

THE MAGAZINE FOR INDUSTRIAL VEHICLE TECHNOLOGY, DESIGN & ENGINEERING

iVT Industrial Vehicle Technology International

SEPTEMBER 2017

iVT

INTERNATIONAL
INDUSTRIAL VEHICLE TECHNOLOGY

WORLD-FIRST INNOVATIONS

- | Autonomous road-roller concept
- | The OEM using Google Glass
- | Fully self-driving forklift launched

Smarter tech now

How CANbus is evolving
to meet new demands

**10 BEST
NEW VEHICLES**
AT AGRITECHNICA 2017



SEPTEMBER 2017 VOL. 25 No. 3

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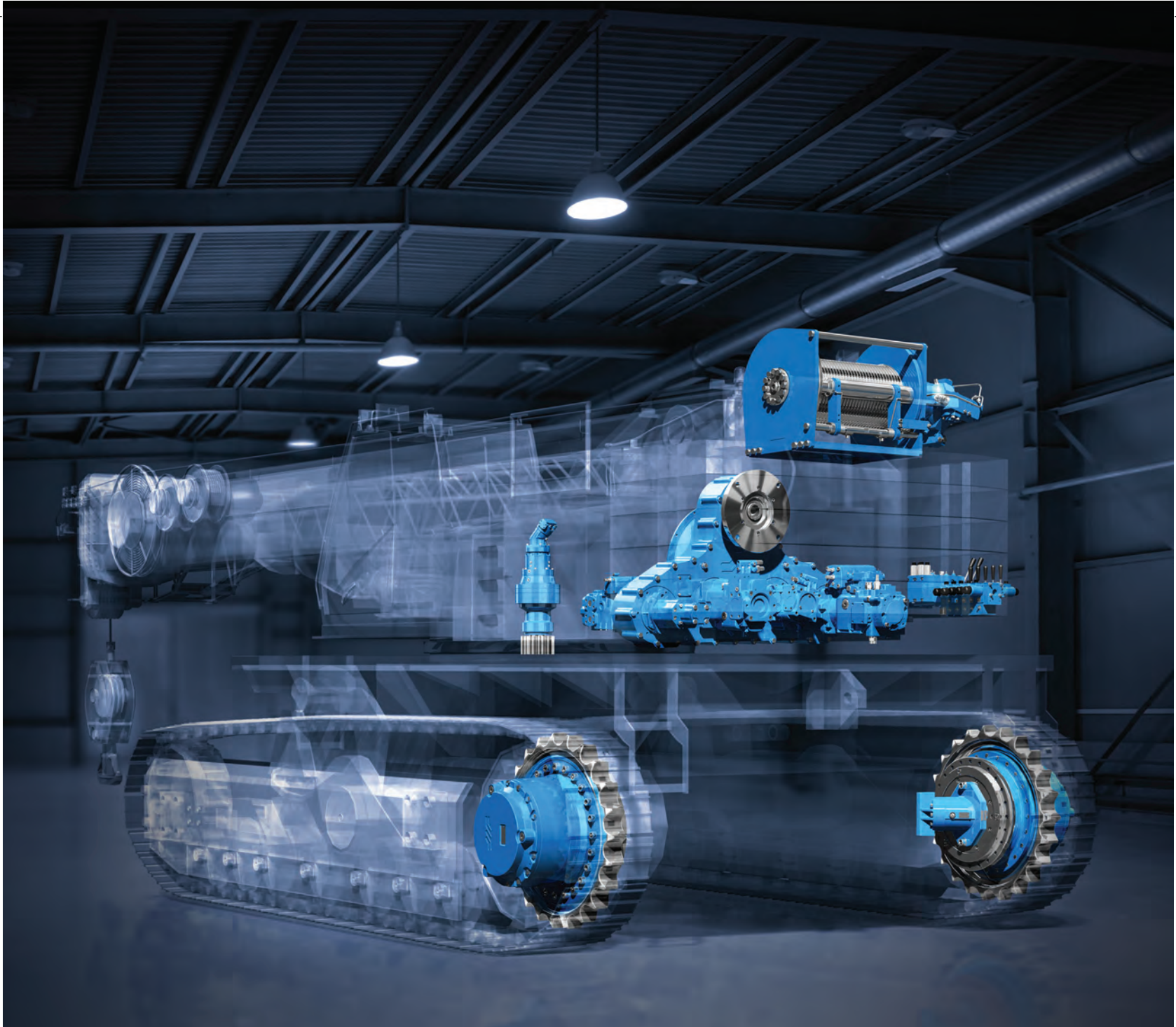
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"The fact that the fair will soon be underway is very exciting. The work we have done in the two years since Agritechnica 2015 will finally come to fruition" p90



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FOREWORD

▷ Electric vehicles are big news in the automotive world. Despite conservative predictions that public uptake of such technology will plateau, with more efficient diesel and petrol engines securing the future of fossil fuels for decades to come, government policy makers have other ideas. An opportunity to finally reduce our reliance on oil presents itself, and is being seized. In July, the British government announced that it will outlaw the sale of diesel- and petrol-only cars by 2040. And an 'arms race' has begun between automotive manufacturers now focused on outdoing one another with the best hybrid, all-electric and alternatively fueled solutions.

But what about the industrial vehicle world? As with the early days of automotive electric and hybrids, such powertrains in heavy-duty machinery have been met with a healthy dose of skepticism. Can they ever produce the required power levels? How long will a charge last and what happens if you need to recharge in the field? What about using them in locations with limited electrical infrastructure? Many such questions are still yet to be fully answered. But that hasn't stopped OEMs from pressing ahead with concept vehicles in both construction and agriculture – and even getting some to market. Bringing to mind the old adage – where there's a will, there's a way.

One such concept is John Deere's SESAM (Sustainable Energy Supply for Agricultural Machinery) tractor. It's a surprising vehicle in many ways – turn the key and a quiet

hum, rather than the loud chug of a diesel, greets you. Look under the bonnet and, instead of a greasy internal combustion engine, you'll find a huge bank of battery packs. Follow it into the field and you'll find it doing all the jobs of a traditional tractor its size, quietly and efficiently. It's just one of the projects being overseen by Prof. Dr Peter Pickel, deputy director of John Deere's European Technology Innovation Centre, who gives us the inside story on this, and his other new technological advances, from page 30.

It's just the beginning of the huge 140-page agricultural special you'll find in this, the biggest ever quarterly edition of *iVT* – inspired, of course, by the forthcoming Agritechnica expo being held in Hannover, November 12-18. Within our event preview (which starts on page 88) you'll find *iVT*'s 10 Best New Vehicles that will be showcased in Germany. One of which is – you guessed it – an electric tractor. The Fendt e100 Vario is being trumpeted as the world's first commercially available all-electric tractor. No surprises, then, that it won a silver medal in Agritechnica's Innovation Awards. You can read more about it on page 100.

As far as innovation in electric drives for industrial vehicles goes, this is just the beginning. If you want to learn more about what's to come, visit *iVT*'s symposium, November 14-15 in Cologne – a direct train runs to Hannover! Find out more about this event on page 14.

Tom Stone, Editor, iVT International

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ContiTech

▷ Google 'Explorer' Glass – the wearable, augmented reality technology – was a false start for the internet giant. Launched in 2013, it initially attracted a great deal of media attention, but privacy concerns and the simple fact that people found talking to someone wearing the spectacles an unnerving experience, meant that it failed to gain popularity with the public. Google withdrew the Explorer product from public sale in early 2015 after disappointing results.

