hall 26, Stand K02

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CeMAT

hall 26, booth K02

elobau ®
sensor technology



The new modular armrest MA225 midi Customised as standard

Until now, customised multifunction armrests were only realistic for large mobile machine manufacturers, but with the modular armrest MA225 midi, elobau also opens up this possibility to manufacturers requiring smaller quantities. The innovative, modular design allows customers to configure their armrest with an ergonomic arrangement of operator controls without the high development costs. Additionally, the armrest has inbuilt USB charging and storage. Every-

one can now benefit from elobau's years of experience in designing and manufacturing functional, ergonomic and user-friendly operator controls for demanding applications. Conformance to Safety Level AgPL c according to ISO 25119 and fully compliant with EU Regulation 167/2013 "Mother Regulation", as well as being manufactured from bio-based materials, the MA225 midi armrest sets the standards for functionality and design.



From Paris to the world

FRENCH CONSTRUCTION VEHICLE OEM MECALAC IS READY TO LEAD THE PACK AT INTERMAT PARIS WITH AN IMPRESSIVE ARRAY OF NEW INNOVATIONS, AS EXECUTIVE VICE PRESIDENT ALEXANDRE MARCHETTA EXPLAINS

► This is an exciting moment for Alexandre Marchetta. Groupe Mecalac, the company he runs with his father, is riding a wave of recognition for its innovative urban construction vehicles and hangs poised on the cusp of an historic expansion into the new markets of North and Latin America. Yet in this instant of nascent global possibilities, the young executive vice president is quick to emphasize Mecalac's credentials as a family-owned company with human values, focused on building profitable, long-term relationships.

"Talking to drivers, site managers and mechanics helps us to understand people's priorities for today and their expectations for tomorrow," Marchetta explains. "From the very beginning, we have listened to our customers both



nationally and internationally and to their needs, which are not only economic but structural and cultural, too." Such a philosophy, he believes, will enable Mecalac to continue adapting to the specific demands of new markets while offering a distinctive product range with sharply defined parameters. "Our core business is in compact, versatile, easy-to-handle, ergonomic machines – machines that can dig,

load and carry." The vision is one of frictionless, space-efficient, multifunctional operations tailored to future urban jobsites. "When a single driver and a single machine can cover a wide range of tasks on one building site without any complicated maneuvers and with extended capabilities in each function, a huge amount of time will be saved."

Paris in the spring

Today, Marchetta wants to talk about Intermat Paris, which he sees both as a source of national pride and an opportunity to court international custom. "Intermat is a chance to show the entire world our extraordinarily dynamic sectors of building and public works," he says. "It is a catalyst for business, as each successive edition proves – and 2018 will not be otherwise."

4,000m²
The total area of
Mecalac's stand at
Intermat Paris 2018
(43,000ft²)



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Around 183,000 visitors from 167 different countries are expected from April 23-28 for the world's third-largest building and civil engineering exhibition. As it takes place on Mecalac's home turf, it provides a perfect shop window for the company's products – including, this year, the e12 electric excavator and the Connect Energy Link RFID-based coupling system (see page 28). “We have always been faithful to Intermat, our loyalty being linked to the attraction of visitors from the Europe-Africa axis,” Marchetta remarks, “although the whole world loves to travel to Paris!”

In keeping with previous years, Mecalac will take the opportunity to showcase its machines performing live in the real-life worksite conditions of the outdoor demonstration area. “We have decided to be outside to exhibit the benefits of our products in action,” says Marchetta. “We will welcome both present and future customers to a space of around 4,000m² [43,000ft²] with a demonstration surface of about 1,000m² [10,800ft²] This will allow us to effectively present all our product lines, including the backhoe

loaders, site dumpers and compaction rollers that we produce in England through Mecalac Construction Equipment UK, part of Groupe Mecalac since February 2017.”

Coming to America

The acquisition of the former Terex plant in Coventry in the UK is pivotal to Mecalac's transatlantic aspirations. “The historic markets of France, Germany and Great Britain have driven the growth of our brand and continue to underpin and inspire Mecalac's research and development,” Marchetta stresses. “But not all markets have the same expectations of construction machinery. Our new global offering can provide relevant solutions in Eastern Europe, Russia, the Maghreb, central and southern Africa, the Middle East, Australia and North and Latin Americas. We are looking for a long-term balance by responding to the needs of other countries, which will contribute to the overall health of our business.”

In Europe, Mecalac sees its 12MTX machine as an alternative proposition to the traditional backhoe loader for urban applications providing greater



TOP: The complete range of Mecalac construction vehicles

ABOVE: The 15MWR, the largest in Mecalac's range of award-winning wheel excavators

BELOW: Alexandre Marchetta with his father, Henri Marchetta, chairman of the Mecalac Group

compactness and multifunctionality. Nevertheless, demand for backhoes can now be served by exports from the Mecalac UK plant. Meanwhile Mecalac hopes the rapidly evolving nature of urban construction sites will provide a bountiful market for its core products, with space constraints becoming a more pressing consideration, even in the USA. In particular, the company envisages growing demand for wheel excavators being met by its flagship MWR range, which secured a 2016 Bauma Innovation Award with its radically reimagined architecture, allowing for improved dynamic stability by dint of a low center of gravity more analogous to a telehandler than a conventional excavator.

The Mecalac brand is certainly synonymous with innovative vehicle design, with numerous patents protecting the company's

“FOR 18 YEARS I HAVE WORKED WITH MY FATHER. A PASSION FOR INNOVATION IS PART OF OUR DNA”

Alexandre Marchetta, executive vice president, Mecalac Group



OEM INTERVIEW

unique technical solutions and a growing list of industry honors set to be added to, at Intermat 2018, by a Special Award for Energy Transition for the e12 concept. How, then, do the Marchettas go about fostering the climate of continuous innovation which seems to underwrite their success? “Machines created by people, for people: for us, that’s what customer focus is all about,” Marchetta replies. “The thing that has always characterized our approach is the relevance of the concept. With the new MWRs, listening proactively to our customers and the issues they face was what prompted us to create an innovative solution based on an existing concept.”

Safer solutions

Operator safety is one aspect of machine development wherein Mecalac has established itself as an industry leader. “The famous swing system on our wheel loader range is recognized as the safest in this category of machines,” he says. “Whatever they load frontally can also be transported and swiveled through 90° without loss of stability – even when steering at the maximum angle.” But with safety regulations becoming more and more stringent, particularly in the UK and USA, Mecalac is not content to rest on its laurels, but continues working to introduce a range of safety innovations to its vehicles – including a Mecalac-patented retractable footboard.

“Stepping up and down from the cab is the source of too many worksite accidents,” Marchetta explains. “Now, with the retractable footboard, the cab step automatically extends when the operator lifts the console to exit the vehicle. This provides a ledge directly beneath their feet, which slots perfectly back into the cab when they get back in.

“MAJOR URBAN CENTERS ARE TRYING TO DRASTICALLY REDUCE THE EFFECTS OF POLLUTING ENERGIES AND QUIETER, NON-POLLUTING SOLUTIONS ARE NEEDED FOR JOBSITES”

THE HISTORY OF MECALAC

The name Mecalac derives from Mécanique du Lac, a reference to the lake at Annecy-le-Vieux in the French Alps, where the company was founded in 1974. Ten years later, Mecalac introduced the 11CX, an articulated machine with 360° rotation that fulfilled the functions of a loader, excavator, forklift and tool-handler and was to prove the forerunner of the current 12MTX vehicles. In 1991, Mecalac was bought by the current chairman, Henri Marchetta.

In 2002, Mecalac acquired Ahlmann, a German company that had been pioneering the development of the swing loader since the 1950s.

Under Marchetta’s leadership, the company continued to grow and diversify its product range, producing its 10,000th machine

in 2007 and creating innovative new design concepts with unerring regularity, including the 8MCR skid-steer crawler in 2009, the next-generation 12MTX in 2015 and, in 2017, the game-changing MWR range of wheel excavators. In the same year, Mecalac bought from Terex in the UK a plant that manufactures backhoes, dumpers and compaction rollers, as a precursor to gaining traction in American markets.

“Today, the company has five factories, two in France and the others in Germany, Turkey and the UK,” explains vice chairman Alexandre Marchetta. “For 18 years I have worked with my father. A passion for product innovation and for anticipating technological developments and changes to working practices is part of our

DNA – which is synonymous with stability for employees, partners and customers. The history of Groupe Mecalac is linked to product developments – and these are now accelerating with widening ranges, regular awards for innovation, and Mecalac becoming known as a specialist in versatile, environmentally friendly machinery for urban construction sites.”



GUILHEM VELLUT



TOP RIGHT: Lake Annecy, in the French Alps, which inspired the Mecalac name

ABOVE: Mecalac's headquarters is still in Annecy-le-Vieux, where the company was founded in 1974

“The fuel tank on the MWR wheel excavators is located on the undercarriage,” he goes on, “meaning the driver no longer has to carry out operations at height. Mecalac dumpers are equipped with a hazard-detection system, facilitating avoidance of obstacles in the machine’s path which the operator may have missed.” All such marginal gains are important in a marketplace where driver safety is an increasingly fundamental factor in purchasing decisions.

Looking to the future

The compact multifunctionality of Mecalac machines has enabled them to establish a strong presence in the French capital and the company is

fully involved in the Grand Paris project launched by Nicolas Sarkozy in 2007, which aims to transform the city into a sustainable 21st century metropolis. “Major urban centers are trying to reduce the effects of polluting energies, and quieter, non-polluting solutions are needed for jobsites,” Marchetta reflects. “The transition will take time and, as with electric cars, part of this will be the economic model that must necessarily support the technological transition. But we believe we have taken an important step by introducing the Mecalac e12, an 11 ton, 100% electric excavator offering eight hours of autonomy.”

There is a tide in the affairs of men which, taken at the flood, leads on to fortune. The Paris 2024 Olympic Games is on the horizon and Mecalac is reaching out to the world just as it prepares to turn its gaze on France. As the Games approach and Parisian environmental policy grows ever-more assertive, there is a real feeling that Mecalac is set to seize its historical moment. **ivT**

Turn the page for a case study on Mecalac’s e12

Turn to page 62 for ivT’s full Intermat Preview



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French revolution

ONE OF THE MOST IMPORTANT VEHICLES TO MAKE ITS DEBUT AT APRIL'S INTERMAT PARIS EXHIBITION WILL BE MECALAC'S ALL-ELECTRIC EXCAVATOR, THE E12. IT'S NOT SIMPLY A PROTOTYPE, BUT A MACHINE THAT IS PREDICTED TO REACH MARKET IN 2019

▷ *Efficacité, compacité, autonomie.*
This is the no-compromise formula for electrification at Groupe Mecalac, which has a philosophy sharply focused on building innovative, process-oriented machines for space-limited and environmentally sensitive urban sites.

The French company has established an enviable worldwide reputation for eye-catching vehicles, boldly reimagining accepted configurations to create new forms of compact multifunctionality. Mecalac recently acquired the Terex production plant in Coventry, UK, and is on the cusp of an ambitious expansion beyond its traditional European markets and into the USA, where it sees a burgeoning demand for its versatile and space-efficient off-highway products.

Now Mecalac is staking a claim in the emissions-free markets of tomorrow by unveiling the e12 – a market-ready, fully electric excavator. Making its world debut on home soil at Intermat Paris 2018 on April 23-28, it is poised to receive a Special Award for Energy Transition. Commercial availability is anticipated in early 2019. The machine is an electric version of the 12MTX, with which it shares dimensions, though sporting a blue, rather than yellow, livery. Identified as the perfect template for a new electric vehicle due to its strikingly innovative architecture, it is with the 12MTX that the e12's story begins.



15%

Estimated
power curve
efficiency gains
from the e12's
electrohydraulic
system



The e12 will make
its world debut on
home soil in Paris at
Intermat this year



ABOVE: A blue livery distinguishes the electric e12 from the yellow of the diesel 12MTX

Billed as the first articulated excavator in the world, the 12MTX's rear-mounted 85kW Tier 4/Stage IV diesel engine is positioned separately from a compact turret that offers full 360° rotation. With an operating weight of 9,700kg (10.7 tons), an overall length of 4,619mm and a turning width of 2,710mm, its maximum reach is 7,100mm and its maximum break-out force 6,400daN.

Four machines-in-one

Though an excavator, its uniquely versatile design enables it to do the work of a wheel loader, a telehandler and a tool carrier, so that fewer vehicles are needed on site and use is highly efficient. Mecalac reckons that a 12MTX spends just 25% of an average day in idle mode, compared with 70% for conventional vehicles performing only one job.

"You have to imagine it's four machines in one," explains Mecalac's head of design and

146
The record-breaking total power capacity (in kWh) of the e12's 1m³ LiFePO₄ battery pack

product management, Patrick Brehmer. "We need a powerful engine to run the hydraulics – but a compact turret. It's the most compact excavator in the world because the engine is separate from the turret. Then you have an articulated undercarriage, so the boom is made to work in both directions. It is also a loader, but instead of driving forward and backward to load we can use the boom. We can do dynamic and static loading, even at a 90° angle. We can take pallets like a telehandler but we can place them 4m [13ft] below ground level, which no telehandler can do."

In conventional excavators, the dipper cylinder is positioned over the boom, providing power in only one direction, but the 12MTX's cylinder is underneath, providing real lifting power for loading and handling. Whereas an excavator normally has just one pump,

25%

The predicted idle time thanks to the multifunctional design of the 12MTX

needing only to sit and dig, a loader has two pumps, enabling simultaneous driving and lifting.

"The 12MTX has two completely separate hydraulic circuits: one hydrostatic closed loop for driving and one for working," says Brehmer. "The boom has no influence on driving. Normally, when you begin to move an excavator's turrets and boom, you slow down – but we need maximum energy in both for loading and tool carrying. The hydrostatic loop's high sensitivity is important for telehandling, where you must go inch-by-inch."

Progress to lower emissions

With cities such as Paris pushing to eliminate diesel vehicles, emissions-free construction zones are on the horizon and huge global markets for electric machines may rapidly emerge. Thus Mecalac looked into the key obstacles to commercially viable electric excavators.

"WE REALIZED THE 12MTX WAS PERFECTLY READY FOR ELECTRIC: WE COULD REPLACE THE ENGINE WITH 1M³ OF BATTERY AND REMAIN COMPLETELY COMPACT"

Patrick Brehmer, head of design and product management, Mecalac



First, any compromise on performance must be avoided; customers need to do the same job in the same time as with diesel. Second, for urban applications there must be no compromise on compactness. Finally, there can be no compromise on autonomy – the length of a working cycle. This is the greatest challenge presently facing electric vehicle manufacturers. "One day of work is 8-10 hours," says Brehmer, "Our customers are under day-to-day pressure and cannot just work for 4-5 hours. Unlike a classical excavator, in our vision the vehicle is constantly working, not waiting for the loader or the telehandler. So there must be no compromise on performance, compactness or autonomy."

Efficacité, compacité, autonomie

For eight hours of autonomy in continuous, peak-performance operation, Mecalac calculated that a mobile excavator would

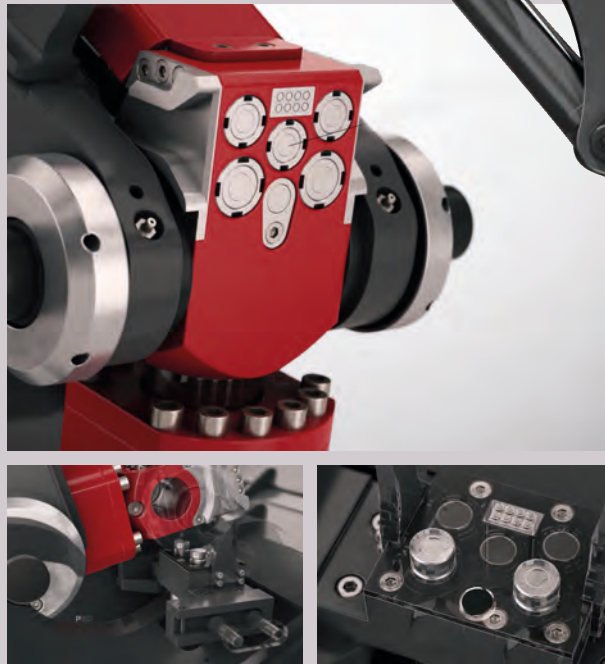
AUTOMATIC ATTACHMENT RECOGNITION

When your company ethos centers on versatile machines performing a wide variety of tasks, the ability to quickly swap attachments and optimize settings for specific implements takes on a magnified importance. That's why, as well as the e12, Mecalac will be using Intermat Paris 2018 to showcase Connect Energy Link, its latest coupling system.

Connect Energy Link builds on the success of Mecalac's previous coupling system, the lightness, integration and ease-of-use of which garnered a 2015 Intermat Innovation Award. The new system provides automatic connection of the machine's hydraulic lines and electric cables to the attachment – without any need for the operator to leave their workstation.

RFID technology is employed, with a sensor in the excavator arm detecting an electronic chip in the attachable tool. This allows automatic attachment recognition, so the machine adapts its electrical and hydraulic settings automatically to optimize the efficiency of a given attachment.

Mecalac is confident that this patented innovation will improve safety, save time and provide operators with unprecedented convenience and energy-efficiency when using a single vehicle to wield a varied host of tools in modern urban settings.



ABOVE: A machine's hydraulic lines and electric cables are automatically connected without the operator leaving the cab

require 146kWh of energy, necessitating 1m³ of batteries. But can this be accommodated without compromising that second non-negotiable – compactness? The answer lay in the architecture of the articulated 12MTX.

"Initially, it was designed to carry a big engine and keep a compact turret, but we realized that it was perfectly ready for electric. We could replace the engine with 1m³ of battery and remain completely compact," explains Brehmer. "Other architectures involved some form of compromise, but we didn't want to add one millimeter to the 12MTX because then the customer would lose something. Even with new engine specifications like Tier 4 or 5, we make each machine smaller than the last – because the job doesn't change and the operator still needs optimum visibility."

High power density technology

Even keeping the e12's batteries to 1m³ required a technology with much higher power density than the lead-acid batteries used in cars and

"LITHIUM-ION BATTERIES ARE MADE FOR 1,000 CHARGING CYCLES, WHICH MEANS THREE YEARS. IT'S OKAY FOR A PHONE, BUT NOT A MACHINE"

forklifts, which would only provide around 30kWh per 1m³ of space. While offering superior power density, lithium-ion batteries presented limitations in terms of lifetime. "You see it with smartphone batteries," Brehmer explains. "Lithium-ion batteries are made for 1,000 charging cycles, which means three years. After that, battery performance quickly decreases and you can no longer work for a full day. But our machines are made for nine years. It's okay for a phone, but not a machine."