But what felt odd and creepy on the street, or in a bar, has now

found a new home – on AGCO industrial vehicle production lines. Now known simply as Glass, reflecting the fact that development for this project has now passed to Google's parent company Alphabet, the Enterprise generation of the technology is going from strength to strength and is now focused on making vehicle production lines more accurate and efficient.

Tried and tested

After several years of testing, full implementation of Glass as an everyday tool on a working

production line happened earlier this year at AGCO's plant in Jackson, Minnesota. The plant manufactures Massey Ferguson and Challenger high-horsepower wheeled tractors, Challenger track and articulated tractors, and RoGator and TerraGator application equipment.

Whereas in the past inspection and quality control was done using clipboards, later with help from desktop computers and laptops, and most recently tablets, now these time-consuming and sometimes easily breakable (tablets were often dropped) solutions have been

Future





vision

JUST AS GOOGLE GLASS WAS FADING FROM OUR COLLECTIVE MEMORY, THE TECHNOLOGY HAS BEEN REBORN – THIS TIME AS A VALUABLE HIGH-TECH ASSISTANT ON AN INDUSTRIAL VEHICLE PRODUCTION LINE

replaced with Glass. The technology can also provide training and simple reminders of correct procedures.

“Glass is used for standard work instructions,” Peggy Gulick, director of business process improvement for AGCO, tells *iVT*. “In addition to work instructions via Glass, ‘quality gates’, especially factory inspections, are done with Glass. Some of the component manufacturing areas, such as paint prep, also benefit from Glass.”

Making a difference

The efficiency improvements are impressive. “The numbers show 30% reduction in processing times and

a 50% reduction in on-the-job training times,” says Gulick. “Glass has also shown a significant reduction in product defects, especially when measured during training. We are seeing many benefits including productivity and quality improvements, efficiency of manufacturing and production.”

Currently, AGCO has more than 120 pairs of Glass deployed, which includes some other manufacturing sites that are piloting the solutions that are in everyday use in Jackson, as AGCO plans to expand use of Glass.

“AGCO is proud to be an innovator and thought-leader in

ABOVE AND LEFT: Workers on the AGCO production line use Glass to get jobs done more efficiently

agricultural equipment by using the latest innovations in manufacturing, like wearable technology,” says Gulick. “No one else in the agricultural equipment industry is utilizing this technology the way AGCO is.”

The long view

While it has taken until this year for Glass to be used in standard assembly work, AGCO in fact started testing the technology as soon as the first prototypes were available in December 2013.

One of the challenges that had to be overcome before Glass could be used on an everyday basis was its

WHAT'S NEW



“EMPLOYEES WHO USE GLASS HAVE EMBRACED THE TECHNOLOGY AND HAVE BEEN ACTIVELY INVOLVED IN FINDING NEW APPLICATIONS DURING THE ADOPTION PROCESS AT THE JACKSON FACILITY”

Peggy Gulick, director of business process improvement, AGCO



integration with PPE. “We used our PPE partner 3M to make prototypes that we could use to deploy Glass for use on the production floor,” explains Gulick. “We ensured they met OSHA eye and face protection requirements and could be manufactured to meet the needs of workers using prescription eyewear.”

On the factory floor, it is rapidly gaining acceptance with workers, who are able to immediately see its benefits. “Employees who use Glass have embraced the technology and have been actively involved in finding new applications during the adoption process at the Jackson facility,” says Gulick. “Their acceptance and requests for Glass in various applications have been driving forces behind AGCO’s adoption of Glass. They take great pride in their work and in producing a quality product, and they see many time-saving, step-saving and process-improvement benefits from Glass. There were a few skeptics initially, but now they love it!”

Looking to the future

Now the future for the technology looks bright. AGCO Glass pilots are happening all around the world in its factories including some in Brazil, Europe and additional sites in North America. And with the world’s largest agricultural equipment show fast approaching, the company isn’t ruling out showcasing Glass for visitors to Agritechnica 2017 in Hannover this November. Keep your eyes peeled at the three AGCO stands: Hall 20, Stand A26; Hall 15, Stand G38K; and Hall 6, Stand E33. **ivT**

THE FEATURES OF ENTERPRISE GLASS

Voice control

Much like many other Google products, Glass features voice control. The wearer can change what’s in the Glass display, get it to take pictures, or store information, by using simple voice commands.

Touchpad

Another control method is a touchpad that is located on one of the arms of the glasses. By putting a finger on this and swiping forward or backward, the wearer can scroll through menus.

Sensors

Glass can also be controlled, and receives information, via its

onboard sensors. The original Explorer Glass had an ambient light sensor, a digital compass, a wink sensor and a blink sensor. The Enterprise edition has all of these plus a barometer, a capacitive head sensor, a hinge sensor and satellite location technology.

Camera

Operated using voice control, the Glass 5MP camera, which also has video capability (720p), is particularly useful on the AGCO production line for recording anything that needs attention at a later stage. Unlike the previous Explorer edition of the tech, the Enterprise

edition has an LED that lights up when video is being recorded.

Display

The original Explorer Glass used a liquid crystal on silicon (LCoS) field-sequential color system, LED illuminated display. Polarized light from the display is reflected into the wearer’s field of vision using mirrors and prisms. The Enterprise edition is said to be largely unchanged in its visual setup, although Alphabet has yet to reveal the exact spec.

Sound

Explorer Glass used a much-talked-about

bone-conduction speaker meaning no earpiece was necessary. The Enterprise edition has ditched this and uses instead a simpler speaker next to the right ear. This is said to improve the sound quality.

Battery

Enterprise Glass claims greater battery life than its predecessor, and also is available with an additional external battery pack.

Memory

Its 32GB of built-in memory means Enterprise Glass has twice what the Explorer edition had.



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Forklift of the future



LEFT: Robot driver are here, but ones that look like this are certain to be confined to sci-fi movies for the time being
BELOW: Seegrid's GP8 Series 6 in action

SEEGRID GP8 SERIES 6 PALLET TRUCK

Fully automated material handling achieved with the first automatic pick-up and set-down technology

The warehouse material handling sector has long led the industry in the field of autonomous vehicles. Automated guided vehicles (AGV) have been in general use for years. They improve efficiency by doing away with the need for forklift operators, although they can only follow preset paths, usually defined by wires embedded within flooring.

Over the past few years, forklift OEM Seegrid has

been breaking out of the AGV box by manufacturing pallet trucks that are more truly autonomous – able to have their routes redefined with simple reprogramming, doing away with the need for guide wires or other external hardware.

Until now, human workers were still needed to help load and unload pallets, but with the new Series 6 GP8, Seegrid has perfected fully automated material movement.

“The GP8 Series 6 closes the automation loop by providing an end-to-end solution, removing the need for human assistance,” says Jeff Christensen, vice president of product with

Seegrid. “Developing self-driving vehicles that autonomously move objects from one side of a factory to another was difficult enough; the accuracy levels required for hands-free load exchange certainly posed a bigger challenge.

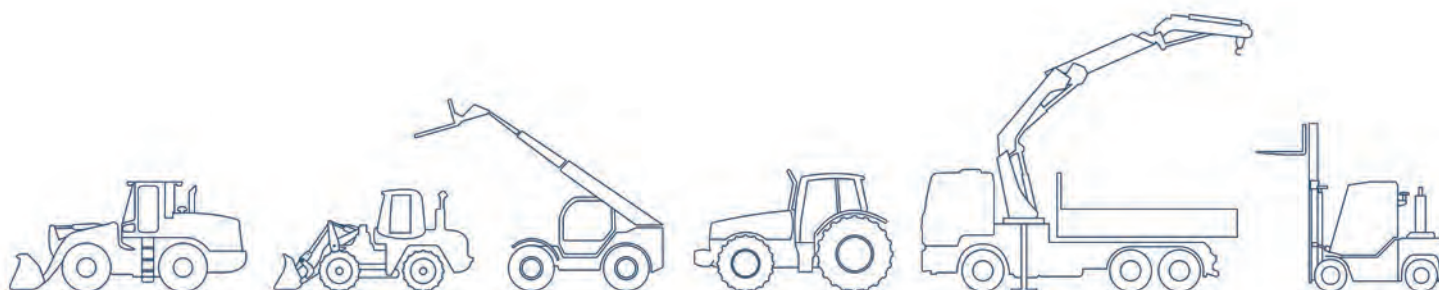
“We engineered the GP8 Series 6 to reverse into pallets, pick them up, and set them down. Because the vehicles run on three wheels, as soon as they start driving back they must overcome a reverse pendulum effect while maintaining motor control. Fine-tuning that motor control was one of the key engineering challenges we overcame in developing the Series 6.”



On the web

Watch a video of the Seegrid GP8 Series 6 at www.iVTinternational.com/seegrid

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WHAT'S NEW

CONSTRUCTION FOCUS



16%

The year-on-year rise in global construction equipment sales predicted by Off-Highway Research for 2017. By the end of the year, it expects sales to exceed 810,000 units. The biggest rises in sales are coming from developing nations. In Europe, sales are up overall by a modest 2%, while the USA has seen an 8% uptick in the first half of the year.

US\$44bn

The upper end of Caterpillar's prediction for total worldwide sales in 2017. This was upgraded from US\$4bn at the end of July after the announcement of better than expected second-quarter results.

"Our team delivered an impressive quarter. As demand increased, we continued to control costs and generate higher profit margins," said Caterpillar CEO Jim Umpleby.



350

The maximum yearly unit sales predicted by Off-Highway Research for the French dump-truck market by 2020. This represents a return to stability after a recent slump, but pre-2008 levels of 500 units per year are unlikely to be seen again soon as they were due to artificial factors created by the pre-crash 'bubble-like' conditions.

BOOM TIME

IN 2017, THE CONSTRUCTION VEHICLE MARKET HAS DEFIED THE EXPECTATIONS OF MANY AND LOOKS ON TRACK TO DELIVER SIGNIFICANT GLOBAL GROWTH BY THE END OF THE YEAR



"SINCE THE BEGINNING OF 2017, WE HAVE SEEN A POSITIVE MARKET TREND THAT IS STILL ONGOING"

Dr Margarete Haase, chief financial officer, Deutz

For the first half of 2017, the engine group's consolidated financial figures reveal that earnings before tax, depreciation and amortization (EBIT) were up by €2.1m (US\$2.4m), to €22.8m (US\$27m), compared with results for the January to June period last year.

83%

The astonishing rise in excavator sales in China expected this year, as compared with last. Off-Highway Research reports that the boom can be, in part, attributed to more funding being made available for infrastructure projects, both through government funding and public-private partnerships.

STAGE V WE ARE FIVE STEPS AHEAD.

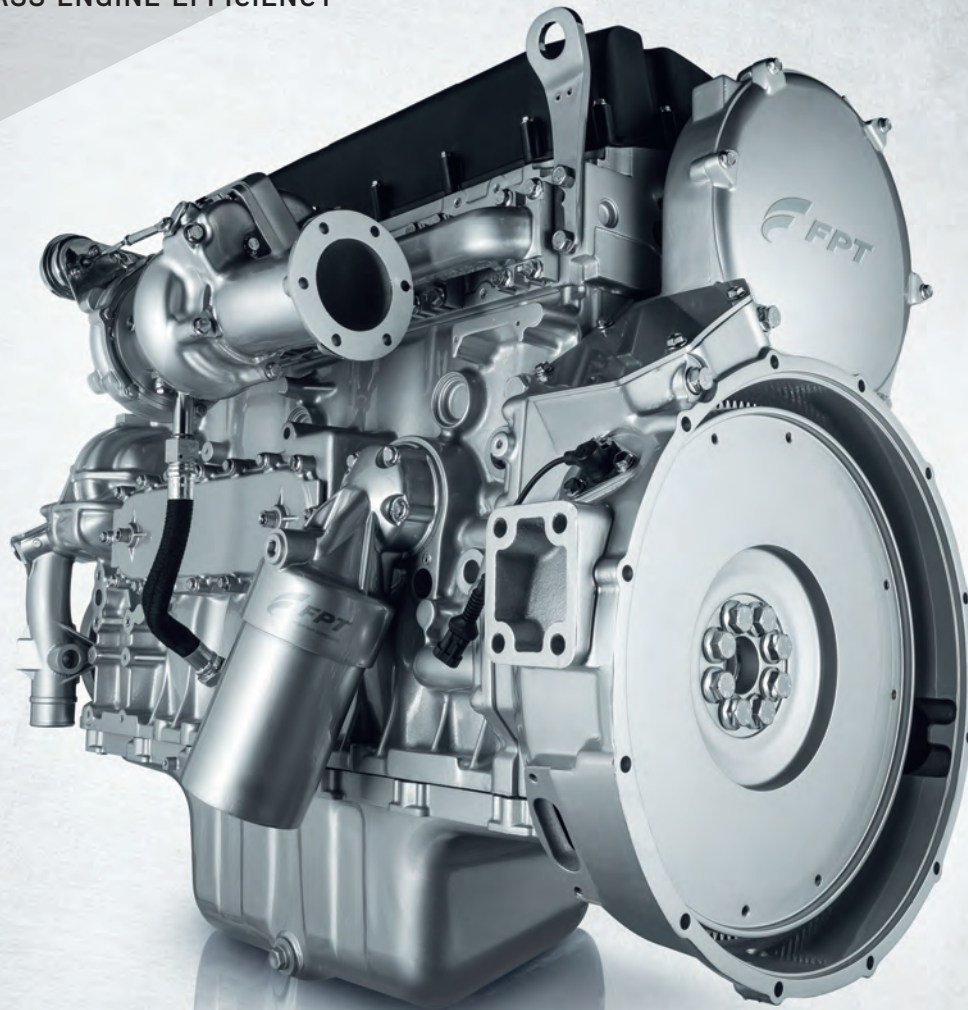
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Topics under discussion:

- Autonomous vehicle hardware
- Lidar systems
- Sensors
- Autonomous loading systems
- Robotics and AI technology
- Guidance and mapping systems
- Remote monitoring
- Testing and validation
- Autonomous software
- Obstacle detection and collision avoidance
- Connected vehicle technology and IoT
- Vision guidance systems



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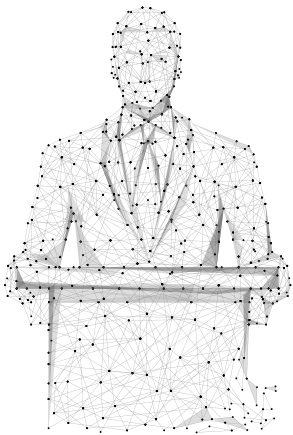
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For more information about the Autonomous Industrial Vehicle Technology Symposium 2017, please contact **Nick Moller, conference director:** nick.moller@ukimediaevents.com

Top up your knowledge

FIND OUT THE LATEST INDUSTRIAL VEHICLE DEVELOPMENTS AT TWO NOT-TO-BE-MISSED EVENTS, TAKING PLACE FROM NOVEMBER 14-15 IN THE GERMAN CITY OF COLOGNE, THAT WILL HELP SHAPE THE FUTURE OF THE INDUSTRY: ELECTRIC & HYBRID INDUSTRIAL VEHICLE TECHNOLOGY SYMPOSIUM, AND AUTONOMOUS INDUSTRIAL VEHICLE TECHNOLOGY SYMPOSIUM



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To view the full program and book your delegate pass, visit electricandhybridivt.com



THE INDUSTRY CONTINUES TO MOVE TOWARD MORE ELECTRIFIED POWERTRAINS

This year the **Electric & Hybrid Industrial Vehicle Technology Symposium** will once again bring together experts in the industrial vehicle field.