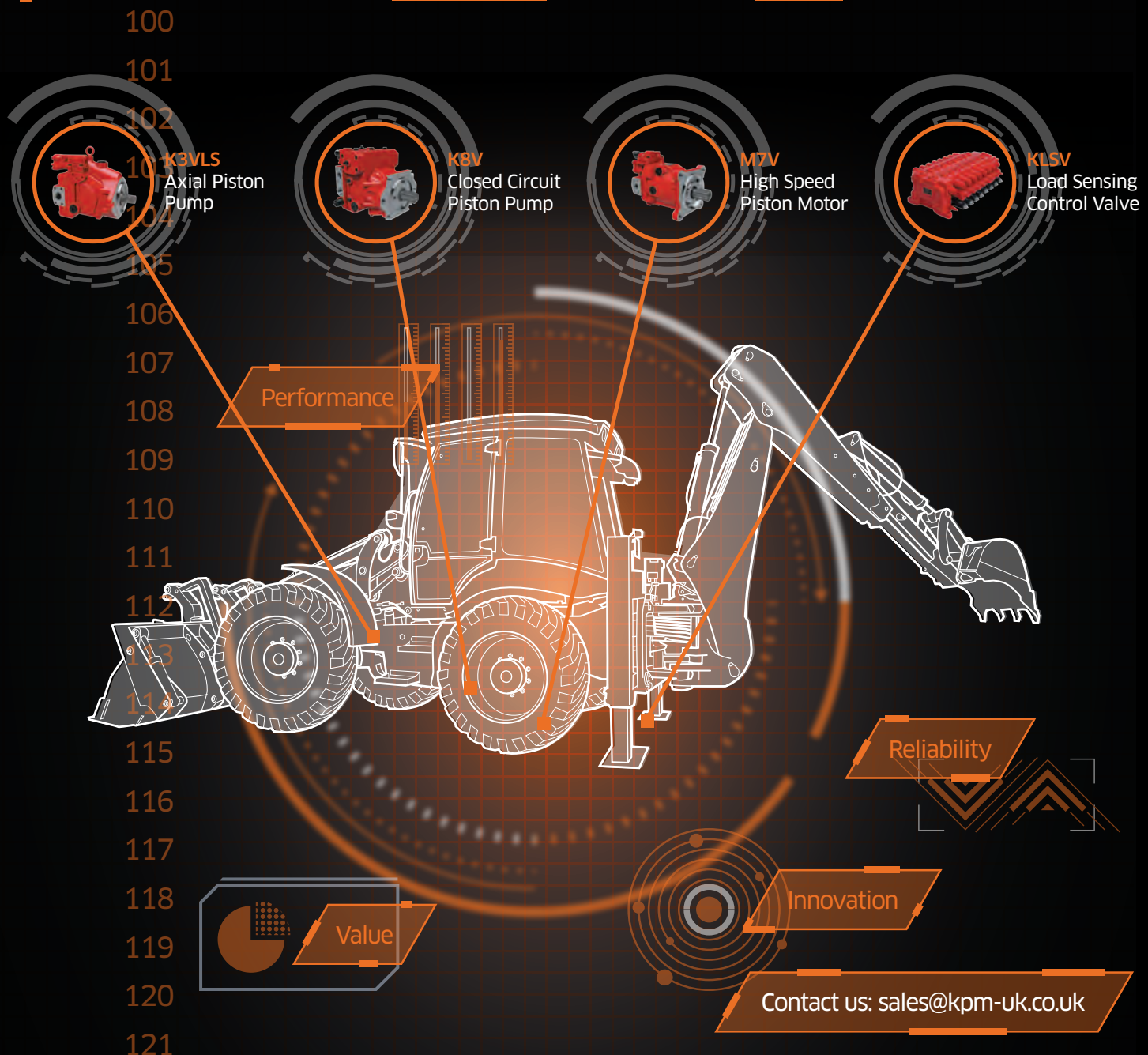
Instead, Mecalac opted for lithium iron phosphate (LiFePO₄ or LFP) battery technology, which

offered several advantages. LFP has sufficient power density to provide the requisite 146kWh from a 1m³ space and can also complete three times as many charging cycles as lithium-ion without deterioration – supporting peak vehicle performance across a nine-year lifespan. Moreover LFP batteries are dry and inert, which eliminates any risk of leakage or explosion, even in the event of a severe shock on the work site – and any possibility of a 1m³ excavator battery-pack combusting is clearly better avoided. LFP batteries require no specific cooling within the temperature and power ranges of e12 operation, saving on space and cost.

But even with LFP in place, further innovation was still required to achieve eight-hour autonomy at 100% performance. "We had to keep optimizing the energy request," Brehmer continues. "That's why the whole pilot system, from the joystick to the main valve, is now electrohydraulic – with a new generation of main valve that allows us to gain the last 15% by optimizing the power curve."

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A NEW WAY TO SELL INDUSTRIAL VEHICLES

Along with next-generation machines, Mecalac is launching its Mecalac Financial Solution: a paradigm-shifting financing model for customers.

"As we're innovative on architecture and technology, we also wanted an innovative way of coming to market," Patrick Brehmer explains. "Of course, batteries and engines have a huge cost." Traditionally, total cost of ownership falls roughly into three parts – one-third on initial outlay, one-third on maintenance and one-third on diesel over a machine's lifetime. With the e12, maintenance and running costs would be slashed, since 50% of maintenance on conventional machines is linked to the engine, while battery power will be 6-10 times cheaper than diesel, Brehmer believes, depending on local electricity markets.

But the upfront cost of buying an electric vehicle will be higher – and customers may wish to pay for use of the machine, rather than purchasing outright. The nature of battery markets is a key factor. "The price of batteries



is decreasing rapidly," says Brehmer. "You might buy a machine today, but two years later there may be much cheaper batteries available with better autonomy – so it's impossible to resell. We want that to be our problem. Our customers want to work, to dig – not check battery prices on NASDAQ."

With many companies managing the second life of reduced-capacity

batteries for purposes such as stadium illumination, a whole new business model for machine reuse is anticipated. This is why Mecalac has partnered with DLL, a world leader in financing for capital goods, to develop the Mecalac Financial Solution, aiming to offer end-users a number of flexible and individually tailored options for servicing their electric vehicle needs.

The benefits of eliminating the noise, vibration, emissions and maintenance of internal combustion are clear. An electric powertrain also brings performance benefits, including the increased precision of dedicated closed circuits.

Instant wins

The e12 recovers energy during braking and can feed it back to the batteries via an inverter. But what excites Patrick Brehmer most is the instantaneous response that electric transmission affords. "Electric motors have great tractive force and, unlike a classical engine, which achieves maximum torque only at a certain RPM, we have maximum tractive effort immediately available. For off-highway and loading applications it's incredible!"

He expects the e12 to be ready for market in 2019. "We didn't want to just make a prototype or concept. At every show you see electric and

autonomous vehicles, but what can customers actually buy? Quite a boring machine. But at Mecalac, innovation only has a meaning if we bring it to the customer."

A universal solution

Diesel engines entail a range of solutions around differing Tiers, Stages and diesel quality between countries – but electric power, Brehmer believes, will provide a single, whole-world solution. The date of diesel bans in some European cities is already fixed and feedback suggests that the e12 will attract interest on both sides of the Atlantic. Change is in the air and, with its transformative brand of thinking, Mecalac could be happily placed to lead a French revolution in global construction vehicle markets. **ivT**

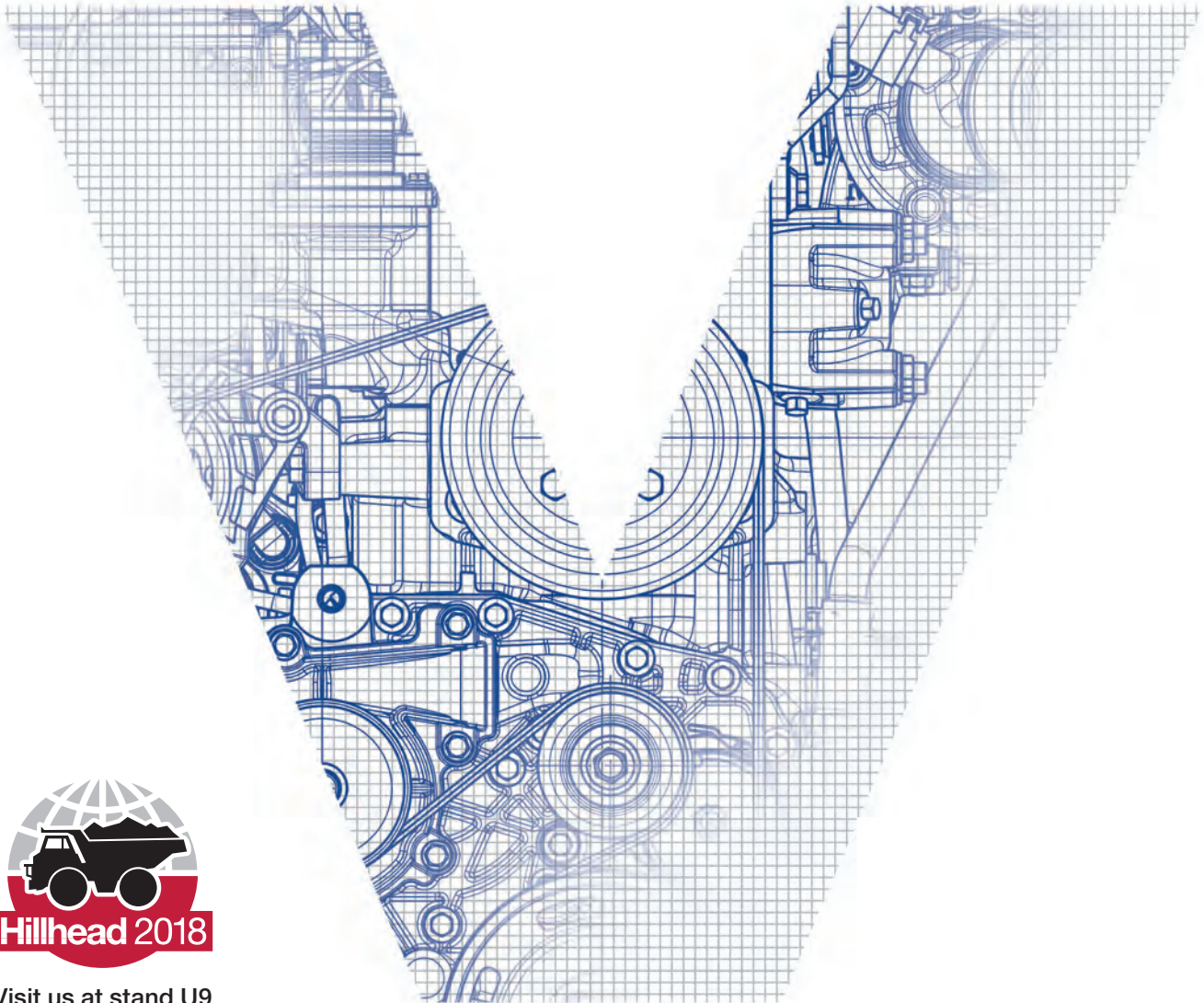
On the Web

Watch a video summary of Mecalac's e12 at www.ivTinternational.com/e12

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Sparkling into life



WITH HYBRIDIZATION AND ELECTRIFICATION
ON THE INCREASE, IVT SHARES SEVEN
KEY DRIVERS FOR THE TECH

▷ Electrification and hybridization are already underway in some sectors of the non-road mobile machinery (NRMM) industry and will undoubtedly have a large part to play in helping to reduce emissions and increase efficiency in the future.

What does electrification and hybridization mean for customers, suppliers and OEMs? It is critical that companies understand the scenarios facing the industry. The opportunities are great, but without the knowledge, companies could find themselves outdated, with little to offer industry.

There will be hardships, threats to market share, and weakening of profits for some companies. However, there is a light at the end of the tunnel: Electrification and hybridization offer greater functionality, lower emissions and lower fuel costs. It is just a matter of time before technology becomes commercially viable on a large scale.

Here, we look at hybridization and electrification as a trend in itself. We consider: what is the short-term future? And what are the key drivers to the evolution of electrification and hybridization in the longer term?

Currently, the market for fully electrified and hybridized machinery is limited to small, niche vehicles and high-horsepower, high-annual-hour machinery. Both categories are relatively low volume. The high-volume applications – for example, those sold into the rental industry,

to contractors, and agricultural applications – are not currently suitable for full hybridization or electrification. The up-front cost and/or TCO of hybrid or electric machinery in these less cost sensitive end-use categories is just not financially viable yet.

A key short-term trend in the agricultural equipment industry will be the electrification of the power take-off (PTO). In most agricultural applications, the PTO takes power from the transmission with one or two of its own clutches to allow it to operate independently. The electrification of PTO means the load on the engine and the strain on the transmission is reduced, while the operator would have greater functionality and flexibility with an electrical system, rather than a less efficient hydraulic system.

Electrification of implements will have to go hand-in-hand with electrical coupling on the PTO. Key suppliers are working closely with OEMs to fill this requirement, and OEMs have been acquiring implement suppliers.

In the current market, electrification development costs are extremely high and many OEMs are more concerned with investing in other cost-cutting or yield-increasing technologies, rather than focusing on electrification.

The magnitude and intensity of certain key drivers is going to have to increase before electrification and hybridization becomes more mainstream in the NRMM industry. So what are those drivers?



1 CO₂ and/or greenhouse gas (GHG) legislation being introduced beyond Stage V (Primary driver)

It is likely that developed markets will introduce some form of CO₂ legislation by/beyond 2025 and it is feasible that some of the emerging BRICS nations (Brazil, Russia, India, China and South Africa) will introduce CO₂ legislation for NRMM too. This will drive electrification and hybridization, which will increase investment in technology and drive down price (compared with current premiums). This will make electrification and hybridization more suitable for high-volume applications that currently can't support the added cost of electrified machinery.



2 Air quality indicators and low-emission zones (LEZ) (Primary driver)

Globally, cities are beginning to introduce strict emissions regulations in specific central areas. This will likely have a similar impact to CO₂ and GHG legislation (see 1), but on a smaller scale, within a quicker time period.

MARKET REPORT



3 Enclosed working environment regulations (Niche application)

In enclosed inner-city developments, electrically driven machinery is often already required by law in developed countries. These regulations will become more common.



4 Increasingly stringent legislation regarding workplace emissions (Localized)

Legislation over conditions in workplaces will drive electrification and hybridization of construction machinery, even in open-air spaces. The industry is already seeing evidence of this trend. Wacker Neuson's WL20e electric wheel loader is a good example of a smaller, all-electric industrial vehicle already on the market to meet demand in these areas.



5 Stage V: the first emissions regulations to include engines below 56kW (Primary driver for low-powered machinery)

Stage V regulations, which come into force in 2019, will be the first applicable to engines below 56kW. As smaller machines are easier to electrify and OEMs and engine manufacturers will not have existing emissions-reducing technology to build on in this class, many OEMs will choose to focus more on developing electric and hybrid machines.



6 Noise pollution limits for inner-city operation (Niche machinery)

Currently applicable in some large cities, noise regulations will continue to be adopted in developed countries and will consequently make electric industrial vehicles more in-demand.



7 Improved operational efficiency from 48V mild hybrid systems (Niche machinery)

All accessories on the engine are likely to move off the load of the engine and onto a 48V electrical circuit. Mild hybridization, electrifying the PTO, and other ways to electrically power implements and attachments, are attractive prospects for OEMs and suppliers looking beyond 2021 because the technology for auxiliary power requirements is similar to, and easy to translate from, automotive industries. This means investment versus payback is much more attractive.



This article is taken from KGP's forthcoming multiclient report on hybridization and electrification in the non-road and commercial vehicle segments. www.kgpauto.com

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'ELECTRIC' MAY BE THE BUZZ WORD WHEN IT COMES TO ALMOST ANY TYPE OF VEHICLE, BUT FOR OFF-HIGHWAY MACHINES, OEMs AND ENGINE MANUFACTURERS ARE PLACING BIG BETS ON OTHER WAYS TO LOWER EMISSIONS



Natural solutions


 20%

The potential reduction in carbon emissions achieved by using a natural gas engine over a diesel one

MAIN IMAGE AND INSET: New Holland's T6.180 100% methane powered prototype

Whenever renewable energy is discussed, the talk quickly turns to a green, electrically driven future conjured up by media images of windmills, solar panels and bunny rabbits. Unfortunately, everyone who has even the basic concept of what it would actually mean to junk the internal combustion engine knows that this scenario cannot possibly become a reality.

Our governments lurch from one technological soundbite to the next without apparently considering realistic options. As we start to experience the problems of charging and operating electrically powered vehicles in everyday circumstances, it is increasingly evident that, as engineers, our challenge is still to develop efficient ways of powering

the prime mover in a vehicle or machine with as little environmental impact as possible, and that includes the avoidance of the truly horrific visual impact of wind farms that inhabitants of many countries are being asked to endure.

Gas! Gas! Gas!

Natural gas is abundant in our world and it is becoming one of the favored options for the generation of electricity. Companies such as the German engine manufacturer MAN have been exploiting the need for large gas-powered engines for decades, with units like those in its E32 range. In recent years, MAN has translated some of that success to the municipal transport sector – with an average market share

of 39%, MAN is Europe's leading supplier of gas-powered buses. Gas power accounts for 20% of all MAN city buses sold during 2016.

Manufacturers recognize that generally the engines used in these vehicles are simply converted diesel power plants. Steven Nendick of Cummins comments, "CNG/LNG engines are built on the same production line and share the same key components – blocks, cranks, etc – as their diesel cousins."

This makes sense, so for manufacturers, the principle modification has become the introduction of spark ignition and the requisite reduction of the compression ratio. This fact, coupled with the lower per-unit energy value of the fuel (60-70% of an equivalent diesel

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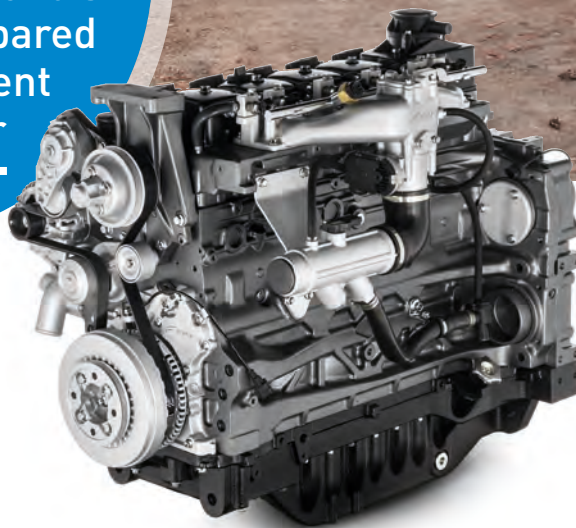
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The reduction in operating costs for New Holland's T6.180 when compared with an equivalent diesel tractor



engine) results in a generally lower engine performance in terms of power and, more importantly, torque. This works for bus operation, stationary applications, and to some extent hybrids, where the power requirement is more or less constant. But these effectively de-rated engines may not be so attractive in conventional off-highway applications where maximum output is frequently demanded of the engines.