As the only conference exclusively dedicated to the design and development of electric and hybrid technology for industrial and agricultural vehicles, the event in Cologne, Germany, on November 14-15, presents a unique opportunity to discuss, analyze and discover the most exciting technological developments and advances.

Although hybrid and electric powertrains are increasingly common in passenger vehicles, the electrification of commercial, agricultural, construction and off-highway machines poses specific design challenges. Delegates will learn how these issues are being resolved in a bid to increase the deployment of a new generation of emissions-free vehicles that meet evermore stringent regulations.



PROGRAM HIGHLIGHTS



Capturing industrial powertrain requirements with bespoke duty cycles

Tuesday, November 14, 5:00pm
 Dr Daniel Auger, lecturer in advanced vehicle engineering at Cranfield University, UK, will describe the development of a flexible duty cycle to predict the suitability of a proposed powertrain for a specified industrial application. He will also explain how Cranfield University's approach is to collect data to describe 'activities'. These activities can then form bespoke duty cycles, with the activities in tailored proportions, without extensive testing.



System simulation for hydraulic and hybrid excavators

Tuesday, November 14, 3:00pm
 AVL provides sophisticated simulation models of excavator powertrain components for system optimization under different driving and ambient conditions. In his presentation, Günther Hager, product manager at AVL commercial Driveline & Tractor Engineering, Austria, will explain how a precise concept definition, considering complex system interactions, can be realized.

BOOK YOUR PLACE

TO CONFIRM YOUR PARTICIPATION AND FOR MORE INFORMATION ON THE **ELECTRIC & HYBRID INDUSTRIAL VEHICLE TECHNOLOGY SYMPOSIUM** VISIT electricandhybridivt.com

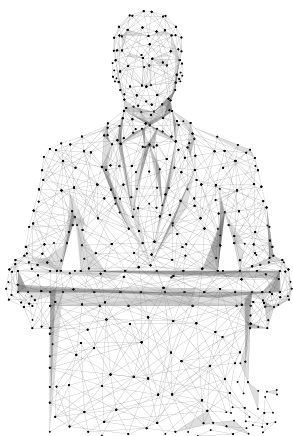


Zero-emissions solutions for heavy-duty container handling equipment

Tuesday, November 14, 6:30pm
 The electrification of Hyster-Yale Group's biggest container handler, a 52-ton top loader, shows the potential of new and clean technology. The reduction of air pollution in urban areas and future legislation also drives the development of zero-emissions vehicles for material handling equipment in ports, as explained in this presentation by Willem Nieuwland, project leader, Hyster-Yale Group, the Netherlands.



SYMPOSIUM PREVIEW



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To view the full program and book your delegate pass, visit autonomousvt.com



HOW IS AUTOMATION INCREASING IN INDUSTRIAL AND AGRICULTURAL VEHICLES?

The world's first conference dedicated to the design and development of highly automated and unmanned industrial vehicles, will take place in Cologne, Germany, this year.

From November 14-15, the inaugural **Autonomous Industrial Vehicle Technology Symposium** will see research and development engineers, robotics experts, autonomous vehicle system hardware and software engineers, as well as OEMs from the construction, mining, agricultural and off-highway industries, converging on the 2,000-year-old city to ponder the true potential of this radical, new technology.

So far, much of the publicity around autonomy has centered on passenger vehicles, but the challenges posed in developing autonomous industrial and agricultural vehicles deserve much deeper consideration.

PROGRAM HIGHLIGHTS



Industrial vehicle functional safety standard for autonomous industrial vehicles

Tuesday, November 14, 12:30pm
This presentation, by Amin Amini from the Robust and Safe Systems Center (ROSAS) in Switzerland, will set out how to apply ISO 26262 to autonomous industrial vehicle technology and how to couple functional safety with cybersecurity issues.



New methodologies for the development and validation of automated systems

Tuesday, November 14, 2:30pm
Eric Chan, global technical expert for connected and automated vehicles at Ricardo, UK, will discuss new processes and methods for developing, testing and validating software-intensive systems robust enough to withstand ransomware cyberattacks.



The merging of precision agriculture and autonomous vehicle technologies

Tuesday, November 14, 3:30pm
Commonplace precision technologies in the agricultural industry, such as auto-steer and section control, are now being merged into a branch of autonomous technologies that are unique to the sector. Darcy Cook, director of engineering at JCA Electronics, Canada, will explore the evolution of this process with real-world examples.

GOLDEN TICKET

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“THE AGRICULTURAL INDUSTRY WILL BE THE FIRST MAJOR INDUSTRY TO BENEFIT FROM AUTONOMOUS APPLICATIONS AS IT IS A NATURAL EVOLUTION OF EXISTING PRECISION FARMING TECHNOLOGIES. AUTONOMOUS VEHICLES WILL BEGIN A TREND TOWARD MORE AND SMALLER MACHINES”

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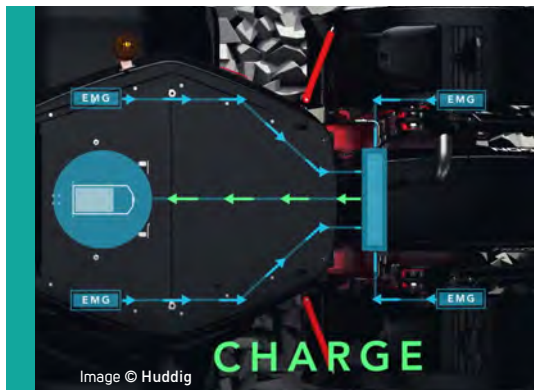
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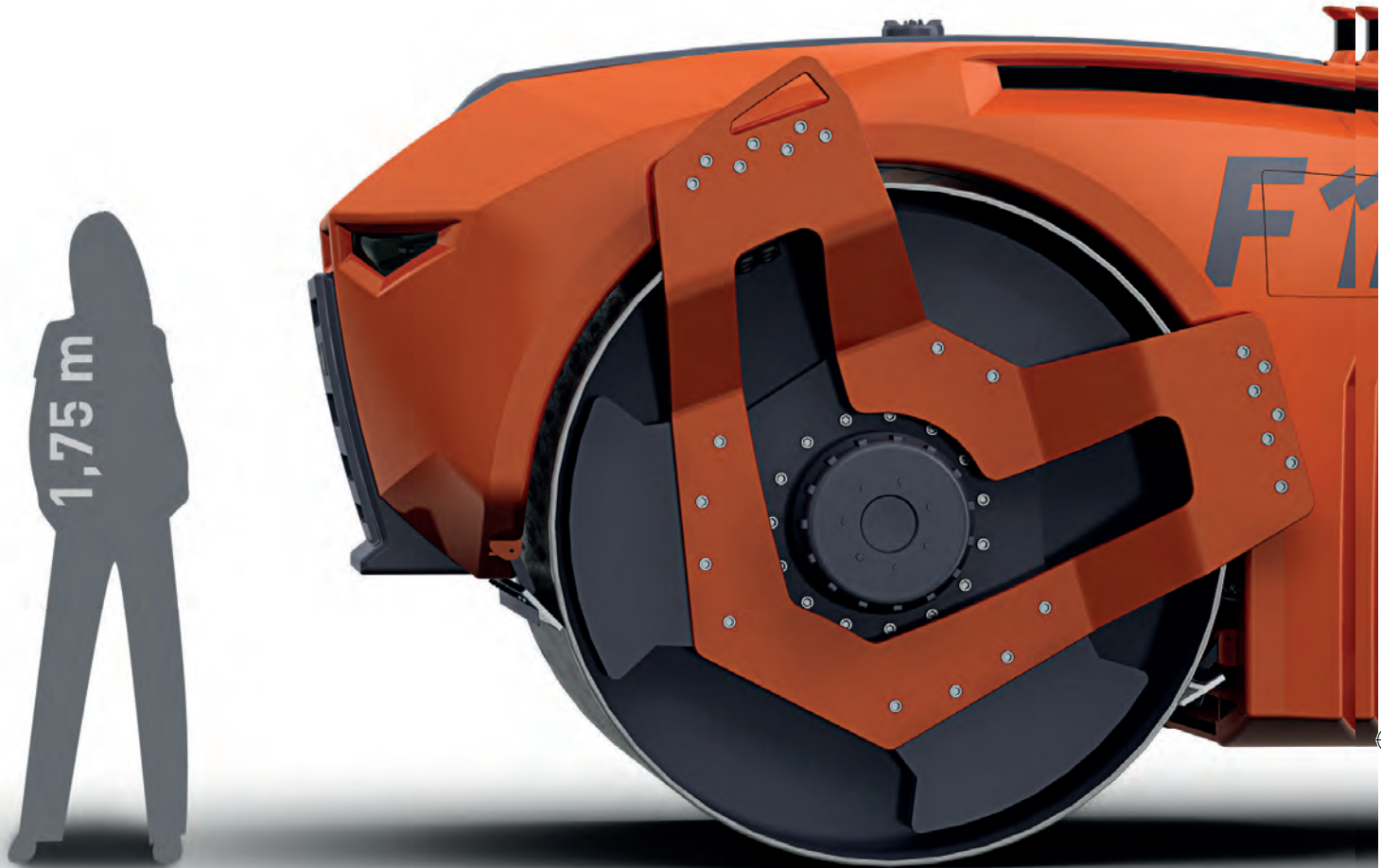


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LEVEL BEST

▶ Autonomous vehicles that can move about without human intervention may not yet be part of everyday life, but they are within reach. Meanwhile, robots that automate everyday tasks – such as lawn mowing and window cleaning – are already becoming widely available to the public.

While there are only a small number of self-driving machines in the industrial vehicle industry, assistance systems on vehicles are rapidly establishing themselves for all manner of purposes.

In compaction technology, Hamm has always started trends and been quick to adopt new technologies. It is once again setting new standards, this time in the development of self-driving compactors.

Trials currently underway within the limits of a test track are just one component of the future-oriented Autonomous Rollers project. Although it will be some years until Hamm rollers are driving and compacting entirely autonomously, the OEM's studies and trials have already demonstrated that such



LEFT: Hamm's concept autonomous roller. The 9-metric-ton machine has a significantly larger drum than traditional designs

BELOW: The overall height of the machine is lower than that of current machines. The ratio of drum diameter to overall height is a huge improvement, translating to greater efficiency



WHILE MANY AUTONOMOUS CONSTRUCTION VEHICLES FACE MANY CHALLENGES DUE TO THE UNPREDICTABLE NATURE OF THEIR WORKING ENVIRONMENTS, SELF-DRIVING ASPHALT COMPACTORS COULD BE ROLLED OUT IN THE NEAR FUTURE

machines enable a noticeable improvement in compaction quality and efficiency.

Autonomous systems

In modern cars and trucks, the use of assistance systems growing rapidly. GNSS navigation, speed control, following distance, lane keeping, parking and automatic beam dipping are increasingly establishing themselves. In many countries, they are even standard on new vehicles. These assistance systems form the basis of the self-

driving trucks and cars that are being developed by industry pioneers, and already being put through their paces on test tracks.

"Rollers for asphalt and soil compaction will be among the first industrial vehicles in which autonomous systems will widely establish themselves," says Dr Stefan Klumpp, chief technical officer at Hamm. "This is because, in many respects, they are closer to cars than many other types of machine. This is why we have been dealing with this subject for some time at



"WE KNOW OF NO OTHER COMPANY IN OUR INDUSTRY WITH A SELF-DRIVING ROLLER"

Dr Stefan Klumpp, chief technical officer, Hamm

10,000

The number of hours of autonomous vehicle testing now exceeded by Hamm



ABOVE: A self-driving roller requires numerous sensors such as radar systems, laser sensors, cameras, GNSS receivers, infrared sensors and incline sensors

Hamm.” Indeed, the company is a pioneer in this field. “We know of no other company in our industry with a self-driving roller. Our investigations have shown that such rollers enable customers to increase compaction quality and efficiency.

“Other leading companies in their sectors, too, are looking into the opportunities and impacts of the autonomous construction site,” continues Klumpp. “This is against a background of limited availability of qualified personnel on the one hand, and high-quality, highly efficient and resource-saving use of machinery on the other. The objective is to further optimize construction processes.”

From drawing board to real world

Dr Axel Römer, head of R&D at Hamm, has already examined with his team what a self-driving roller might look like: “We have considered technical, constructive and economic aspects and evaluated

them in various studies. The result: A driverless roller will not have an operator’s platform but will need significantly more sensors to monitor not only the compaction parameters but also the area surrounding the roller. We have connected these requirements and see many new and constructive possibilities. For example, we could construct autonomous rollers with significantly larger drum diameters, bigger water tanks and more space for the batteries on electrically powered rollers. This offers advantages in terms of quality, environmental friendliness and efficiency.” In collaboration with industrial designers, Hamm has drawn up a corresponding concept design, published in this feature.

However, there is a long road to travel before such a machine will be fully realized – Hamm has a horizon of decades for projects like this. But the journey has begun in as much as numerous assistance systems have

already come into use. One such system is the HCQ Navigator.

Using an onboard computer and GNSS data, HCQ Navigator provides a real-time display of the areas that have already been compacted, including how often and by how much. This is complemented by driving functions such as automatic reversing or speed control, as well as safety features such as rearview cameras. All of them relieve the burden on drivers and, even today, help to increase compaction quality. The developers at Hamm are already working on other systems, including a lane assistant, additional steering aids and the further development of the HCQ Navigator.

Complex sensor technology

Significantly more sensors and more intelligent software than can be found in today’s machines will be required for rollers that are able to maneuver autonomously to carry out high-quality compaction. The



ABOVE: Hamm's test track at its Tirschenreuth factory in eastern Germany

sensors (see illustration, above left) capture all relevant data from the area surrounding the roller. This includes spatial position, direction of travel, distance from other objects, current material parameters of the surface to be compacted (temperature and rigidity) or weather information (wind or cooling rate). The rollers must compare this data with specifications for the area (which parts should be compacted?), the rolling pattern (how many and which rollers work together?) or the desired compaction (what is the desired void content?). Also to be considered is the illustration of the compaction strategy, including instructions for cornering before reversing, edge-finishing, vehicle speed and the use of exciter systems. In short: a complex undertaking.