However, the motivations for considering gas more widely are many. Citing the principle arguments, firstly there's the cost of fuel: Depending on global prices and location, natural gas can be priced as low as 20% of the price of diesel fuels.

Then there are emissions: Burning natural gas in an engine results in a straight 15-20% reduction in carbon dioxide emissions and a dramatic reduction in other pollutants.

Finally there's the cost of any aftertreatment: Because of the purity

of the burn in a natural gas engine, exhaust is handled by a simple three-way catalytic converter. No SCR, no DOC, no particulate filters.

Commercial interest

Serious steps have been taken by both New Holland and Deutz in recent years to assess the viability of natural gas in agricultural tractors as many farmers are now considering natural gas in the form of biogas as a fuel. Deutz collaborated with the University of Rostock and the Deutsche Bundesstiftung Umwelt

ABOVE: New Holland's T6.180 in action producing biofuel
INSET: New Holland's six-cylinder NEF gas engine

(DBU is the Environmental Agency in Germany) on the conversion of its TCD 3.6 diesel engine. The engine, a four-cylinder 3.6-liter diesel unit, was a stock production unit taken directly from the factory. It underwent several reworks to fit spark plugs, modify the compression ratio, and remove the common-rail inlet system and replace with a manifold to connect the inlet ports to a gas carburetor.

Then the tractor was fitted with a number of separate pressure vessels holding around 132 lb (60kg) of CNG, which is roughly equivalent to 16 gallons (73 liters) of diesel in terms of fuel capacity. Final testing took place at the end of 2015, with a reported positive response and the conclusion that production tractors using CNG engines were a viable concept and in practical terms a desirable production solution.

New Holland took a different approach for its methane-powered

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more information
www.ttcontrol.com/TTC-32

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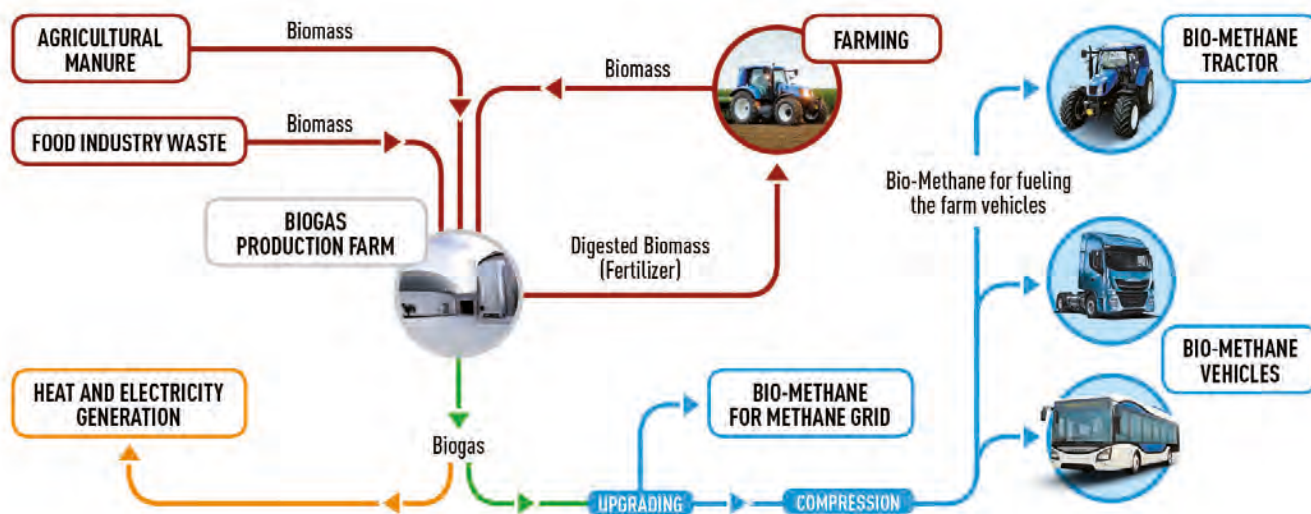


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"WE SEE METHANE AND PROPANE AS THE FUELS WITH THE GREATEST POTENTIAL FOR THE DEVELOPMENT OF TECHNOLOGIES THAT DELIVER ON ALL FRONTS: PERFORMANCE, COSTS AND SUSTAINABILITY"

Carlo Lambro, brand president, New Holland



TOP: The production and usage network for methane biofuel

BELOW: Organic matter is fed into a 'bio-digester' on an energy-independent farm, creating methane gas to power vehicles



tractor prototype, taking an existing NEF Series six-cylinder gas-powered variant from its sister company IVECO, which already used this model in commercial vehicles set up for gas. As the commercial-vehicle variant of the engine does not form a chassis component, the block of the engine had to be reinforced prior to installation. The New Holland project retained the common-rail concept and utilized a reprogrammed ECU to effect the required ignition timing. The engine was installed in a T6.180 tractor unit produced in the company's plant in Basildon, in the UK. Retaining the common rail meant it was easy to address combustion-related issues, for example that of unburned fuel igniting in the exhaust tract causing a 'knock' or 'popping' sound during deceleration. So by sensing any hydrocarbons present in the exhaust gas and adjusting the mix via the ECU, New Holland eliminated this condition in this engine. Refinement like this is a massive step in providing a 'like for like' driving experience compared to the diesel variant.

"The T6 Methane Power tractor is one of the cornerstones of our Clean Energy Leader strategy, which we launched 10 years ago to increase farming efficiency and sustainability,"

says Carlo Lambro, New Holland brand president. "We saw early on that alternative fuels are key to achieving a low-carbon future for agriculture, and we have invested accordingly. Today, we see methane and propane as the fuels with the greatest potential for the development of technologies that deliver on all fronts: performance, costs and sustainability."

Professor Colin Garner of Loughborough University, an expert in fueling for internal combustion engines, agrees: "The high level opportunities with methane are generally good. Methane offers lower CO₂ emissions because of higher hydrogen to carbon ratio of the molecule, compared to diesel. World supplies are abundant and methane is currently cheaper than diesel fuel."

Upgrading performance

For New Holland, the project was overseen by FPT Industrial, the engine development and production wing of CNH Industrial. And like other major engine manufacturers, FPT Industrial has been eyeing the gas-fueled market for some years. Based in the center of Europe and providing engines for both road and off-highway applications, FPT has reacted to the demand for cleaner emissions within cities by providing a range of spark ignition engines

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ABOVE (LEFT TO RIGHT):
Cummins ISL G; Deutz
TCD 3.6; MAN E3262
natural gas engines

BELOW: FPT Industrial's
Cursor 13 NG engine



10%

The target overall
improvement in torque and
power for FPT Industrial's
new gas engines, when
compared with their
baseline gas engine



**"NATURAL GAS IS THE CLEANEST
AND MOST VIRTUOUS THERMAL
ENGINE FUEL. ITS TECHNOLOGY IS
WELL TESTED, READY FOR THE
MARKET AND WILL PRODUCE
ENVIRONMENTAL BENEFITS
RIGHT NOW"**

Pierpaolo Biffali, head of product engineering, FPT Industrial



based on the company's automotive product. Even now, the automotive market still provides the catalyst for development simply because of the volume of production in that sector.

However, it has become clearer in recent years that the demand for clean engines currently driving the automotive industry will spill over into the industrial sector as products become more widely accepted.

To this end, FPT Industrial has set up an R&D team to concentrate purely on gas vehicle engine development: the Hi-eNG project. "Natural gas is the cleanest and most virtuous thermal engine fuel. Its technology is well tested, ready for the market and will produce environmental benefits right now", says Pierpaolo Biffali, head of product engineering at FPT Industrial. According to Biffali, the latest NG engine, the Cursor 13, "reaches near zero CO₂ emission when fueled with biomethane".

This project is aiming for second-generation, high-efficiency

Dictionary definition

methanogen |
noun *Biology*
a methane-producing
bacterium, especially
an archaean, which
reduces carbon
dioxide to methane.

CH₄
Methane

natural gas engine and expects that, when finished, torque, rated power and the reduction in greenhouse gas emissions will all show a 10% improvement compared with the company's baseline gas engine. The team intends to validate proposed changes using their single cylinder combustion simulation engine. Examples of features in development are pent-roof combustion chambers with 'tumble flow' intake ports and twin injectors, both of which promote sufficient gas flow into the combustion process. FPT Industrial is also testing a centrally mounted spark distributor (rather than a plug and a high-pressure cooled EGR circuit) which helps to reduce throttling loss at part load and means that the engine 'feels' more like a diesel.

Natural gas future?

With the growing pressure on environmental responsibility, a handful of the major players are turning their attention to the

"THE BIOGAS GENERATED FROM OUR BIO-DIGESTER UNITS IS USUALLY AROUND 60% METHANE, WHICH IS BASICALLY THE SAME PURITY AS NORMAL NATURAL GAS"

Dr Mauro Nicoletti, area manager,
Schmack Biogas



challenge of producing engines that can handle both natural and biogas as a fuel within an interchangeable engine envelope. There are still challenges, as underlined by Prof. Garner's caveat: "To get a decent energy per unit volume into the fuel tank, of a vehicle you need to store it at either high pressures, or in a liquefied state (i.e. below -163°C (-261.4°F)) and keep it there. These are not barriers, as it is being done – it is just easier with diesel which can be stored at very high energy density (i.e. energy per unit volume [J/m³] at normal atmospheric pressure and normal, ambient air temperatures."

The target is obvious: give the customers viable ranges of industrial engines that perform equally well on either gas or diesel and are physically interchangeable. These will provide the OEMs with a more flexible product to offer to new markets which are, or will become, environmentally sensitive. These initiatives should be applauded by our industry and supported as truly viable options for the future. **ivT**

On the Web

Find out more about New Holland's T6.180 at
www.ivTinternational.com/methane

MAKING METHANE

Although currently there are seemingly endless amounts of naturally occurring fossil-based gas in the world, it never hurts to have a Plan B and that plan may extend to further investigating the subject of artificially stimulating the creation of methane – the principle component of all-natural gas. It's the gas that bubbles from swamp, the gas that provides the stench of effluent, and in future it might be the gas that provides us with that elusive 'renewable' energy source that we will need to power our off-highway equipment.

So how do we produce methane? Methane in the form of biogas has been used for decades in the agricultural industry for heating, and latterly in the public transportation services in some municipalities within Europe.

The basic science is that the methane is produced when certain acids are consumed and digested by any methanogenic organism, the most common culprit being methanogenic archaea, a single cell organism that flourishes in anaerobic environments. Air-breathing organisms (yes, humans, too) secrete methane as a product of digestion, which accounts for those embarrassing moments in meetings when we have a 'methane escape'.

For industrial purposes, though, companies like Schmack Biogas exploit this fact by developing industrial processes and plant designs to allow the production of a pure, methane-rich gas that can be used for a number of industrial applications, which now, as it turns

out, includes its use in industrial engines. Schmack Biogas is one of the largest in the business and has collaborated with several vehicle manufacturers on the use of biogas.

Dr Mauro Nicoletti oversees the design, production and installation of biogas production plants for Schmack Biogas in Bolzano, Italy, and explains, "The biogas generated from our bio-digester units is usually around 60% methane, which is basically the same purity as normal natural gas." Biogas can be refined further, but is sufficiently pure as produced to be pumped into the gas grid in most countries. The digester plants create an anaerobic environment into which virtually any type of organic waste is introduced. These include vegetable and food waste, animal dung, grain-based waste and human excrement.

Within these digesters, the waste is encouraged by bacterial degradation to break down into hydrogen, carbon dioxide and acetic acid. The archaea then consume the acids, converting all of the waste to carbon dioxide and methane. The biogas can be used, bottled or stored, and the by-product of the process is a pure organic liquid fertilizer that has commercial as well as environmental value. This process happens naturally, requiring nothing more than the right conditions. Obviously there are variables, in particular feed balance (excessively high protein can cause over-acidification), and both mechanical agitation and

finite temperature control help promote the effectiveness of the process. This sounds complicated and on a small scale the monitoring and feeding process can be quite challenging.

Dr Nicoletti explains further, "Usually after a year in operation, our customers feel that the process is user-friendly and that use and maintenance is not a complication." However, on a serious production scale, these plants can be almost fully automated and experts agree that, although the design of such plants is well developed, there is still much scope for process improvement and the potential from economy-of-scale that would be gained by more widespread adoption of the gas as a fuel.

Biogas could become a truly renewable source and one that makes long-term sense. Methane captured using this process would minimize emissions of methane, which is one of the most damaging greenhouse gases. A commercial use could be found for much of our domestic and commercial waste; effluent treatment for domestic sewerage could be rationalized and become cheaper.

This will not happen overnight, but driven mostly by the agricultural and commercial vehicle sector, natural and biogas will become more widely available at fueling centers. However, to become really effective this will need widespread government support, and with the potential for lost revenue from fuel excise, that support may be a while coming.



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Tech leaders

The 44 judges sitting on the panel for Agritechnica's Innovation Awards were required to sift through more than 320 submissions. Entries ranged from very practical technology that will provide substantial benefits to the agricultural industry now, all the way to futuristic concepts indicating a path the industry is only beginning to tread. Prior to the show we covered the two gold medal winners, now we present our selection of some of the most interesting of the silver award winners from the competition

BELOW: Fendt's Mobile
Agricultural Robot
Swarms in action



INNOVATION
AWARD
AGRITECHNICA
SILVER MEDAL

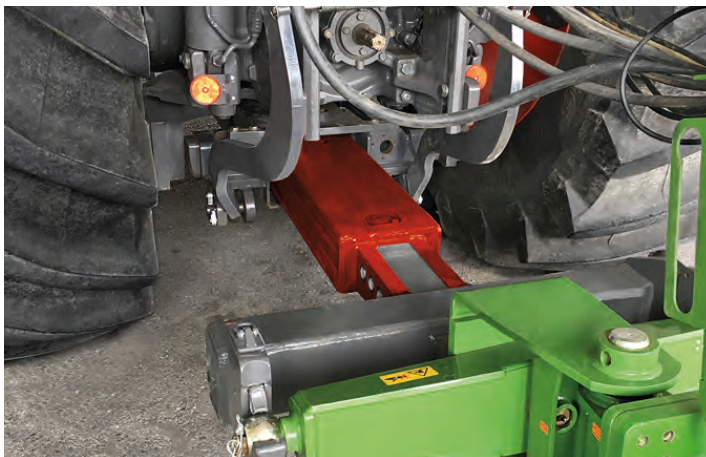




AGROCOM (POLSKA) SMART CROP DAMAGE IDENTIFICATION

Estimating the extent of crop damage caused by extreme weather is labor intensive and often inaccurate. In response, the Polish arm of Agrocom has developed the Smart Crop Damage Identification (SCDI), which can make more accurate assessments. 3D images captured by drones are combined with lidar to calculate the extent of damage. The system reduces the working time required by farmers when checking stocks and for quality assurance.

<https://tinyurl.com/smartcrop>



FENDT, VARIOPULL

The VarioPull from Fendt is able to maintain the same weight distribution on a tractor's front and rear axles regardless of the drawbar load, drawbar power, ballast or the use of the traction booster. Altering an implement's attachment point, the system can bring it flexibly up to within 80cm (32in) of the tractor's rear axle, with weight distribution being optimized as it moves closer. This allows the operator to position the attachment further back to give more space for the drawbar when carrying out a headland turn.

<https://tinyurl.com/variopull>



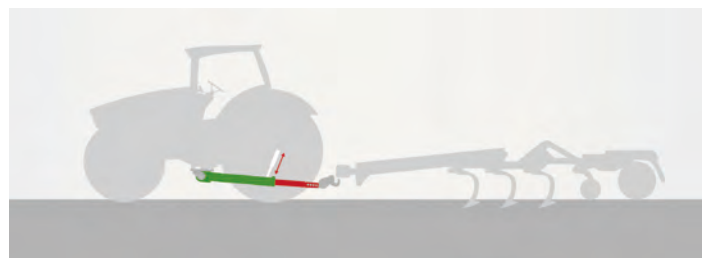
AGRITECHNICA REVIEW



FENDT, MOBILE AGRICULTURAL ROBOT SWARMS (MARS)

Fendt's MARS (Mobile Agricultural Robot Swarms) is the first time swarm technology has been presented to the agricultural industry in a marketable way. The system relies on a number of small, auto-steered, electric units, that can be filled with maize and deployed for seed drilling. The system emits low noise levels and can operate without lights at night-time, making them suitable for seeding fields near residential properties 24 hours a day. Each unit weighs as little as 40kg (88 lb) and the swarm can coordinate the work to reduce soil compaction and avoid the dangers posed to humans by larger vehicles. All job data is logged in the cloud and the units can communicate both with each other and with the operator.

<https://tinyurl.com/fendtmars>





KRONE, LIFTCAB

Given the modern trend for high-yielding maize varieties that reach heights of over 4m (13ft), forage operators can often be driving unsighted into a wall of maize plants for much of their day. The LiftCab from Krone enables the entire cab to be raised by 70cm (28in), reducing operator strain and providing an overview of the crop and harvest fleet – easily spotting obstacles. The space created underneath has the added benefit of providing easy access to service and maintenance points.

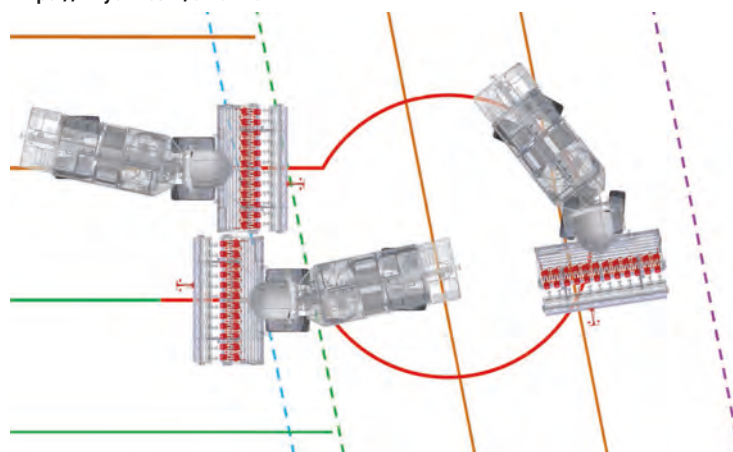
<https://tinyurl.com/kroneliftcab>



HOLMER, SMARTTURN

While typical tractor headland management systems record sequences of repetitive functions that operators can retrieve at the push of a button or based on GNSS positioning, the SmartTurn is an altogether different approach. A software solution, it automates the complete headland turn of a beet harvester, including the raising and lowering of the lifter unit. Holmer's mechanical row guidance system is combined with Reichardt's GNSS-controlled version, turning it into a self-propelled tanker harvester. All headland turn maneuvers in the field to be harvested are optimized, minimizing field traffic and so reducing compaction, losses and downtime.