Testing the concept

Hamm has already successfully completed the first steps of the

journey. Not just on paper but in practice, in the form of endurance testing at the Tirschenreuth factory, and by developing a driverless shadowing roller that follows an earlier machine.

The endurance test track (pictured above) has been operational since 2014, with the primary purpose of testing prototypes. Since then, the developers at Hamm have been testing new autonomous machines under reproducible conditions and in around-the-clock operation for weeks at a time – with no driver at the wheel. In these trials, the machines autonomously complete a specified program, drive themselves to refueling points and park themselves when the test is completed. To prevent collisions with people or objects, the vehicles have been fitted with comprehensive surroundings-monitoring systems. “We have now clocked up over 10,000 hours on this test track and learned a great deal about

**“WE HAVE DESIGNED
A COLLISION MONITORING
SYSTEM, WHICH
REPRESENTS ANOTHER
IMPORTANT STEP TOWARD
AUTONOMOUS DRIVING”**

Hans-Peter Patzner, engineer, Hamm

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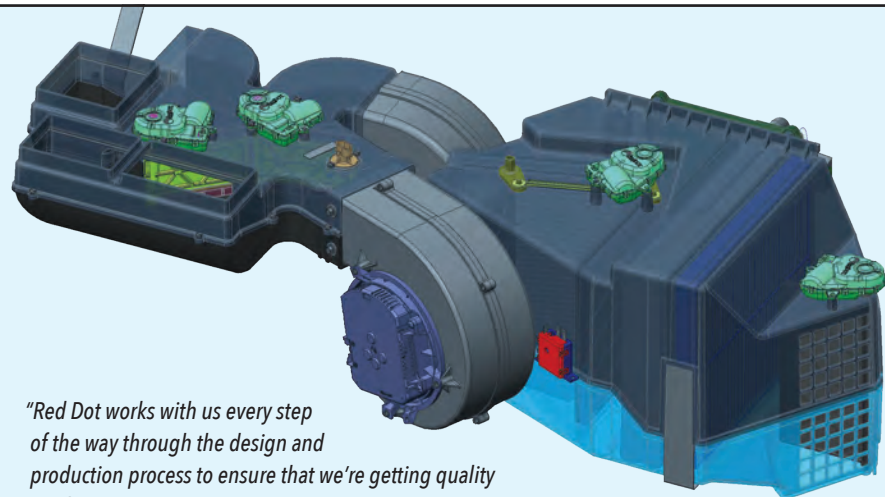
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autonomous driving in the process,” explains Hamm engineer Hans-Peter Patzner, who collaborated in the development of the control system for the project. Patzner is now looking ahead to the next challenge, because the current construction of a second test track at Hamm will enable two different rollers to drive simultaneously. “For this, we have designed a collision monitoring system, which represents another important step toward autonomous driving,” he says.

Driverless shadowing roller

The second project has a different focus: In collaboration with the University of Osnabrück, the team has successfully converted a roller that, without a driver, automatically follows a road paver.

“Taking forward the concept of this shadowing roller, we can leverage a great deal of potential by automating the compaction process,” says Römer. “There will be an increase in quality thanks to compliance with lanes and windows of speed. Targeted braking of the

roller can avoid going beyond the rolling areas and any subsequent over-compaction. Not least, the extremely precise change of compaction lanes helps to prevent deformation. Together, these systems automatically lead to greater efficiency, in particular when applied across the fleet.”

New regulatory frameworks

Aside from the technology, there are a number of legal issues to consider before such rollers can be put to work on the autonomous construction site of the future. A number of questions arise in relation to this technology, such as: Who is liable in the case of damage caused by a self-driving machine: is it the manufacturer, the owner, or perhaps the planner? Moreover, questions will have to be answered regarding the assessment of unclear cases within a workzone: Should the control system be configured so that nearby objects are protected, or should optimum compaction quality always take precedence? Manufacturers and users will have



“BY AUTOMATING THE COMPACTION PROCESS THERE WILL BE AN INCREASE IN QUALITY THANKS TO COMPLIANCE WITH LANES AND WINDOWS OF SPEED”

Dr Axel Römer, head of R&D, Hamm

TOP: Shadowing roller principle: a manned machine follows the paver. A number of unmanned rollers shadow the manned machine and mimic all of its activities

to discuss such matters with clients, authorities, politicians and legislators before such questions can be fully answered.

Because the development of autonomous construction machinery will invariably involve a good deal of expenditure on the part of manufacturers, Hamm has also examined the framework conditions for the establishment of such systems. “We think that, even in 50 years’ time, we will still need and construct asphalt and concrete roads,” says Klumpp. “However, to take a step closer to self-driving machines, the general environment must change, including the construction processes. In our industry, self-driving machines are found in the mining sector, for example. There, highly standardized work is carried out in closed systems; there are few points of



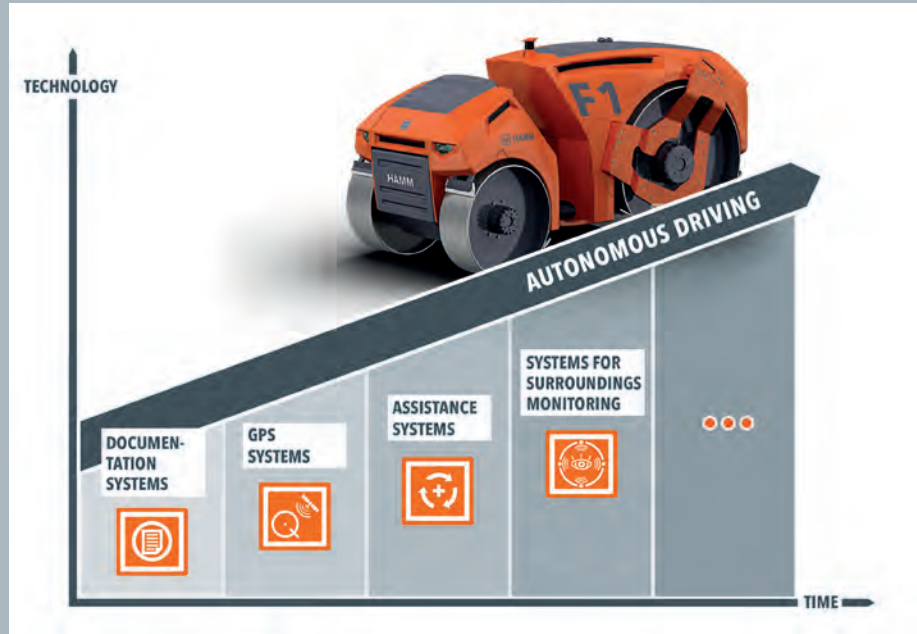
LEFT: The influencing factors in the development of the autonomous construction site are varied and numerous

THE PATH TO FULL AUTOMATION

Whatever form fully autonomous compaction will eventually take, the journey there will be a gradual one. Currently it is partially realized via driver assistance systems.

“Step by step in the years to come, they will relieve the burden on drivers,” says Hamm CTO Dr Stefan Klumpp. “Already now, they are inspired by the vision of autonomous rollers. And, of course, every new assistance function – independently of the vision of autonomous rollers – is beneficial for the compaction process.”

As long as the monitoring of surroundings is not sufficiently precise for fully autonomous driving, a roller driver will need to oversee the vehicle from the cab. He would only take over in specific situations, for example for refueling, during loading and unloading, or in the event of unforeseen incidents. A similar situation already prevails in the field of aviation: in modern commercial aircraft, the autopilot and other systems carry out the greater part of in-flight tasks. The pilots control the aircraft only during take-off and landing, and in exceptional situations, otherwise their main task is to monitor the processes.