<https://tinyurl.com/smartturn>



JOHN DEERE, EZ BALLAST WHEELS

To have the necessary traction required for heavy draft tasks, tractors are traditionally ballasted by attaching heavy weights to the front and rear axles. That is time consuming and hazardous, but John Deere's EZ Ballast Wheels offer a simpler solution. Weights can be fitted to the wheels with a pallet fork and without the need to jack the tractor. In fact, they can be secured or released by a single person. As well as increasing the traction of the tractor, the wheels improve fuel efficiency as well as better protecting the soil.

<https://tinyurl.com/ezballast>



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Filling the

MAIN AND RIGHT:
The Torion 1914 is
the mid-range vehicle
in the Claas line-up
with a tipping load
of 12.4 metric tons





gaps

THE TORION WHEEL LOADER RANGE, DEVELOPED IN ASSOCIATION WITH LIEBHERR, ROLLED UP TO FILL GAPS IN CLAAS'S PORTFOLIO AT AGRITECHNICA LAST YEAR. NOW YOU CAN TAKE A CLOSER LOOK AT THE DESIGN AND COMPONENTS OF EACH VEHICLE

▶ German farm machinery manufacturer Claas has spent the past two years developing a new range of agricultural wheel loaders in association with fellow German manufacturer Liebherr.

The goal for Claas was to introduce a wheel loader range specifically manufactured for all levels of the agricultural market, something the two companies claim has never been achieved before.

And so, before a packed stand at the huge Agritechnica show in November 2017, a senior representative of each company introduced the new Claas Torion range of wheel loaders.

Former Claas managing partner Helmut Claas, and Willi Liebherr, president of Liebherr International, pulled the covers off the new machines. Designed for

agricultural use, the new Torion range consists of seven models in three category sizes.

"The range was designed and specified for usability in agriculture, with specific focus on customer segments by model size," says Alastair Bourne, Claas UK product manager for the Torion range. "Tests were carried out during the past two years at farms in Germany."

Start small

The smallest Torion 535 and 639 models are powered by 46kW (62hp) and 50kW (68hp) Yanmar engines and are ideal for a variety of smaller agricultural jobs, Bourne explains.

"The Torion 535 and 639 are suited to all kinds of farmyard jobs on dairy and cattle farms, such as feeding, manure loading and bale handling," he says. "They are also

"THE RANGE WAS DESIGNED AND SPECIFIED FOR USABILITY IN AGRICULTURE, WITH SPECIFIC FOCUS ON CUSTOMER SEGMENTS BY MODEL SIZE"

Alastair Bourne, Torion product manager, Claas UK



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by the Yanmar engine
(68hp) for the
compact
Torion 639

suitable for special crop farms, vegetable farms and for pallet and box handling. These two models are reliable, easy and safe to operate."

Both four-cylinder engines meet the requirements of exhaust standard Stage IIIB (Tier 4i). Exhaust treatment is carried out with a diesel particulate filter (DPF) with integrated diesel oxidation catalyst (DOC). Claas says the use of SCR technology is not required.

The filter regeneration mode can be adjusted according to the conditions, with either manual or automatic regeneration, as preferred.

In the Torion models, fresh air is drawn in from the radiator cooling package and pre-filtered. The air filter is readily accessible in the machine engine compartment.

A dust extractor valve efficiently removes dirt and dust particles from the filter, which protects it and makes servicing easier.

In these smaller Torion models the generously sized radiator cooling package ensures there is plenty of cooling capacity in all climate conditions. The intelligently designed air supply route guarantees high cooling capacity right from the outset. The heat given off by the engine can leave the engine compartment without being drawn back into the system.

The tipping load of these models is 3.4 and 3.85 metric tons respectively, and clearance height is less than 2.5m (8.2ft).

The infinitely variable hydrostatic drive has two drive modes: F1

"ON THE TORION 535 AND 639 MODELS, THE HYDROSTATIC DRIVE, PUMP AND HYDROMOTORS ARE MADE BY BOSCH REXROTH AND THE AXLES BY COMER"

Alastair Bourne, Torion product manager,
Claas UK



ABOVE: The smaller Torion models are suitable for a variety of farmyard tasks

from 0-6km/h (0-4mph) and F2 from 0 to 20km/h (0-12mph). The driver can switch from one drive mode to the other at the touch of a button, depending on the application.

"On the Torion 535 and 639 models the hydrostatic drive, pump and hydromotors are made by Bosch Rexroth and the axles by Comer," confirms Bourne.

Pressing gently on the brake/inching pedal allows infinitely adjustable deceleration of the ground speed, with the engine speed remaining the same. Fully depressing the pedal automatically

reduces the ground speed to zero, and activates the service brake (hydraulically operated drum brake).

The creep speed facility is ideal for agricultural jobs that require higher oil flow, but slower speeds, such as bedding or sweeping livestock houses.

This means the machine is driven at a constant speed in a set inching position and the required flow of hydraulic oil can be controlled with the accelerator via the engine speed.

The cab and boom on both models are positioned for maximum visibility and the rounded rear window provides the operator with an optimum view to the rear when on the move.

The loaders' size enables them to operate in more confined areas, particularly thanks to their sharp 40° articulating angle.

Torion mid-range

Moving up in size, the mid-range Torions consist of three models, from 103kW to 123kW.

The Torion 1511 is the biggest in this range, at 123kW (165hp),

CLAAS TORION RANGE



the 1410 is rated at 114kW (155hp) and the 1177 at 103kW (140hp). These three models are powered by John Deere Power Systems engines, which have dynamic cooling, demand-driven, engine cooling, and have already proved their worth in the Claas Arion 500 series tractors.

"The mid-range Torion 1177 to 1511 models are designed for farms and contractors with increasing demands in lift capacity and performance," says Bourne. "Or for every agricultural customer who looks for capacity and efficiency in loading and versatility, with still reasonable machine-size dimensions. Arable farms and contractors will also benefit from these models."

Specific applications could include silo compaction and handling of grain, fertilizer and other bulk material.

All three mid-sized Torions have a three-range hydrostatic varipower transmission. The convenient system provides three drive modes, from 0-6, 0-16 and 0-40km/h (0-4, 0-10 and 0-25mph) for optimal adjustment to conditions. "The pumps and the two hydromotors are all made by Bosch Rexroth," says Bourne.

ABOVE: The mid-range 1511 has a hydrostatic transmission with three different drive modes

BELOW: A dynamic cooling system comes as standard on the 1812 while a diesel particulate filter is optional

The engine is positioned low and well toward the rear, so acts as a counterweight, making high tipping loads of 7.75 to 9.75 metric tons possible. All models feature Smart Loading, with a programmable bucket return function and defined lifting and lowering limits.

All three models in the mid-range Torion series are equipped with a standard 7in touchscreen, which serves as a central information hub for operating the machine and is extremely easy to use.

Two joysticks are available for convenient and sensitive control of the Torion. The ergonomically designed joystick

makes operation of all boom functions easy and precise.

The direction of travel can also be changed easily via a toggle switch on the handle. The multifunction lever, available as an option, has an additional four-way control lever that can be used to control a third and fourth hydraulic circuit, for filling and dumping a high dump bucket or opening and closing a silage grab.

Two large Torion models

The largest of the Torion models, the 1812 and 1914, have Liebherr engines with dynamic cooling, providing 143kW (192hp) and 168kW (225hp), and offer tipping loads of 11.1 and 12.4 metric tons respectively.

These bigger machines have been designed for the contractors and large farming businesses that have the highest demands in terms of power, performance and operator comfort.

"For the large-scale farmers, contractors, or those working in the biogas industry, the bigger Torion 1812 and 1914 models will be the most beneficial," says Bourne. "Customers that look for high load capacity and efficiency, served by





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efficient C-Matic transmission and powerful Liebherr engines, will need these machines.”

The efficient Liebherr engines in these larger models meet Stage IV emissions standards with no additional diesel particulate filter, but it is available as an option.

Both large models are equipped as standard with the dynamic cooling system. An optional automatic reversing fan system for very dirty working conditions is also available.

Similar to the models in the mid-range series, these two largest Torion models enjoy optimal weight distribution, with the engine located well toward the rear.

This means that it can be accessed easily, facilitating swift maintenance. The boom is available with either agricultural kinematics or Z-kinematics, the agricultural kinematics being particularly well-suited for all agricultural applications.

Both machines can be equipped with a high-lift boom as an option, as long as they are using agricultural kinematics. Measuring 3m (9.8ft), it is 40cm (15.7in) longer than the standard boom, and can achieve loading heights of up to 4.64m (15.2ft) at the pivot pin.

“Both the Torion 1812 and 1914 models have ZF – C-Matic transmissions and axles,” says Bourne. “The transmission split

CLAAS AND LIEBHERR: FAMILIES OF SUCCESS



The Torion range has brought Claas and Liebherr together for the first time, but strong, decades-long, parallels can be drawn between the two.

Claas was founded in 1913 by brothers Theo, Franz, August and Bernhard (pictured above, from left, around 1950), originally producing

straw binders but later developing a strong knotting system to tie bales. In 1958, August’s son Helmut Claas joined the family firm, becoming director of the engineering department four years later. He was responsible for several innovations that put Claas firmly on the map, including the Dominator combine harvester series developed in the 1970s.

Liebherr also started life as a family business, when, in the late 1940s, Hans Liebherr recognized the need for tools and machinery for the construction industry. Together with design engineers and tradesmen, in 1949 he developed the TK10, the

company’s first mobile tower crane. This launched the company on its journey, developing construction machines and making a foray into refrigerators. Today the group has manufacturing bases in a number of countries and remains family run.

Claas is also still very much a family business, with Helmut’s daughter leading the group. It employs around 11,500 workers worldwide and had a turnover of €3.8bn (US\$4.73bn) in the 2015 financial year.

At the end of 2016 Liebherr employed 42,308 people and had a turnover of just over €9bn (US\$11.2bn), the third-highest in its history.

TOP: The agricultural kinematics loader in the 1914 is unique to the Claas Torion

12.4
The maximum tipping load of the Torion 1914 (the largest in the range) in metric tons

gear box for the two hydrostat motors with clutch (shutting off the larger hydro over 16km/h [10mph]) is made by Dana. And the axles are made by Dana Spicer.” The mid-range 1177, 1410 and 1511 also carry the Dana clutch and Dana Spicer axles.

Claas has been very vocal about the fact the Torions are the first complete agricultural spec wheel loaders to be introduced to the global markets, though other loader manufacturers may disagree.

Responding to this, Bourne says, “Claas is happy to confirm that the Torion wheel loaders for agricultural use have a well-tested and best-proven basement from one of the most powerful and most reliable wheel loader ranges with a global footprint.

“The adaptation of such premium wheel loader models

to agriculture was made by Claas and Liebherr product managers with long-term experience in agriculture and in material handling.

“One example unique to the Claas Torion is the offering of the ‘agricultural kinematics’ loader end in the largest models in the range, the 1812 and 1914.

“This combines the best of both a parallel and Z-bar linkage loader end. With the parallel linkage you get higher torque forces in the upper lift range and a true parallel lift range. From the Z-bar linkage side of the design you get incredible tear-out force with your front attachment,” he says. **ivT**

On the Web

Watch a video Claas Torions in action at www.ivTinternational.com/torion

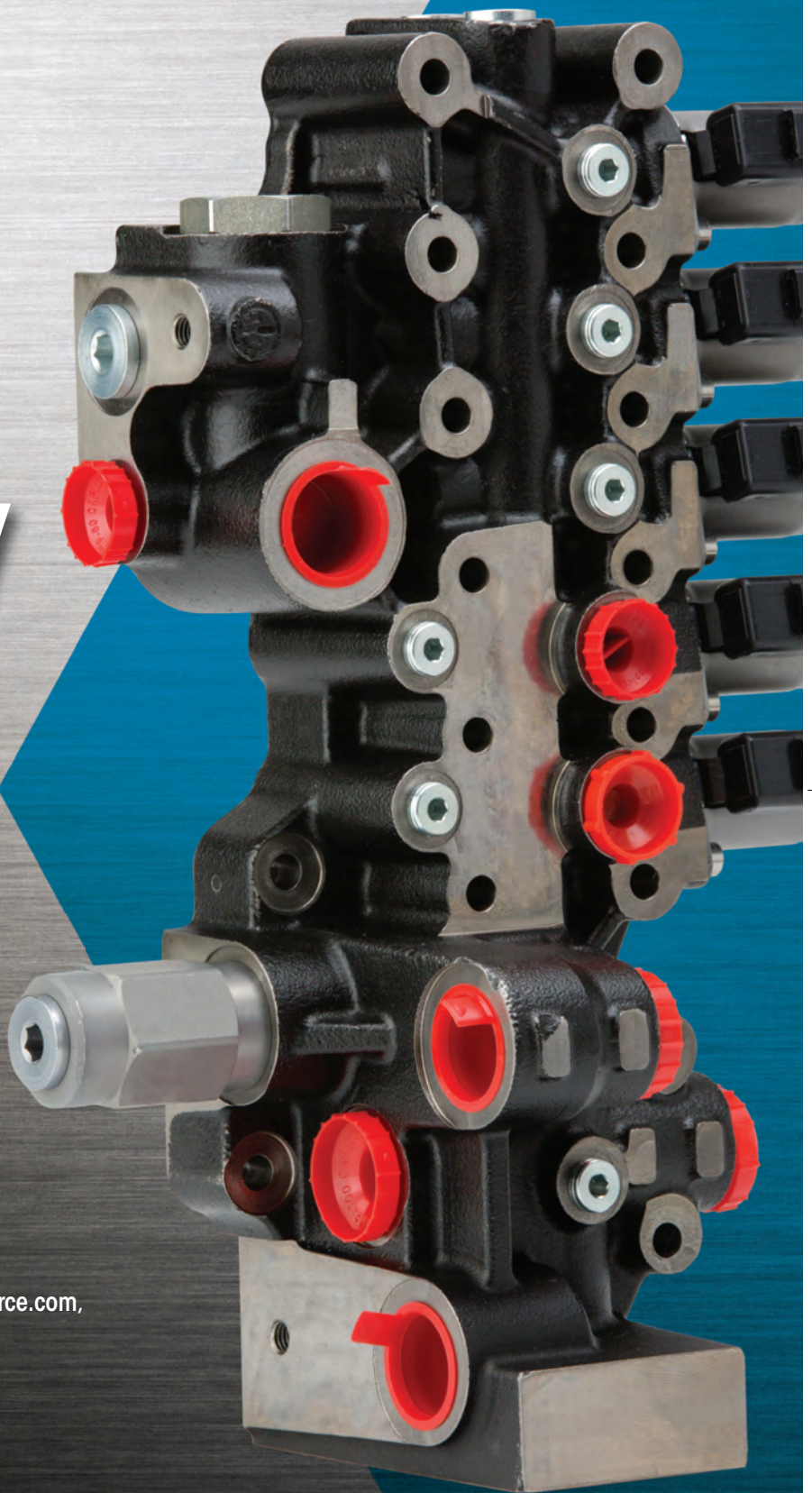
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Head turners

AHEAD OF INTERMAT 2018, iVT HAND-PICKS SIX OF THE VEHICLE DEBUTS LIKELY TO BE CAUSING A STIR AT THE SHOW AND FIVE OTHER MUST-SEE HIGHLIGHTS





April 23-28, 2018
Paris-Nord
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6%
lower fuel
consumption than
its predecessor

LIEBHERR TL36-7

Production of Liebherr's new range of telescopic handlers only kicked off in January this year, so privileged Intermat visitors will be the first to see the new vehicles in the flesh. A total of eight models will eventually complete the line-up – including a top-of-the-range version – but the TL36-7 (pictured) is among the first five being launched and on display at the Paris show. Weighing 3.6 metric tons (4 US tons), the vehicle will have a lifting height of 7m (23ft) and powered by a Stage IV/Tier 4 Final-compliant, 3.6-liter diesel engine with a power output of either 74kW for the 3.6 metric ton vehicle or 100kW for the 4.1 metric ton vehicle.

KOMATSU PC228USLC-11

Komatsu's new short tail excavator, the PC228USLC-11, will be at Intermat this year. The machine offers 21% improved lifting performance while consuming 6% less fuel than the outgoing model. Powered by an in-house built SAA6F107E-3, Stage IV engine, the vehicle has 165hp of power available at 2,000rpm and the integrated selective catalytic reduction system reduces NO_x emissions. An advanced electronic control system is able to manage airflow rate, fuel injection, combustion parameters and aftertreatment functions. A 7in TFT-LCD widescreen color monitor displays information in 26 languages to make life easier for operators, and a new auto-idle shutdown helps reduce fuel consumption.

INTERMAT PREVIEW

6,000kg
load capacity

AUSA D600 AHG

Visitors to Intermat this year will be able to see Ausa's new dumper in the flesh for the first time. The completely overhauled D600AHG now has telematics as well as start/stop functionality and a number of improved safety parts. The 2,210mm-wide vehicle offers a variety of driving modes for efficient fuel consumption. It also has a power output of 55kW and a load capacity of 6,000kg.

PURPOSEFULLY COMPACT

Hydrokit designs, sells and delivers, in the shortest possible lead times, customer and machine-specific hydraulic and electrohydraulic solutions to improve performance, security and comfort of mobile and static machinery.