“WE HAVE FORMULATED OUR VISION. THIS HAS RESULTED IN INDIVIDUAL PROJECTS THAT, LITTLE BY LITTLE, WILL LEAD US TO AUTONOMOUS COMPACTION”

Dr Stefan Klumpp, chief technical officer, Hamm

contact with the outside world and few unforeseeable influences on the process. With such clearly defined boundaries, giant dumpers are already transporting rocks across large mines that span kilometers – without a driver. In road construction, by comparison, the processes are far less clear-cut and so they are much less easy to structure. Every construction site is a little different. There is also much more contact with the surroundings (and therefore much more potential hazard), and user behavior is not uniform. So that we can continue

to leverage potential through automation, we would have to introduce, for example, larger construction sections and more standardization throughout road construction. In turn, this requires a change in thinking among planners and construction companies.”

From roller driver to manager

Ultimately, the job description of the roller driver will also change. First of all, further automation could alleviate the issue of skills shortages. The job description would change again in the subsequent step, when shadowing rollers or largely remote-controlled rollers become established on the construction site: from a driver steering a machine to a roller manager who configures and supervises an entire fleet of machines – perhaps even working from an office. This kind of development will initially occur in the high-wage countries, provided that it entails qualitative and commercial advantages. In this case, it would result in cost savings

through greater efficiency, and with fewer staff. In addition, rework would be eliminated thanks to higher quality. Of course, this will demand suitable interfaces and planning tools on the part of planners and customers, as well as a corresponding legal framework. This environment will have to evolve in parallel with the machines.

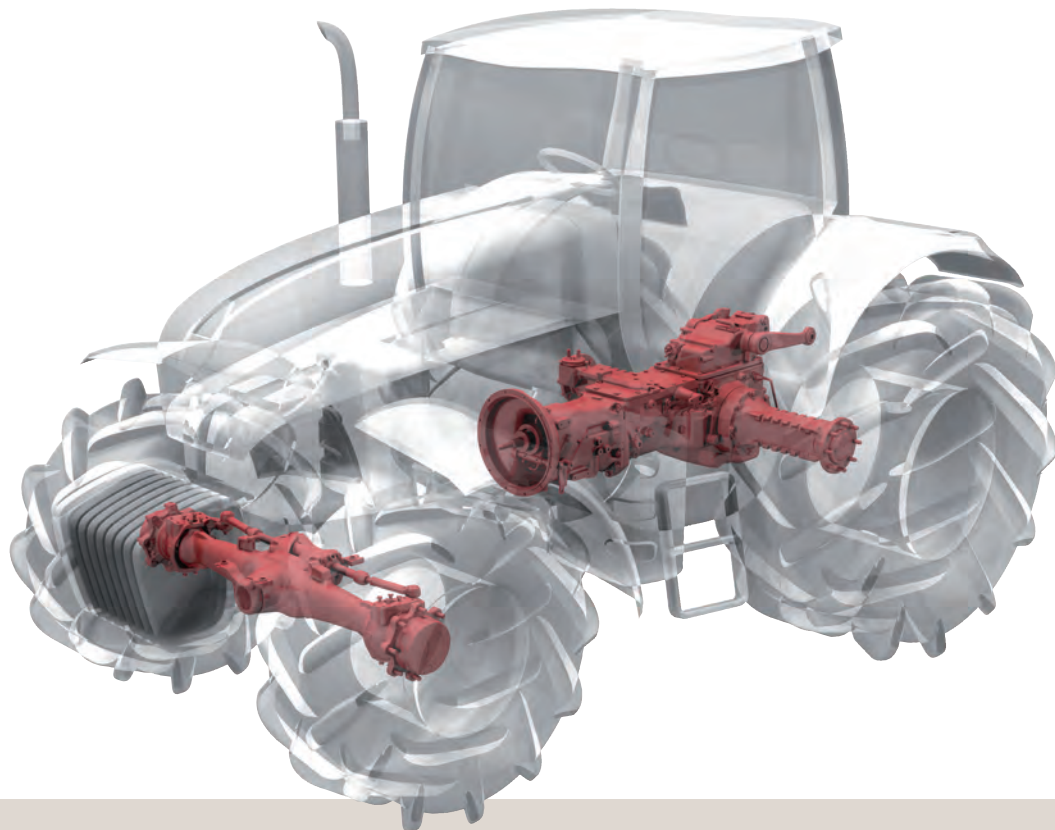
Vision for the future

Activities at Hamm go beyond exchanging and developing ideas about the subject of autonomous driving. Klumpp describes the roadmap: “We have formulated our vision. This has resulted in individual projects that, little by little, will lead us to autonomous compaction. For some, our long-term objective may still sound like science fiction. But in 20 or 30 years, many aspects will already be reality – even routine. Eventually, aided by our developments, the road construction methods of the future will be even more efficient than they are today.” **iVT**

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FEATURING

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electric tractor – the inside story **p30**

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Claas has completely updated its
Axion 900 tractors **p80**



**EXCLUSIVE AGRITECHNICA
PREVIEW p88**

A portrait of Prof. Dr. Peter Pickel, a middle-aged man with short grey hair and light eyes, wearing a grey suit jacket, a light blue shirt, and a patterned tie. The background is a solid, bright yellow. The text is overlaid on the lower part of the image.

AS DEPUTY DIRECTOR OF JOHN DEERE'S EUROPEAN TECHNOLOGY INNOVATION CENTRE, PROF. DR PETER PICKEL AIMS TO KEEP THE AGRICULTURAL GIANT AHEAD OF THE COMPETITION, AND HAVING OVERSEEN THE DEVELOPMENT OF AN ALL-ELECTRIC TRACTOR PROTOTYPE, HE IS RIGHT ON TARGET

THE NEXT

35%

Approximate
efficiency of
diesel engine
in converting
thermal energy
to mechanical
energy

80%

Overall
efficiency of
charging and
discharging
a battery

90%

Approximate
overall
efficiency of
electric motors

▶ Ask about the SESAM (John Deere's world-first, battery-powered high-performance tractor prototype) and a note of boyish enthusiasm seems to chime through Prof. Dr Peter Pickel's conversation.

With a mammoth 670V lithium-ion battery pack in the space traditionally occupied by the engine and fuel tank, the SESAM (Sustainable Energy Supply for Agricultural Machinery) Tractor is driven by two 150kW electric motors providing output of 400hp or more and a top speed of 50km/h, outperforming the comparable 6215 diesel model while remaining extremely low-noise and emission-free. But the limiting factor is battery capacity: with three hours charging time needed after every four hours of typical partial-load operation, for now at least John Deere has ruled out the possibility of the SESAM becoming a commercially viable proposition.

For Pickel, deputy director of John Deere's European Technology Innovation Centre at Kaiserslautern, Germany, where the SESAM was designed, present constraints are of less significance than the future possibilities which this essentially visionary project aims to demonstrate. Developed with financial support from the German Economic Ministry, the SESAM is intended to anticipate a bright new age of autonomous, energy-independent agriculture whose dawning will depend on the advance of electric machines.

Electric future

"There are three reasons why electrification is a key enabler for future agricultural machines," he explains. "The first is that electrification is a highly efficient drivetrain technology. In practice, a diesel engine achieves about 35% efficiency in converting thermal

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“WE ARE TALKING ABOUT HIGH PRECISION. THE VISION IS THAT EACH PLANT [WITHIN A CROP] WOULD HAVE A NAME AND BE TREATED AS AN INDIVIDUAL”



35%
The amount of electric energy that comes from renewable sources in Germany

energy into mechanical energy. Charging and discharging a battery can be done with overall efficiency of 80% and electric motors have an efficiency of about 90%.