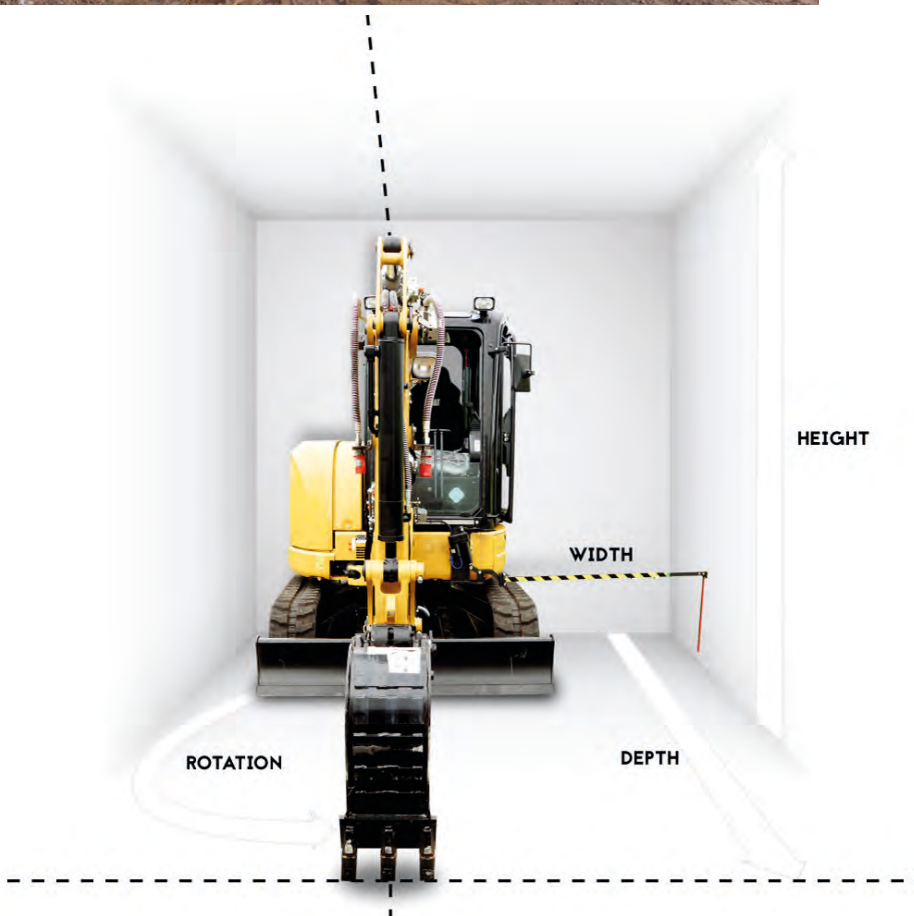
For Intermat, Hydrokit introduces its latest innovation for more efficient work on height/width/depth-limited construction sites while giving operators greater protection. With the movement limitation kit, you can 'put your movements in a box'. The control box allows in-cab adjustment of the extreme positions of boom and arm in height, rotation, depth and width, calculated from the information provided by the sensors installed on the machine.

On the stand, you will get an overall picture of what Hydrokit and its subsidiary Soerma TP are capable of. Soerma TP will present its new compact motor-grader, Easy Grader, for which Hydrokit developed the hydraulics. Its compact dimensions allow grading work in the narrowest sites such as cycle paths, footpaths and building platforms.

Hall 4E Stand 062

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SAFETY CONTROLLERS

In recent years, functional safety has been the trend that has permanently changed the way control systems for mobile working machines are developed. The introduction of the EU Machinery Directive 2006/42/EC set new requirements that machine manufacturers must comply with. Further, new revisions of C-type standards have been published to align application-specific requirements with the Machinery Directive and state-of-the-art technology.

High availability, scalability and diagnostic coverage of the working machine are essential objectives that can be achieved using programmable electronics. A certified safety PLC provides a solid foundation to implement software-based safety functions. However, the entire software ecosystem must support an OEM's technical requirements and business objectives, such as strict time-to-market needs. Since development of safety-related software is expensive and time-consuming, developers often prefer to use pre-certified software components to build an application. This makes it possible to release development resources to focus on core functionality of the machine while minimizing the effort needed to develop new safety-related software.

Therefore the availability of safety-related application libraries and an efficient toolchain to setup system configuration and develop safety-related applications, as well as a safety programmable logic controller (PLC), are key factors for a successful project. **Epec's** objective is to provide machine manufacturers with a complete solution to achieve the shortest time to market.

Hall 5A Stand B075

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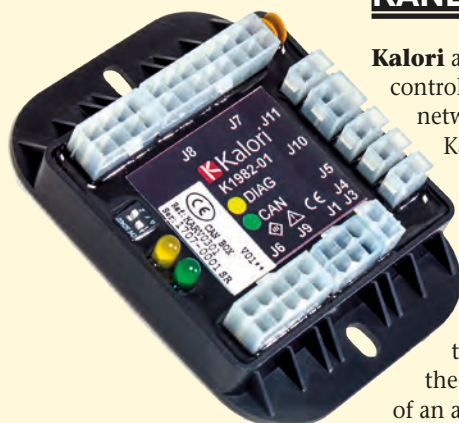
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MECALAC E12

The Mecalac E12 is arguably the pièce de résistance. Winner of the Interimat innovation award, the fully electric excavator is ideal for urban building sites, emitting no harmful emissions while boasting 146kWh capacity and an eight-hour range. For more information and a six-page case study of the vehicle, turn to page 28.

KANBOX FOR HVAC



Kalori air-conditioning systems may be controlled by a CAN-based (controller area network) communications system. The Kanbox is capable of communicating over CANopen and J1939 type networks.

With the Kanbox, manufacturers may now control all those commands relating to the running of the air-conditioning or heating system. These controls may be activated via the vehicle's own interface, meaning the manufacturer may save on the cost of an additional interface panel. It can also be controlled via some of the command modules in the Kalori catalog, like the all-new PCK3.

The Kanbox by Kalori can control the HVAC system, potentially the pressurization system, up to four actuators and the compressor,

the various temperature sensors and a number of additional peripherals. The Kanbox operates under a supply of 9-36V. It is fitted with minifit type connectors and is protected against polarity inversions and over voltages. The casing is classed as IP66. It also meets the requirements laid down in REACH (1907/2006) and RoHS (2011/65/EU).

The change to CAN management systems is a natural evolution in the world of machinery manufacturers. The investment involved is, in the main, paid for by the savings made in the overall cost of control systems, and, in addition, it provides a range of additional data (diagnostics, state of connections, etc).

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RELIABLE COUPLINGS

Stucchi SpA, one of the leading companies for quick couplings and always attentive to developing products for multiple needs, offers a very wide range of multicouplings that are adaptable to the most varied applications.

Among them is the DP2, which is the most compact model of the range, containing two couplings available in the sizes $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ for a maximum operating pressure of 350 bar and flow rates up to 150 l/min.

The DP2 model finds its ideal use in operating machines where it is important to reduce the overall dimensions to a minimum, such as on the arm of mini and midi excavators where the minimum protrusion from the excavation arm is required.

DP2 multicouplings are equipped with FAP-ZN flat-face couplings that allow the connection of the hydraulic lines with residual pressure with a minimum of effort and a high degree of safety.

Their use is very simple and intuitive. After connecting, a locking device is activated to ensure that the system is properly connected and can't be disconnected accidentally. The special fixing system, consisting of a locking nut and an anti-unscrew ring, makes the DP2 multicoupling suitable for impulse pressure conditions and allows for simple assembly and maintenance.

Hall 5B Stand G014



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7m

maximum lift
height



BOBCAT E27Z

A new generation of Bobcat compact excavators is arriving just in time for Intermat with details of the 2-3 metric ton models being released prior to the show – the E27z being one of them. Offering high levels of stability, the machine complies with weight limits to ensure easy trailering. A big focus has been given to operator comfort, with more ergonomic controls, 360° view and comfortable seating.





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1,100mm
superior rotor
diameter

KEESTRACK R3/R3E

A redesigned track-mounted impact crusher unit from Kestack is set to be unveiled at Intermat 2018. The R3/R3e includes all the benefits of the diesel electric hybrid concept, the Destroyer 1011, that the company presented 12 months ago. Built to be a mobile solution for a broad range of applications, the machine has fast loading and setup times, while the wide-opening doors and flaps provide good accessibility to all of its operational components. It will be available as a diesel-hydraulic or fully hybrid version, equipped with a diesel/electric drive and electric plug-in power supply. Both versions have a high-performance impact crusher, offering crushing efficiency of up to 250 metric tons an hour thanks to a heavy-duty 920mm rotor.

SMALL-SIZED, HIGH-POWERED ENGINES

Motorenfabrik Hatz introduces its new liquid-cooled three-cylinder diesel 3H50T, a fan-to-flywheel version of the engine, as well as an open power unit (OPU) variant.

Extending the product range of H-series engines, which were specially developed by Hatz for current and future requirements on power, performance, reliability and international exhaust gas standards, the Hatz 3H50T has a displacement of only 1.5 liters and a maximum torque of 130Nm, giving the engine the highest torque in its class in the market today. The 3H50T does not have an intercooler or diesel particulate filter and this contributes to its compact size.

Even with its low weight and small installation dimensions, the performance data of the engine

exceeds many older engines in the 19-37kW class.

The 3H50T satisfies EU Stage V as well as EPA Tier IV final requirements. It is therefore an ideal choice for upgrading existing machines in the 19-37kW class to EU Stage V.

The Hatz 3H50T OPU is a plug-and-play solution that is an ideal choice, particularly for manufacturers of compact machines that need engines fully ready for installation.

With its integrated and optimal design of the radiator, hoses and cabling as well as the electronics, the Hatz OPU concept greatly simplifies design and installation.

Hall 5A Stand E002

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VEP-HD SERIES



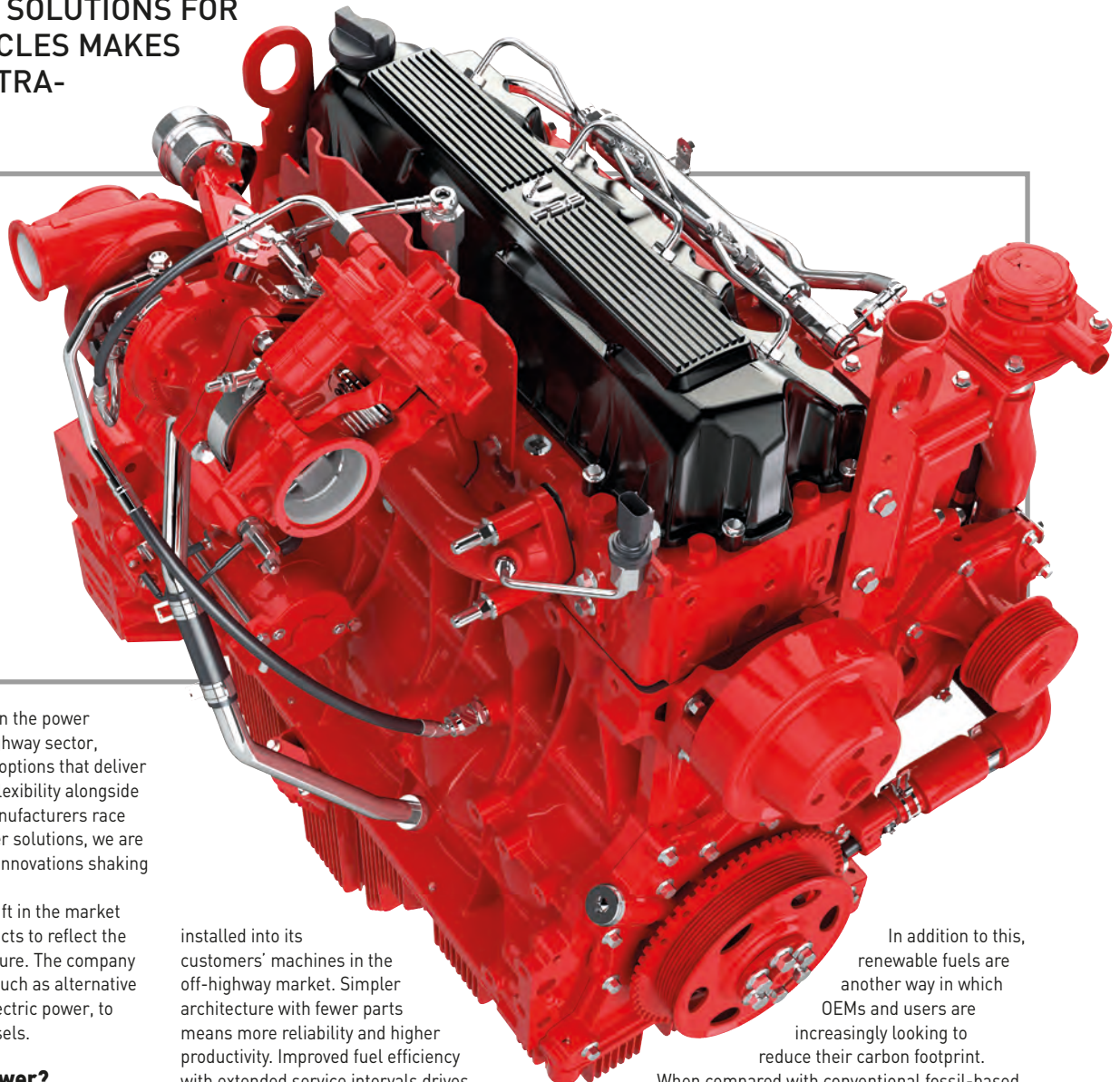
- ◆ Connection/Disconnection with both side under pressure is allowed.
- ◆ Internal pressure release valve system allows an easy connection with high internal residual pressure.
- ◆ High resistance to impulse pressure.
- ◆ Flat face is easy to clean, reducing contamination in the hydraulic circuit.
- ◆ Minimal fluid spillage during disconnection.
- ◆ Minimal air inclusion during connection.
- ◆ Internal valve design creates minimal pressure drop.
- ◆ Modular design allows flexibility with a wide range of configurations (Flange code 62 included).
- ◆ Safe and simple to use.

a constant flow of solutions

Powering the future of industrial vehicles

A RANGE OF EXISTING AND UPCOMING LOW EMISSION POWER SOLUTIONS FOR INDUSTRIAL VEHICLES MAKES THE CASE FOR ULTRA-CLEAN DIESEL

The new F3.8 delivers machine capability and uptime while reducing the total cost of ownership



It is an exciting time to be in the power industry. Across the off-highway sector, customers are demanding power options that deliver greater efficiency, reliability and flexibility alongside reduced emissions. As engine manufacturers race to meet the demand for new power solutions, we are seeing new concept systems and innovations shaking up the industry.

Cummins is addressing this shift in the market by expanding its portfolio of products to reflect the alternative power needs of the future. The company is developing a range of options, such as alternative fuels, range extenders and full electric power, to complement its suite of clean diesels.

A future without diesel power?

With the development of electric drivelines and the increased provision of alternative fuels, will we see the end of diesel? This is unlikely. To meet environmental guidelines, engine manufacturers have adapted their engine technology to meet the most recent emission standards, resulting in diesel engines that are cleaner, simpler and more efficient.

This philosophy is epitomized in Cummins's new Stage V engines – 100 of which have already been

installed into its customers' machines in the off-highway market. Simpler architecture with fewer parts means more reliability and higher productivity. Improved fuel efficiency with extended service intervals drives lower running costs. The engines are more compact with less weight, taking less time to cool, less installation complexity and lower installation costs for manufacturers.

Cummins Stage V is the power solution for many installations, including cranes, excavators, wheeled loaders, forklift trucks, air compressors, dump trucks, drilling equipment and several other off-highway vehicles.

In addition to this, renewable fuels are another way in which OEMs and users are increasingly looking to reduce their carbon footprint.

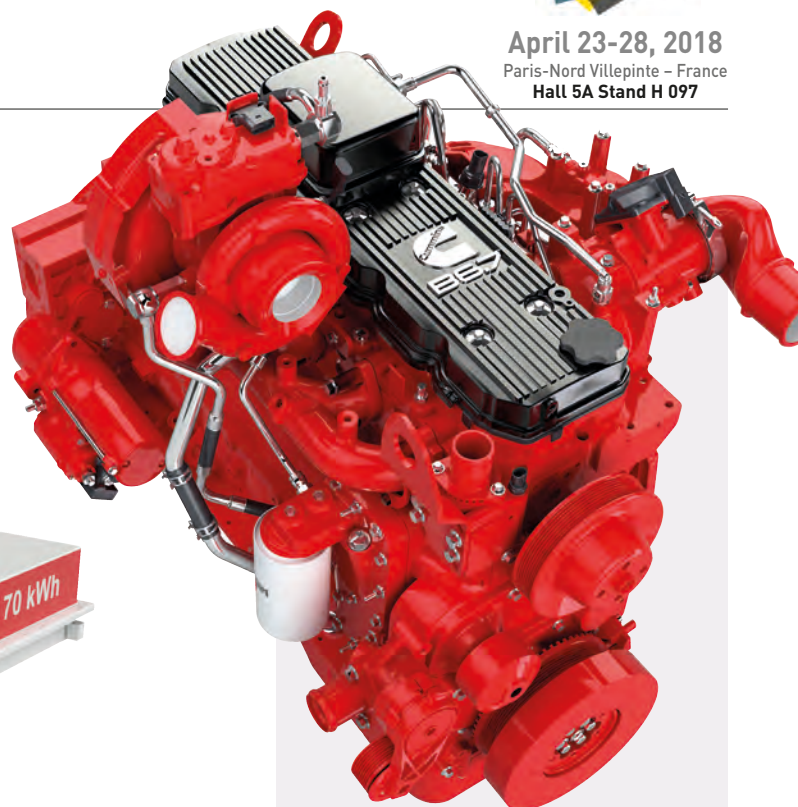
When compared with conventional fossil-based diesel, paraffinic diesel fuels offer the potential to reduce greenhouse gas emissions by 40% to 90% over the total life of the vehicle. The fuel is also very flexible, as it can be easily blended with standard diesel at varying percentages (including winter-grade fuels) and it has the same stability and cold properties as conventional diesel. Ultimately, the fuel can be stored and used in the same ways.



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RIGHT: The B6.7 is the most popular diesel engine ever built by Cummins

BELOW: The standard-sized Cummins battery enclosure provides a 70kWh storage capability with up to eight enclosure units (560kWh)



When used in compatible engines, such as the Cummins B6.7 and L9 engines, the fuel enables operators to minimize their emissions-based footprints, thereby extending the life of the diesel.

Alternative power solutions

Alongside these leaps in cleaner diesel engine technology, alternative power solutions are coming to the fore. To reflect these shifts in the market, Cummins has moved from being a diesel expert to being a powertrain expert. It now offers customers a range of solutions, from ultra-clean diesel to natural gas, renewables and even electrification.

Electric power has been championed by the automotive industry, governments and the media. However, the reality is that the benefits of it vary from market to market. One of the biggest challenges is aligning the battery capacity/size with the duty cycle of the machine and the charging capability. The more capacity needed between charges, the larger the battery has to be. Just like an engine, the larger the battery, the higher the cost. In addition, the battery needs to be packaged in the appropriate position in the equipment and its weight impact has to be considered.

Despite this, electric drivelines are ideal for operators where even lower emissions are required to improve air quality, particularly in urban and portside locations. To cater for this emerging market, Cummins has been building experience in a range of electrification concepts. These include parallel hybrids, range extenders/plug-in hybrids and full electric, to provide customers with the best solution for their on-highway and off-highway machines. Cummins' range extended electric vehicle driveline (REEV) is one such electric power solution, with the working concept being unveiled at Intermat 2018.

The Cummins REEV is designed to replace a standard driveline using larger Cummins or competitor engines up to nine liters in capacity. The system is essentially a hybrid, with battery power combined with a compact engine generator that utilizes a four-cylinder Stage V F3.8 engine. The system uses a high-efficiency traction motor that provides a continuous torque of 1,850Nm, eliminating the need for gear shifting and dramatically reducing powertrain noise. Crucially, this system has been designed to deliver an instant peak torque boost of 3,400Nm when the application reaches difficult working conditions.

Natural gas engines also offer ultra-low emissions, low noise, excellent torque and high fuel efficiency. The truck and bus market has seen successful natural gas installations, and Cummins has developed significant experience in this area. Right now, however, the level of investment needed for off-highway adoption of natural gas engines is proving a challenge for manufacturers. Should OEMs sufficiently invest in the technology, Cummins is ready to work with them.

Conclusion

Power solutions for off-highway applications are not one size fits all. Users require a range of solutions to meet variations in types of industrial equipment, their differing load factors and duty cycles. With a range of power solutions to choose from, OEMs obtain greater flexibility and reduced emissions. While Cummins ventures into the battery and electric driveline technology world, ultra-clean diesel engines look likely to remain the go-to power source. **IVT**

Hugh Foden is executive director of off-highway business at Cummins



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Data-driven precision

AN INTELLIGENT LOAD MONITORING SYSTEM IS ENHANCING SAFETY AND IMPROVING ACCURACY FOR INDUSTRIAL VEHICLES

Initially targeted for telehandlers and other lifting applications, Dana's Spicer Smart Suite intelligent load monitoring system (ILMS) uses patented and proprietary mechanical, electronic, machine-learning and software technologies to evaluate vehicle stability in every dynamic condition and to improve operator safety.

Beyond preventing vehicle tip-over incidents, ILMS also monitors productivity by estimating lifted loads and driveline operative conditions, including operator misuse. This helps to reduce the risk of vehicle breakdowns, improve productivity and precision, and enhance the long-term durability of powertrain systems.

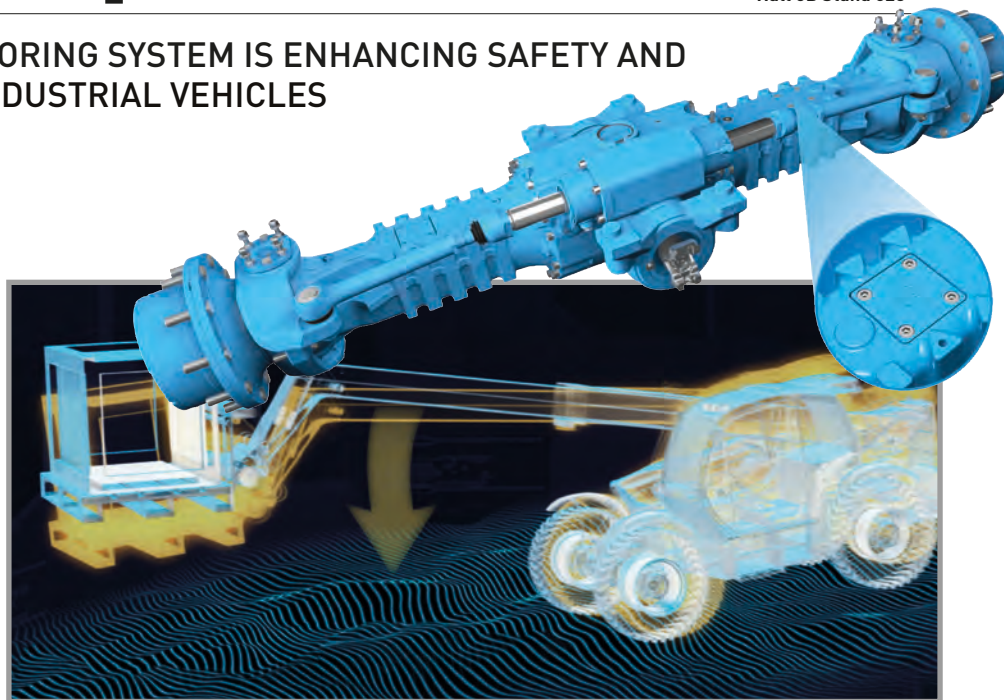
The Spicer Smart Suite ILMS physically integrates with mechanical axles typically used on working machinery, and measures and collects real-time data through the embedded sensors. Proprietary software uses artificial intelligence and machine learning algorithms to elaborate the data and provide insightful information about vehicle stability. It can even anticipate the risk of a vehicle tip over before it occurs.

This information is distributed on the vehicle network through the CANbus, while other connected vehicle systems can use it to take specific actions to prevent operator incidents, such as limiting vehicle speed or operating/facilitating the extension of the boom.

Forward-thinking technology

The Spicer Smart Suite ILMS represents a significant advancement in technology compared with other marketed systems, offering insights far beyond the requirements of the European Union's EN15000 regulation. The EN15000 requires vehicle stability monitoring only when the vehicle is stationary, but the Spicer Smart Suite ILMS provides reliable monitoring in all vehicle working conditions, including steering, climbing, loading, and other dynamic conditions, potentially creating a new standard and level of expectation for this capability.

Beyond vehicle stability, the proprietary algorithms of the Spicer Smart Suite ILMS can provide other insightful information from the same embedded sensors. For instance, lifted load weight



The Spicer Smart Suite ILMS uses patented and proprietary data-collecting technologies across the vehicle to prevent tip-over incidents, estimate static loads and supply intelligent calibration management

can be estimated and used to measure vehicle productivity. Thanks to the deep integration into the axle structure, Spicer Smart Suite ILMS can also monitor driveline operating conditions. For example, it can detect when the axle has been subjected to external shocks or operator misuse. This information can be used for predictive vehicle maintenance, reducing vehicle downtime and optimizing the efficiency of vehicle usage.

By recognizing, learning, and anticipating vehicle and operator behavior, this system can significantly reduce the need for vehicle calibration and enables operational parameters to be customized by taking into account specific machine characteristics, engineering tolerances and operator tendencies.

Traditional load monitoring technology collects limited measurements from a single remote-mounted or retrofitted load cell on the rear axle. These cells do not perform reliably in dynamic conditions and offer less than optimal integration with mechanical and electrical systems. The Spicer Smart Suite ILMS technology enhances the intelligence drawn from drivetrain components through an integrated solution that includes: data collection devices, such as load cells and other sensors, that capture data from key drivetrain operating processes; onboard computing capabilities

that consolidate, manage, and analyze data; and compatibility with common vehicle communication protocols and telematics systems.

Additional expertise

Dana is also testing a range of premium functions, including vehicle usage records, which document load cell sensor data, vibration and shock absorption, and other historical information. This data collection can benefit the vehicle rental market in terms of liability, maintenance, and cost considerations. In addition, mechatronic systems that will leverage intelligence from the drivetrain to perform key functions and operations independent of operator intervention are under development.

ILMS is the first technology from Dana's Spicer Smart Suite portfolio that leverages the Internet of Things and Industry 4.0 trends to support the company's evolution into the age of smart equipment. At Intermat, taking place in Paris from April 23-28, Dana will showcase its wide range of advanced drive and motion systems for the construction industry. **IVT**

Giulio Ornella is head of fluid power, electronics and advanced engineering for off-highway drive and motion technologies at Dana Incorporated



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April 23-28, 2018
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New engine technologies

TWO EXPERTS IN THEIR OWN FIELDS HAVE JOINED FORCES TO SET NEW BENCHMARKS IN POWER, PERFORMANCE AND EFFICIENCY

▶ In 1992, Rubble Master introduced its first crusher for the recycling of asphalt, concrete debris and materials left over from brick production. Today the OEM continues to offer an excellent alternative to heavier crushers for big applications, including mining, with its compact yet powerful RM 100GO! and RM 120GO! impact crushers fitted with John Deere Tier 3/Stage IIIA or Final Tier 4/Stage IV PowerTech E 9.0L engines.

A crusher requires a good engine response to maintain a constant speed under highly fluctuating loads. Thanks to their packaging and leveraging of emissions technologies for a wide variety of applications and emissions needs, John Deere engines are ideal partners for Rubble Master. Both of the John Deere engines used in the crusher units offer customers the reliable emissions-compliant power needed in tough applications.

Optimizing aftertreatment packaging and reducing its weight are important factors for many applications. From the technology side, John Deere has been working to leverage new catalyst technologies and emissions control calibrations to enable the downsizing of aftertreatment systems. The company's latest aftertreatment solutions deliver greater package flexibility and offer easier installation thanks to a reduction in size and weight.

Businesses such as Rubble Master are already experiencing the benefits of reduced size and weight in current Final Tier 4/Stage IV John Deere engine models. The RM 120GO! track-mounted impact crusher from Rubble Master can reduce up to 350 tons of demolition waste in an hour, despite weighing just 35 tons. Furthermore, impact plates enable the operator to switch between recycling and natural stone applications quickly, increasing productivity and flexibility.

New technologies in action

The RM 100GO! track-mounted impact crusher can handle up to 250 tons per hour, crushing construction and demolition waste, concrete, asphalt, glass, coal, natural rock and even the reinforced concrete used in the production of high-quality construction materials.

Capable of recycling and processing materials on site, Rubble Master's John Deere-powered



RUBBLE MASTER

With the RM 100GO! and RM 120GO!, customers can opt for either a Tier 3/Stage III A or Final Tier 4/Stage IV PowerTech E 9.0L engine

impact crushers bring a quick return to small- and medium-sized recycling contractors.

With years of expertise in application integration, John Deere's wide product offering gives OEMs more options for matching power and performance to exact machine requirements. As both an engine and vehicle manufacturer, the company can leverage its experience in the field to optimize its products on a systems level rather than in terms of single components – leading to enhanced performance, durability and packaging.

John Deere Power Systems pioneered advanced emission technologies for Tier 3/Stage III A, and

based its Final Tier 4/Stage IV on these proven technologies. The company is ready to lead customers through the upcoming Stage V transition, thanks to its considerable experience in diesel particulate filters. In fact, John Deere has more than 900 million hours of experience in using its own emissions technology in a variety of applications.

John Deere Power Systems manufactures and markets 30kW to 448kW (40hp to 600hp) industrial diesel engines and 56kW to 559kW (75hp to 750hp) marine diesel engines for use in a variety of off-highway applications. The company will highlight its latest innovations at Intermat Paris, on Stand D021 in Hall 5A. **IVT**

Patrick Thil is manager OEM engine sales for European, Africa and Middle East (EAME), Asia and Australia, John Deere Power Systems



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Preparing for Stage V

STRICTER OFF-HIGHWAY EMISSIONS REGULATIONS WILL COME INTO FORCE NEXT YEAR AND EXTENSIVE TESTING IS SHOWING OEMs WHICH NEW ENGINES WILL BE BEST FOR THEIR VEHICLES

▶ In 2019, the European Stage V emissions standard for off-highway engines will come into effect. Scania Engines showcased its solutions in April 2016, and since then, field trials have been run on the latest equipment to validate engine hardware, software and calibration. Construction equipment manufacturer Doosan Infracore Norway, for example, has been testing a 9-liter, five-cylinder Scania engine for the past five months and a 13-liter, six-cylinder engine for the past two.

Establishing the most effective concept

Development of Scania Engines' Stage V solutions has been ongoing for the past three years, with many concepts having been evaluated using computer simulation and testing.

The concepts have been assessed, according to five main criteria: handling of exhaust emissions, performance and response, fuel efficiency, cost, and engine lifetime.

Van Davenport, Scania Engines' lead calibrator for Stage V engine calibration, says, "We looked for worst-case scenarios for different applications, including excavators, stone crushers, harvesters, compressors and front loaders, and came up with a solution that would work for all areas."

As a result, Scania Engines caters to each application's specific requirements, be it engine response or fuel efficiency.

"We have learned a great deal from our Stage IV- and Tier 4 Final-compliant products, having looked for improvement areas," Davenport says. "For Stage V we focused specifically on thermal management in the aftertreatment system, transient response and fuel consumption."

Thermal management entails keeping the temperature at an optimal level in the aftertreatment system, regardless of the surrounding and operating conditions, while transient response is about how well and how fast the engine builds torque.

The key to success has been the integration of the throttle handling with the variable-geometry turbo (VGT) control strategies. The VGT also works as an exhaust brake.

Mark Scott, group manager for the calibration and performance team at Scania Engines, says, "Testing in cell and test rigs has shown that the strategies



Development of a Stage V solution began three years ago

RIGHT: Doosan Infracore Norway is testing two Stage V engines

employed – including the use of both hardware and software – to ensure fast, transient response have been very successful. It is possible for us to test consistently, even at high altitude."

True to Scania Engines' commitment to continuous improvement, parts of the job had already been done, the first generation of a similar system having been introduced in 2011, when the integrated Euro 6 exhaust gas aftertreatment system for trucks and buses was launched.

Fitting a wider range of applications

The development team for the Stage V platform has further refined the components and designed a distributed system to make the platform fit a wider range of applications.

Another very successful factor has been the use of Scania's own engine management system,



which gives to engineers complete control of an engine's behavior.

"We already work closely with original equipment manufacturers on the Tier 4 Final products," Davenport says. "We will continue to focus on and improve our cooperation."

Scania Engines' Stage V-compliant industrial engines range from the 9-liter five-cylinder and 13-liter six-cylinder in-line engines to the 16-liter V8 engine, covering output from 202kW to 566kW. **IVT**

Anders Nordner is technical writer at Scania



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A slow and steady drive

A NEW HYDRAULIC HYBRID VEHICLE DRIVE SYSTEM HAS BEEN DESIGNED FOR SLOW, CONTROLLED USE

By strengthening its range of full systems, Poclain Hydraulics is bringing more value to its customers. The company is leveraging its efforts through a strategic restructuring that will enable it to focus on system solutions.

Poclain Hydraulics' CreepDrive range, with a new dedicated motor and pumps, all from its high-performance range of products, is an example of the company's strategic focus. The expanded CreepDrive range will address the needs of a wider range of applications. The range will be introduced at Intermat Paris in April 2018, and available to buy in mid-2018.

Constant hydraulic control

A hybrid mechanical hydraulic transmission from Poclain Hydraulics, the CreepDrive system enables vehicles to work at very low constant speeds regardless of the engine speed, thereby giving auxiliary systems the power they need to work effectively. When the system is disengaged, the vehicle is able to drive at normal on-road speeds with no mechanical transmission efficiency losses.

The complete CreepDrive range contains two motors, a variety of PW pumps and plug-and-play control kit, including the CANbus communication.

The new motor has two speeds over a wide range of displacements. Other new features include a reinforced shift cylinder and shaft seals as well as an extremely robust design. Compared with the existing motor, this new motor has double the speed and triple the torque. Despite this significant performance improvement, the motor length has only increased by 50mm (2in) and is lighter than comparable products to meet the needs and requirements of third parties who are installing the system.

Integration into a wider range of vehicle applications, including medium commercial vehicles – where constant speed and accurate positioning are essential – is now easier. CreepDrive removes added stress on braking and clutching that occurs when vehicles are working at low speeds, as well as the additional maintenance required to keep those systems working properly. Replacing friction braking with hydrostatic braking acting as an integral decelerator reduces the need to feather the brakes.



ABOVE: The CreepDrive system is designed for vehicles that operate at very low speeds

BELOW: Shifting transmissions can be achieved simply by activating a switch



This enables greater precision and less opportunity for error, helping operators increase safety and productivity.

In addition, radial technology eliminates the need for an additional reduction stage and offers some of the highest efficiencies on the market. This reduces fuel consumption and noise, which makes the system more suitable for urban applications. Additional applications include: road maintenance and marking/stripping, bridge inspections, rail track maintenance,

airports, road sweepers, mulching/chipping, snow cutting, suction dredging, and slinging.

Operational tips

The vehicle brake can be applied to enable hydrostatic ground drive and the mechanical transmission can be set to neutral while the engine power take-off (PTO) is engaged to drive the pump that supplies flow to the system's hydrostatic motor. A switch located in the cab engages a pneumatically controlled mechanical clutch that disengages the mechanical transmission and engages the hydrostatic transmission.

The driver can set the engine speed to the desired working RPM and, after releasing the brake, can move the joystick in the direction required.

Consistent low working speeds of 0-9mph (0-14km/h) are achievable in forward and reverse directions. When traveling at on-road speeds, the clutch is disengaged, thereby allowing the mechanical transmission to continue operating.

The full CreepDrive system will be on display at the Poclain Hydraulics Intermat booth in Hall 5A – Stand F046. **IVT**

Bruno Lacheteau, director of trucks and bus markets, Poclain Hydraulics



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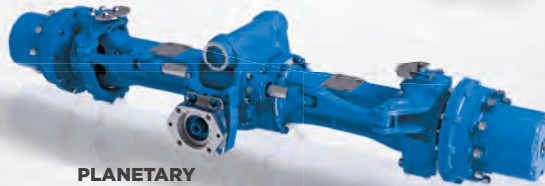
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Next-generation drives

A WIDE RANGE OF DRIVE SOLUTIONS FOR SELF-PROPELLED MACHINES AND OFF-ROAD APPLICATIONS

▶ NAF AG is a global leader for bogie axles, with a payload range of 10-50 metric tons and optional patented solutions, such as the company's Permanent Bogie Balancing System for rough terrain and the harshest conditions.

The NAF product portfolio features steering, rigid and bogie axles, as well as gearboxes for applications in forestry, agriculture, mining, material handling, construction, airport and off-road heavy-duty transport. With NAF's modular system, it is possible to combine technical features, such as a planetary gear drive with a patented turbo brake, as well as a multiple disc differential lock for perfect traction control.

Industrial solutions

In the construction sector, NAF specializes in drive solutions for articulated dump trucks of up to 45 metric tons and motor graders with up to 350hp.

Due to its long-term experience with bogie axles and wide range of suitable components, NAF is open to customized solutions.

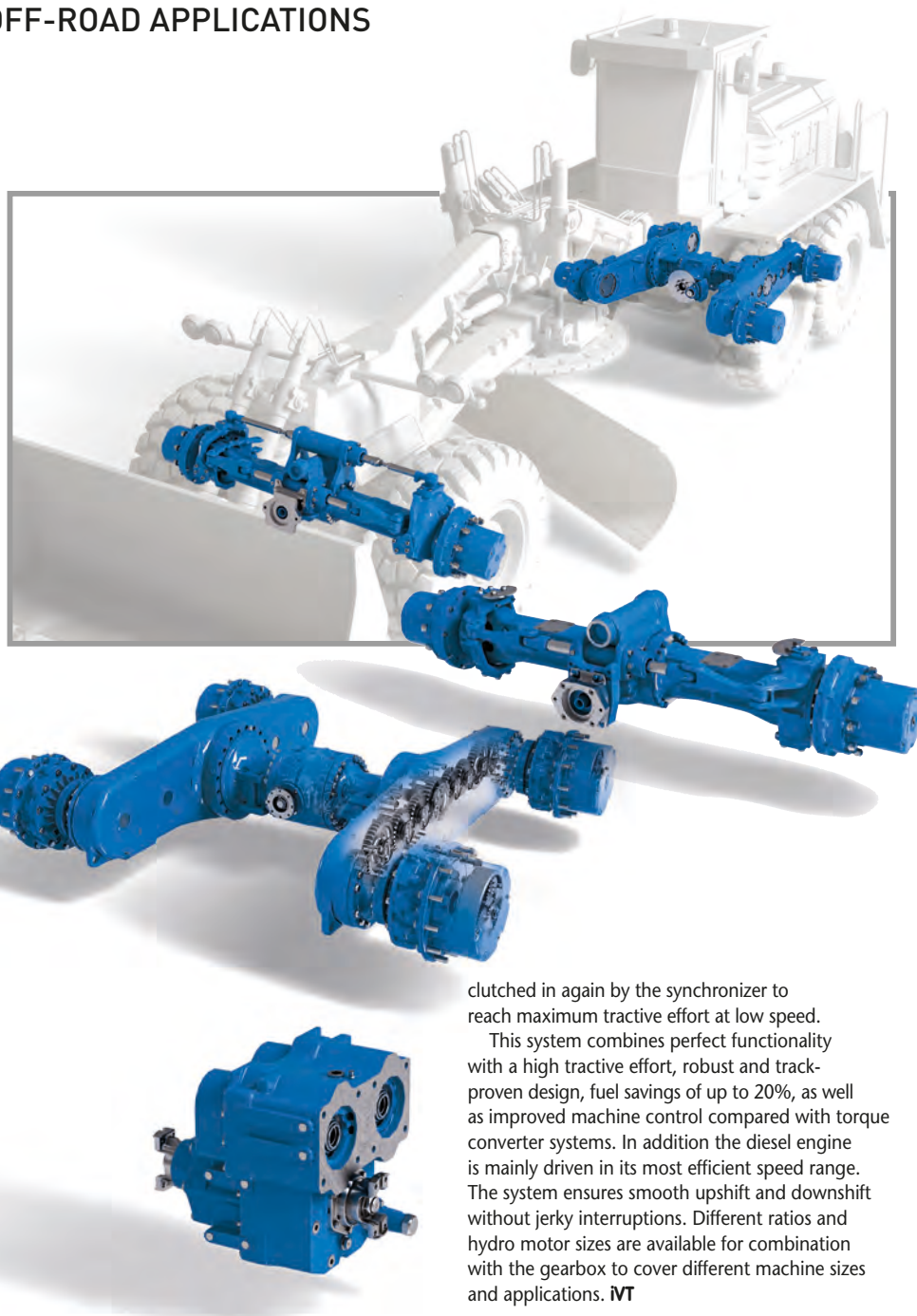
NAF's modular designs allow it to offer the cost advantages of a standardized product line, but with a high degree of flexibility and faster project completions.

NAF focuses on strong and reliable drive solutions for heavy motor graders. For applications with a top-to-rear bogie axle, NAF supplies an all-wheel drive with a directly driven front axle, including a side tilting and two-motor gearbox for a full hydrostatic system.

Multifunction gearbox

The patented DualSync gearbox can provide hydrostatic continuously variable transmission (CVT) functionality for the entire speed range. The configuration allows two operating modes: simultaneous use of both motors for high tractive effort and perfect control at low speed; and fuel saving, single-motor mode for high driving speeds.

Both motors that drive NAF's mechanical DualSync gearbox are connected with different ratios. When the second motor (with the higher ratio) reaches its speed limit, it is declutched by a synchronizer ring and the first motor takes over up to maximum speed. When reducing speed, the second motor is smoothly



clutched in again by the synchronizer to reach maximum tractive effort at low speed.

This system combines perfect functionality with a high tractive effort, robust and track-proven design, fuel savings of up to 20%, as well as improved machine control compared with torque converter systems. In addition the diesel engine is mainly driven in its most efficient speed range. The system ensures smooth upshift and downshift without jerky interruptions. Different ratios and hydro motor sizes are available for combination with the gearbox to cover different machine sizes and applications. **IVT**

Peter Illig is head of sales and marketing at NAF Neunkirchener Achsenfabrik, Germany

ABOVE: Possible drive solutions for motor graders



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UNITEDSEATS

Off road seating manufacturer



FROM UNITEDSEATS EXPERIENCE

A NEW SEATING COMFORT with the new MGV35 series of seats for forklifts, compact industrial vehicles and construction machinery.

Compact low profile mechanical suspension seat range meets EN.13490 / IT1 / IT2 / ISO 7096 / EM1 TO EM9.

Available in low-back and mid-back with standard and wide seat cushion. Fully folding adjustable backrest. Full options include armrests, back extension, seat switch, seat belt, fabric choice.



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GRASWOLD, HEILIGTAG | P. 2018

Scientific seating

A NEW MODULAR RANGE OF HIGH-PERFORMANCE MECHANICAL SEATS FOR INDUSTRIAL AND CONSTRUCTION VEHICLES IS MAKING MACHINE OPERATION SAFER AND MORE COMFORTABLE

United Seats, based in Zwijndrecht in the Netherlands, is the dedicated, own-brand range from EBLO Seating.

EBLO has more than 35 years' experience in designing, manufacturing and providing machine drivers and operators with ergonomic seating solutions. United Seats supplies to more than 40 OEMs in the construction, agricultural and forklift sectors, as well as the aftermarket.

With such experience, the company understands the need to provide comfortable seating, which in turn leads to greater productivity for equipment operators and, more importantly, a reduced risk of injuries and accidents.

Meeting customer demand

As United Seats has a core group of customers who produce forklifts, wheel loaders, tow tractors, telescopic handlers and other industrial vehicles, it needed to bring in a new generation of low-profile, low-frequency seats to maintain its current portfolio and to serve new customers and sectors.

Design work on the range – initially on the MGV35 model – began two years ago and was followed by product testing.

Adjust for comfort

The MGV35 low-profile suspension seat has an SIP (seat index point) of only 220mm (8.6in), yet features a high-performance mechanical suspension with a 50-155kg (110-342 lb) weight range, and has a vertical range of 80mm (3.1in). These ride characteristics have enabled the MGV35 to meet an array of international standards, including EN13490 and IT1, IT2, and EM1 to EM9. This makes the MGV35 an incredibly versatile compact seating product.

The rotary weight adjuster is smooth and the operator can view the weight gauge while adjusting the seat. Such an easy-to-use weight adjuster lessens the need for the operator to request an air seat option. The mechanical suspension of the MGV35 series is also durable and particularly robust for exposed, 'open cab' vehicle applications. In the long run, it is easier to service than an air seat.



TOP: The MGV35-MGV55 family

RIGHT: The MGV35 model seat cushion offers a high level of comfort

The standard but ergonomically designed MGV35 is stylish, well-suited to modern, new, compact machines and comes in a 460mm (18in) width version that includes a retractable seatbelt. It also comes with a deluxe Delta contact switch, which detects the operator's presence across the whole seat cushion surface – vital because, on some machines, operators sit on the edge or sides of seats while operating implements such as masts and buckets.

Mix-and-match add-ons

As the first model was introduced to supply a major forklift OEM, careful consideration was made to

create a flat cushion that allows for ingress/egress and which helps to prevent premature wearing out of the cushion. The seat and back cushion are easy to replace when restoration is necessary and the backrest recliner is fully retractable with a forward fold-flat feature. To meet users' varying needs, the seat comes with a full range of options such as armrests, back extensions, heated seats and different fabrics. **ivt**

David Hale is US business manager, EBLO Seating, and Evert Mallie is CEO and technical ergonomist, EBLO Seating



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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm Ref: 514

Serving all requirements

ONE COMPANY REMAINS POPULAR AMONG ITS CUSTOMERS THANKS TO ITS CAPABILITY TO PROVIDE STANDARD, AS WELL AS TAILOR-MADE, AIR-CONDITIONING SOLUTIONS

▶ Siroco, an international supplier of thermal solutions, is a brand chosen by its customers because of its in-depth knowledge of technical issues and its ability to resolve them effectively.

"Our customers, who are manufacturers of forklift and handling equipment, need to warm up and cool their cabs with either standard products or specific solutions," says Julien Brochier, sales manager at Siroco. "We have to engineer solutions for vehicles that work in a range of temperatures – from -25°C (-13°F) in a climatic chamber, to 50°C (122°F) outdoors in a moist and dusty environment. Every project is challenging, but that is what keeps us motivated."

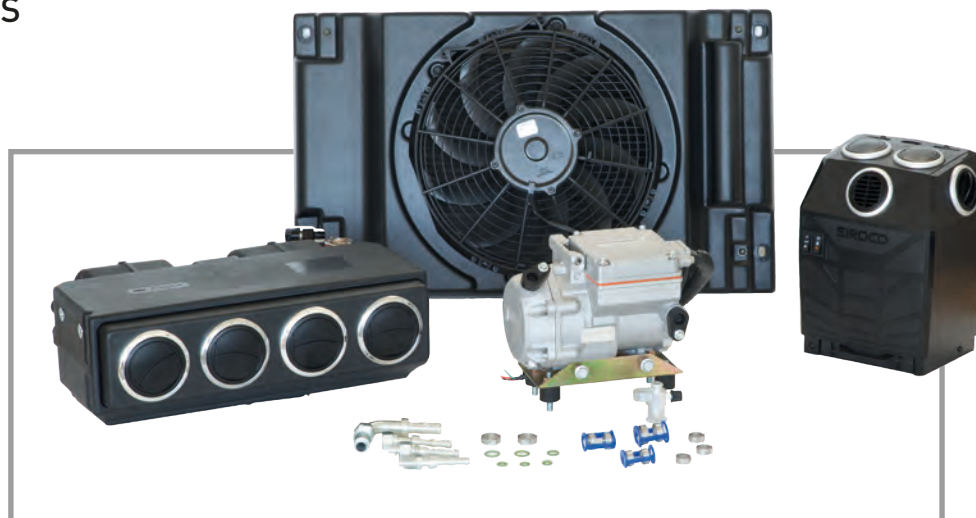
Thermal approach as a whole

"The process for implementing heating and cooling units in forklift cabins is not straightforward, especially for air inlets/outlets and hydraulic connections. Therefore drafting specifications is an important step, especially in regard to the definition of interfaces. On one hand, depending on the range level, Siroco offers thermal solutions that are easy to set up. On the other, it offers systems that can regulate heating capacity or control the speed of electric units.

To meet specifications, Siroco has the advantage of being able to define a thermal approach as a whole. "We not only develop heaters and coolers, but also integrate all functionalities of heating, ventilation and air-conditioning [HVAC] systems, including climatic control, air distribution, defrosting and air filtration," says Brochier. The real challenge is designing a compact and powerful product that is easy to integrate into the cab. It is therefore sometimes difficult to suggest a standard solution, which is why Siroco's specific solutions have become so well established.

20 years of success

"Although we are capitalizing on 20 years of specific developments for lift trucks, we are also putting forward new solutions to our customers," says Brochier. "Siroco can support them in modernizing their cabs." For each project, a specific strategy is adopted and supported by tests in a climatic chamber, using prototypes or by field monitoring.



ABOVE: Siroco's thermal and electric air-conditioning kits for forklifts: the Cierzo condenser, Austral Performa evaporator, E-Sonora electric heater, and electric compressor and fittings

BELOW: The new Sanoa air-conditioning unit is available with two different front panels – with sleeves or with air diffusers

"Depending on specifications, it takes six to 12 months to develop complete thermal solutions," says Brochier. "Our goal is to reduce development times, without rushing. In terms of time, accurate specifications are the key to the success of a project. We use rigorous standard designs and performing components that are already approved and scaled for customer projects."

New off-the-shelf products by Siroco do not offer specific solutions without reliable, effective and cost-saving elements. "As well as a wide range of

standard products, we work with components and subsets designed and approved by our department Siroco Engineering," says Brochier.

Siroco has recently developed an advanced electric control panel called the CP2, intended for use with HVAC systems, for both diesel internal combustion engine (ICE) and electric vehicles.

Another product is Sanoa, a best-in-class air-conditioning unit. The HVAC version offers 610m³/h nominal airflow and a 6.3kW cooling capacity. The evaporative emission control version offers the same nominal airflow but a 7.7kW cooling capacity.

A third product is the compact and powerful TS700 – a new centrifugal blower that offers a performance of 700m³/h. Thanks to its excellent performance/size ratio, it is ideal for cooling a small cabin and includes an air filter.

Using parallel flow technology, the two Cierzo condensers offer 5.6kW or 8kW of dissipated power. Supplied with or without a filter drier, the condensers work well with Siroco's air-conditioning units.

Committed to customer success

"In continuous pursuit of enhanced performance, we ensure our customers' specific needs and high standards are met. We are committed to the success of their projects in thermal comfort," says Brochier. **IVT**



Sylvain Reydellet is managing director at Siroco

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www.ukimediaevents.com/info/ivm **Ref: 515**

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Proportional valves Screw-in cartridges



It is the high power density, the customer-friendly operation, the robustness as well as the ease of maintenance, which characterise the mobile hydraulics. These characteristics are also demanded of the hydraulic components, which are utilised in the applications in the mobile sector.



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Requirements

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- ◆ Compactness
- ◆ High reliability
- ◆ Long service life

Valves with integrated electronics



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BULLETIN BOARD

Uniting the construction equipment world

Faster, a manufacturer of quick-release hydraulic couplings, is hosting a forum dedicated to global construction equipment manufacturers.

The event will focus on showing what a difference the quick-release coupling can make to a machine, and will provide a road map to further innovation of the hydraulic components. The star guest of the event will be race engineer and F1 expert Giancarlo Bruno. Presenting his unique perspective, Bruno will show how important the integration of each single component is to reaching maximum performance on an F1 car.

Connecting Equipment World will offer engaging technical discussion, with all relevant OEMs represented, making it a not-to-be missed

occasion for networking and the sharing of expertise.

The event will take place in Milan, Italy, on May 17 and 18, 2018.

On the first day, attendees will gather in the heart of Milan, in an exclusive location equipped with technological devices for the benefit of the discussion and the workshops. At the end of the technical work, customers are invited to a private viewing of Leonardo Da Vinci's most famous painting, The Last Supper. On May 18, there will be a visit to Faster's plant in Rivolta d'Adda, to look closely at QRC production.

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Quote Ref: **516**



Compact magnetic angle sensor

Plastic sensor housings may be leakproof for a short time in harsh environments. In the long term, however, humidity will penetrate the inside of the sensor housing due to the hygroscopic properties of the plastic material, eventually destroying the sensor electronics – even with a high IP protection rating, such as IP67.

ASM Sensors presents a sensor designed for harsh conditions but still offering an exceptionally compact housing. Magnetic angle sensor Posirot Pras29 comes in

a completely closed, laser-welded, hermetically-sealed 316L stainless-steel housing. The

housing is only 10mm thick, 45.5mm long, 49.5mm wide and completely potted, with a special sealing compound also covering the cable area, to prevent longitudinal water ingress along the cable. Shielded

against electromagnetic disturbances, the sensor can be used even in the presence of strong electromagnetic fields.

The sensor measures rotary position from 0° to 360°, utilizing a multiple Hall Effect sensor array and a position magnet. The protection class is IP67. Analog outputs are available either with 0.5 to 10V, 0.5 to 4.5V or current 4 to 20 mA. The analog sensor has a linearity of ±0.5%.

Due to the robust, hermetically sealed, stainless-steel housing, the sensor is resistant to shock, vibration and dirt, while able to withstand temperatures from -40 to 85°C (-40°F to 104°F). Posirot Pras29 magnetic angle sensor is therefore perfectly suited for wet environments or those with fluctuating temperatures, such as industrial vehicles, mobile machines or food and pharmaceutical processing machinery.

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Quote Ref: **517**



High volume flow screw-in cartridges

A complete standard program of proportional screw-in cartridges is available in size M42x2. Comprised of spool valves, pressure valves and flow valves, the range is designed for maximum pressures of up to 400 bar. With volume flows of up to 400 l/min, they are also optimally suited to controlling large fluid amounts.

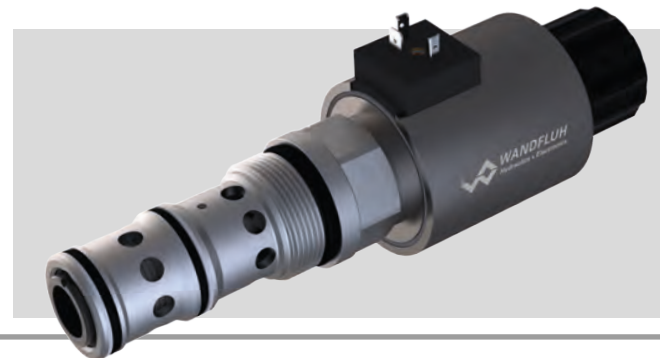
Wandfluh has many years of experience in proportional technology, and thanks to its high resolution and low hysteresis, the valves are suitable for demanding applications. The exchangeable coil simplifies the logistics – as the solenoid coil can be retrofitted, proportional screw-in cartridges

offer a very flexible system. Different plug and voltage alternatives are available ex-stock according to individual adaptations, all with the customary Wandfluh flexibility. In addition, the performance of the valves has been increased by the improved solenoid coil – achieving a salt-spray resistance of as much as 500 hours. Ambient temperatures of up to 70°C (158°F) can be accommodated without any performance loss.

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Quote Ref: **518**



Clever self-priming axial piston pump

Kawasaki has been producing the K3VL axial piston pump range for more than 15 years, continuously developing new features and control options to complement the range. The 200cc frame version of the pump was released in 2006, with other frame sizes later added to the range.

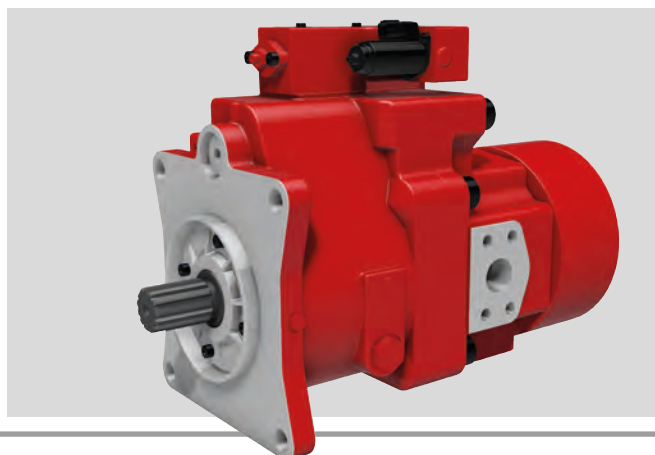
The latest addition is the K3VL200H. This variant allows for higher self-priming speeds with the integration of an impeller to the inlet passage of the pump. Initially for high-speed operation, or speeds above 1,900rpm, it was necessary to boost the inlet of the pump via external devices within the system. The K3VL200H removes the need for a system-boosted inlet by providing the boost pressure within the pump.

This increase in self-priming speed capability enables simpler installations of the K3VL200H to operate at more than 1,900rpm. Furthermore, to save power, modern diesel engine speeds are being reduced, which means the need for step-up gear boxes or larger pumps to maintain system performance is growing. The K3VL200H is there to fulfil this role.

The K3VL200H is available with the same additional options as the K3VL200, among them load sensing, torque limiting (including power shift) and displacement control, including a range of through-drive options.

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Quote Ref: **519**



Heavy-duty range of hydraulic PTOs

Twin Disc makes heavy-duty productivity possible with the addition of three new hydraulic PTOs. The HP500, HP800 and HP1200 cover higher power requirements: 500hp, 800hp and 1,200hp.

Alongside the existing PFI-60 (275hp) and PFI-120 (560hp), they offer Twin Disc's renowned quality in rugged-duty, high-horsepower hydraulic PTOs.

The compact but powerful PFI-60 and PFI-120 can mount to an engine, remote mount with shaft input, and mount to the input or output of the pump drives. They also have a shaft or pump mounting pad as options.

Replacing mechanical PTOs in heavy-duty applications improves the torque modulation and cushioning of hydraulic clutches to reduce driveline startup, acceleration, deceleration and shutdown loads. Twin Disc Hydraulic PTOs contain an oil-filled, multiple-disc, hydraulically actuated, self-adjusting clutch.

Typical heavy-duty applications for hydraulic PTOs include crushers, grinders, mulchers, dredgers, pumps and compressors.

In addition to superior driveline equipment protection and performance, Twin Disc hydraulic PTOs offer manufacturers the

comfort, convenience and safety of remote actuation and control, as well as flexible mounting options for easier equipment integration.

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Quote Ref: **520**



Unique variable hydraulic torque divider

HydraForce continues to innovate in hydraulic traction control, extending the HTD line with the patent-pending HTD10-E50 variable hydraulic torque divider (HTD). The HTD is a unique pressure control that balances loading across two drive motors. It solves several problems that have always plagued hydraulic propelling applications: heat build-up, energy waste, and inefficiency.

The traditional approach to traction control relies on pressure-compensated flow divider/combiner valves that operate on a significant pressure drop, and require additional valving to accommodate steering differential. A 100 l/m four-wheel drive system can add as much as 3.3kW to a vehicle's cooling load.

The HTD is completely different. In an HTD drive circuit, a series flow arrangement provides primary traction control. The HTD sits between the two drive motors, regulating pressure to ensure both motors apply equal tractive effort. This valve either relieves, or provides makeup flow allowing the two wheels to turn at different speeds. For vehicles with different front-to-back load characteristics, the HTD10-40 allows alternative ratios, and the new HTD10-E50 uses an internal pilot stage relief, allowing the system to respond with a variable ratio depending on overall load.

HTD valves eliminate the energy waste and heat build-up of flow dividers, and sized for the differential flow only, offer an effective traction


control solution that saves cost and reduces the installed footprint.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **521**



New integrated position sensors

 The new SGH25 wire-actuated encoder from **Siko** is characterized by a measurement range of up to 2.5m (8.2ft) and a long service life.

The wire-based position sensor is suitable for applications that use mobile machines – for example, dumper trucks, excavators and agricultural machinery – where it measures the position of hydraulic and telescopic cylinders, and communicates that information to the machine control system via integrated communications protocols.

The robust SGH25 was developed specially for use in extreme conditions in mobile hydraulics that are mainly used in agricultural machinery and construction machines.

The resilience required for this has been designed and tested both electronically and mechanically for the service life of a cylinder. Other sensors in the range include the SGH10 basic model, which has a measurement range of up to 1m (3.2ft), and the SGH50, which covers large measurements of up to 5m (16.4ft).


The range can be integrated directly into hydraulic cylinders. A newly developed plastic extends maximum fluid temperature from 85°C (185°F) to 105°C (221°F).

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **522**



Out of the box cloud management

 Connected machines are about to shape the future of farming, construction and other fields where special machinery is needed.

As a leading provider of functional safety in the domain of off-highway vehicles, **TT Control** offers cloud and IoT solutions as well as advanced connectivity platforms.

TT Control's complete out of the box cloud management platforms provide true plug-and-play functionality. The TT Connect Cloud Service management platform helps customers monitor and manage vehicles and fleets. It enables machine OEMs and fleet owners to access machine data with a fully customizable, intuitive front end.

TT Connect Cloud Service unlocks the benefits of digitization in the off-highway market, such as complete machine management, data analysis and operational cost savings. The company's IoT gateway, TT Connect

Wave, is a high-performance, ruggedized IoT gateway designed to connect a vehicle or machine to the cloud via wireless or cellular interfaces.


The company also offers connectivity platforms for the management of network architectures of vehicles and other machines in rugged operating environments.

TT Connect 616 is designed for application development and support of Ethernet in vehicle network architectures, including advanced technologies such as TSN (time-sensitive networking). The platform combines and manages all in-vehicle interfaces, among them CAN-FD, FlexRay, LIN and Ethernet.

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Quote Ref: **523**

Versatile and compact rotary sensor

 **Curtiss-Wright Industrial's** NRH305DR is a no-contact rotary position sensor offering an optimal combination of performance, safety and cost for OEMs designing vehicles and control systems.

Sharing many of the same features/benefits as the NRH300DP, the NRH305DR enhances system performance by incorporating two completely independent power supplies and output channels for full electrical redundancy, operating from a 5Vdc regulated supply.

An 8mm low-profile sensor body, small footprint and fully-encapsulated, IP68/IP69K-rated design ensures the sensor offers exceptional levels of performance. Its separate magnet assembly can have a permissible air gap between 1.5mm and 8mm (depending on magnet style) and can accommodate up to ±2mm radial offset to ease setup/installation.

Versatile, factory-programmable electronics can be easily set to one of two analog voltage output ranges or one of three PWM frequencies. Additionally, the polarities of each of the analog outputs can be independently set, with onboard diagnostic functions ensuring the outputs are put into safe, pre-defined states should an internal sensor error be detected.

The NRH305DR uses proven, wear-free Hall-effect sensing technology and features a number of magnet arrangement options, including an over-molded magnet carrier that simplifies the interfacing of the magnet and sensor during installation. Optional bolt, plug or loose carrier variations are also available.

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Advanced off-highway controls

 The latest control product to be launched by **Deep Sea Electronics** is DSEM643, which offers a sophisticated level of programmable control for smaller applications, or to expand the I/O options of the larger DSEM640.

The product is highly versatile, suiting a wide range of mobile applications with programming via CODESYS 3.5.

Designed to provide superior protection against dust and water ingress, the unit carries an IP67 rating and also incorporates a breather to allow the DSEM643 to equalize pressure and reduce condensation while filtering out liquids and other contaminants.

This rugged design enables the product to be mounted outside, in a completely unprotected environment, direct onto the chassis if required, and used in widely varying climatic conditions from -40°C to 85°C [-40°F to 185°F] at full load. The ruggedized design includes an aluminum die-cast housing and the module passes

stringent EN, ECE and ISO testing for shocks and bumps, vibration, salt spray, EMC and electrical safety. The controller also has E11-R10 type approval.

For optimizing bus networks four independent CAN interfaces are available, each one compatible with J1939, CANopen and RawCAN, offering a versatile framework for complex network designs.

Integral to the unit is a powerful 32 bit microprocessor with a 220MHz clock speed and 4MB of application memory, providing outstanding performance and operating response times.


The DSEM643 also features Ethernet connectivity, 16 configurable inputs with digital and analog capability and 18 configurable outputs with digital, PWM and PWMi capability.

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Emission-compliant, powerful engines

 **Kohler** presents its updated diesel engines platform, designed to meet the requirements of a market that demands more application flexibility and compliance with the various emissions limits, along with performance and productivity.

Kohler Flex is the range of solutions for emission control that Kohler has designed to enable each configuration of the KDI platform to comply with all emissions standards and regulations worldwide.

At the heart of Kohler Flex there is the clean combustion of KDI

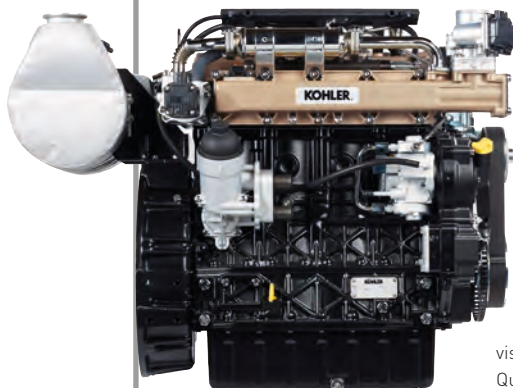
engines that enables the adoption of a compact, state-of-the-art diesel particulate filter (DPF) to meet Stage V emission standard.

Kohler Flex combines the clean in-cylinder combustion of KDI engines, made possible by high-pressure common rail (2,000 bar), four valves head, turbocharger, cooled exhaust gas recirculation, and the most compact aftertreatment devices (dissolved organic carbon, selective catalytic reduction and DPF) to comply with all emission requirements. Each combination of Kohler Flex has been designed in line with the all-in-one philosophy, with the objective of minimizing change for engine installation into existing packages.

These efficient and reliable systems can be deployed in many combinations to achieve effective emissions solutions for the different markets.

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ivT
INTERNATIONAL
INDUSTRIAL VEHICLE TECHNOLOGY

NEW HEIGHTS



When JCB changed the face of farming



JCB's Loadall 520 telehandler delivered massive efficiency gains for farmers

JCB Agriculture marked the end of 2017 by celebrating the 40th anniversary of its Loadall telescopic handler. Launched on October 20, 1977, the campaign for the groundbreaking new vehicle featured the slogan 'Obsolescence day is coming', indicating that the new vehicle would make traditional masted forklifts – a mainstay of 1970s farms – obsolete.

Forty years on, true to the prediction, telehandlers have become essential agricultural equipment, while masted forklifts are, at best, a secondary consideration, with only niche applications.

Even so, many in the industry were unsure why a telescopic handler would benefit their business and JCB chairman Lord Bamford is the first to admit that the changeover was a gradual process. "When we launched the Loadall in 1977, we sold just 64 machines," he says, "but we were very confident that the telescopic handler would grow in popularity simply because it made jobs so much easier on construction sites and on farms."

"The concept soon took off and the faith we put in the telescopic handler four decades ago has been repaid. It's wonderful to celebrate 40 years of success of the Loadall, with production hitting historic levels."

Production, in the early years, was as little as four units built per day, with even JCB employees seeing the Loadall as the poor relation of the backhoe loader.

It took the company three decades for the first 100,000 machines to be sold, but only a further 10 years to reach the 200,000 benchmark.

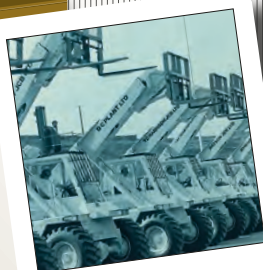
The two-wheel-drive launch vehicle had a 6.4m (21ft) lift height and lift capacity of 2.25 metric tons. Fast-forward to today and a wide range of telescopic handlers are produced by JCB, with models capable of carrying loads exceeding 6 metric tons up to a height of 20m (65.6ft).

One of the ways JCB marked the Loadall's milestone was by exhibiting a special limited edition 541-70 Agri Pro (pictured below) at the LAMMA show, Peterborough, UK, in January 2018.

This distinctive machine was shown with a yellow and black engine cover, and the rear of the heavy-duty chassis is also painted black, while 'JCB Loadall 40' graphics on the boom and engine cover highlight the significance of the special edition.

The same special graphics are also available on a limited edition version of the new Loadall 560-80 Agri Pro and the high-level specification of both machines includes normally optional bright LED road lights as standard. **ivt**

Vehicle evolution



A new era



An '80s classic



Much loved



Future-proofing

AS THE CONSTRUCTION WORLD GATHERS FOR INTERMAT PARIS, THOUGHTS WILL INEVITABLY TURN TO FRANCE'S NEXT HIGH-PROFILE MEGA PROJECT – CONSTRUCTION FOR THE PARIS 2024 OLYMPICS. WITH THAT IN MIND WE PRESENT A CONCEPT MACHINE TO MAKE THE BUILDING SITES SAFER

Arms

- Lower arms curved to maximize visibility in lower front area, even when arms are raised
- There is an open view between the middle sections of the arms, even when the bucket is raised
- Center of gravity for arms is lower than conventional loaders, for outstanding front stability
- Inverted Z-linkage prevents loading/unloading mechanism and cylinder from obscuring the operators' view.

Cab

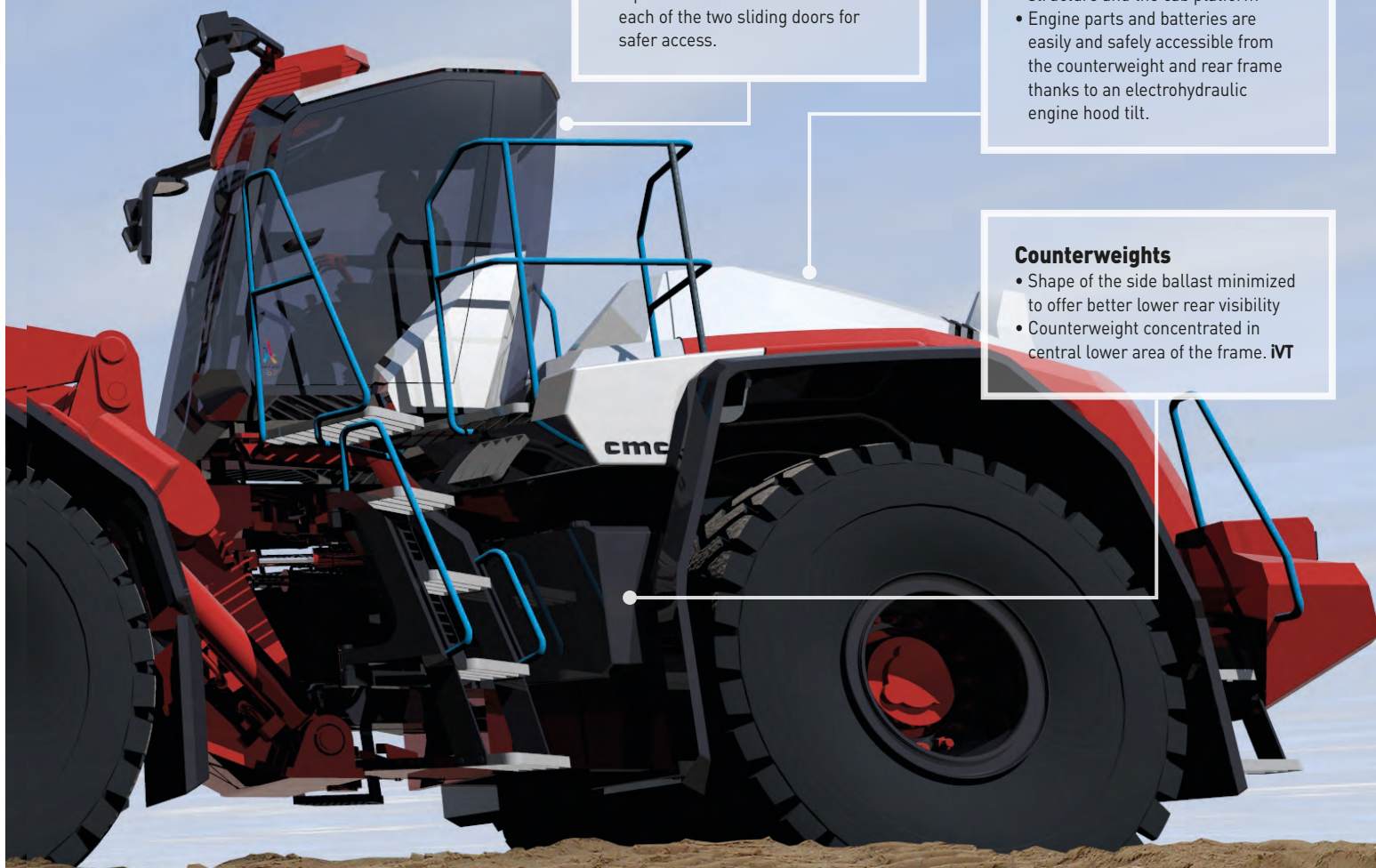
- Two conventional posts plus two double posts
- Windshield is tilted back to improve upward visibility
- Backward sloped glass rear area improves visibility toward lower points
- Gently sloped steps on both sides
- Step structure can be tilted to access mechanisms during maintenance and cleaning
- Bright rails run all around the loader, easy to spot in distinctive bright blue
- A platform extends out from under each of the two sliding doors for safer access.

Hood and mechanisms

- DOC and DPF units placed longitudinally to avoid increasing the height of the hood, maintaining maximum side visibility
- Rear fender structure has been cut in the corners to improve lower rear visibility
- Fuel, AdBlue or hydraulic oil tanks are accessible from the steps structure and the cab platform
- Engine parts and batteries are easily and safely accessible from the counterweight and rear frame thanks to an electrohydraulic engine hood tilt.

Counterweights

- Shape of the side ballast minimized to offer better lower rear visibility
- Counterweight concentrated in central lower area of the frame. iVT



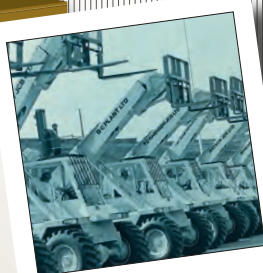
NEW HEIGHTS



When JCB changed the face of farming



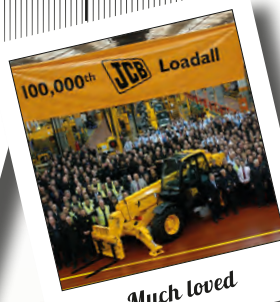
70s memories



A new era



An '80s classic



Much loved



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Forty years on, true to the prediction, telehandlers have become essential agricultural equipment, while masted forklifts are, at best, a secondary consideration, if not entirely done away with.

Even so, many in the industry were unsure why a telescopic handler would benefit their business and JCB chairman Lord Bamford is the first to admit that the changeover was a gradual process. "When we launched the Loadall in 1977, we sold just 64 machines," he says, "but we were very confident that the telescopic handler would grow in popularity simply because it made jobs so much easier on construction sites and on farms."

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