“The second reason is that electricity is a key enabler for automation. Today, we are talking about smart farming with autonomous machines with high precision. The vision is that each plant [within a crop] would have a name and be treated as an individual – and if you want to operate with the highest accuracy, you need highly dynamic, independent drivetrain behavior.” Coming from a production technology background, rather than agriculture, Pickel is quick to draw a parallel with the transition from mechanical to electric drivetrains in production machines over recent decades, facilitating the advent of computer numerical control (CNC).

On the efficiency of electric vehicles Pickel takes a long-sighted

RIGHT: Where a tractor's engine would be traditionally located, John Deere's SESAM has a massive bank of batteries



view, considering machines not merely in isolation but in relation to the whole production chain. “You have to ask, ‘Where does this electricity come from?’” he says. “If it’s from a power plant running on coal, then the plant has the same problem of converting thermal energy into mechanical energy with an overall efficiency of about 50% and the vehicle’s overall efficiency drops into the dimension of a diesel engine. But if electricity comes from windmills or photovoltaic systems, then the overall electric drivetrain efficiency is very good indeed.” Such

joined-up thinking about the energy economy is what provides the final predicate of the SESAM venture.

“The third reason for electrification is that, more and more, farmers are becoming producers not only of food but also of energy. They have land to install windmills and photovoltaic systems and the opportunity to grow oil plants for fuel and to produce biogas. In future, farms will increase self-supply of electricity and consider how they can use this for their mobile machinery.” In Germany, around 35% of electric



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WHAT'S INSIDE THE SESAM?

The SESAM Tractor prototype incorporates a 670V lithium-ion battery system, which drives two 150kW electric motors, one powering the drivetrain via DirectDrive 24-speed transmission while the second is used for lubrication, hydraulics and PTO (power take-off) in standard operating mode. Hence PTO can be varied independently of drive speed and auxiliary drive speed reduced in partial load conditions. Extended mode links the two motors, temporarily increasing drivetrain power to 400hp – nearly twice the maximum output of a comparable diesel model such as the 6210.

"You can also run the machine with 500hp," Peter Pickel explains. "A diesel engine has a precise limit, but you can overload electric motors for 30 seconds and nothing will happen. But if you pull all the time with full power, you decrease battery life." This is estimated at

four hours in typical mixed-mode operations with three hours of subsequent charging required. However, 90% of braking energy is recovered, while energy loss through idling is eliminated and the electric drivetrain offers high efficiency with maintenance-free components. It is quiet, CO₂-neutral and emission-free.

"It has the same feeling as a conventional tractor with the same controls and operational capabilities – everything. One of our goals was to make the SESAM a true tractor that can do any operation a comparable standard tractor can do."

Although the SESAM may not make the trip to Agritechnica 2017, John Deere will be bringing plenty of other exciting new friends to the party. These will include the S700 Series combine range, incorporating the latest

automated harvesting technology, as well as the state-of-the-art 6230R and 6250R tractors, boasting outstanding power-to-weight ratios and billed as glittering new flagships for the John Deere 6R Series.

See page xxx for a full case study of John Deere's S series combines



LEFT: One of the key principles of the SESAM design was that it should be able to perform all the operations of a standard tractor of the same size

energy already comes from renewables and some regions are almost energy-independent, helped in part by an increase in energy production from farmland.

A sustainable agricultural future is envisaged wherein renewable energy harvesting and farming will coexist, providing a dual income stream. The land will be worked by electric vehicles charged with clean energy generated on the same farm. As battery technology improves and more farms subscribe to this model, potential will grow for farms to

provide grid services. If photovoltaic systems cause overproduction of energy, batteries can be used to store this and return it to the grid when needed. If photovoltaic production drops due to cloud cover, farmers could be asked to put their batteries on the grid, keeping it stable, instead of working their vehicles.

European dream

As John Deere's manager of external relations, Pickel is responsible for advanced engineering and research projects pursued in coordination

with universities and other organizations, often with national or EU funding. He is especially passionate about this collaborative dimension to his role, which offers a sense of involvement in something much larger than John Deere. "What I enjoy most is the EU scene, being active on many committees and societies. I'm chairman of the European Sub-Technology Platform for Agricultural Engineering Technologies, collecting future topics, submitting and preparing White Papers and presenting to the European Commission. I am representing a larger group of companies and I work a lot with universities; working with young people gives me new ideas every day. I think Europe has to grow together, not diverge."

Indeed, working together toward technological solutions is a consistent thread that runs through Pickel's thinking. With everybody



90
The percentage of braking power recovered by John Deere's SESAM tractor

LEFT: The SESAM is ready and waiting for the advent of all-electric attachments

because the machine would stand for longer in the field without being able to run. So we need machines that do not fail – or which have very, very good disturbance management systems – as an inherent part of automation.”

Even more instrumental to the advent of autonomous farming will be a change in the popular mindset. Pickel points out that, from a technological standpoint, autonomous farming has already been possible for several years. “The reason we don’t do it is legal – but I think two things will happen,” he says. “First, there will be a paradigm shift. People think now that autonomous machines are hazardous – but societies will learn that they are safer than man-guided machines or vehicles.

“This will lead to a second thing: car firms will put pressure on governments to change the law,” he continues. “As soon as we have legally autonomous cars on our streets, it will be possible to run autonomous tractors on the fields. We are perhaps 5 or 10 years away from that.”

Through projects like the SESAM, John Deere is clearly doing all it can to be well-positioned when that time comes – electrification being an important step toward automation. And, although Pickel strikes a cautious baritone of circumspection concerning the pace of change, his optimistic faith in what can be achieved in the fullness of time with bright minds working together across national and commercial boundaries rings out also, high and clear. **iVT**

On the Web
 See John Deere's SESAM tractor in action at www.iVTinternational.com/sesam

talking about smart farming as database packages multiply, a common approach is needed. “There are several products on the market already, like our software platform MyJohnDeere, an alternative to 365FarmNet. In future, there will be more solutions and all producers will commit to some basic platforms as a backbone and provide control solutions allowing for greater interaction between cloud-based services and machines.” He hopes also that cooperation may breathe fresh life into previously stalled projects. “In 2011 we tried to provide an electric tool interface as an alternative to hydraulic interfaces and PTO (power take-off) – but this failed because there were too few compatible implements on the market. It is a chicken-and-egg problem; we are waiting for implement producers to produce electric implements, so it’s a vicious cycle. The standard for electric interface on tractors is

developing under the lead of the Agricultural Industries Electronics Foundation (AEF) [see page 38 for the latest from the AEF]. Once it is ready – I hope by the end of the decade – then we hope to find some partners to take the next step in electrification of tractors.”

Reality check

Although optimistic about the horizons which cross-industry consensus and collaboration may open up, Pickel shows definite realism regarding current limits on the pace of progress. This applies not only to the viable mass-production of battery-powered tractors, but also to any imminent prospect of the widespread automation of big farm machines.

One obstacle to this is manufacturers’ current inability to promise the requisite standard of functional stability. “In a factory, autonomous tooling machine fleets run without interruption, without disturbance,” he explains, “but on the field we still need a tractor-man near the tractor-machine whenever a functional disturbance happens, such as a stuck baler. To work autonomously, you could send out a signal: “My machine is disturbed, please send service staff to repair.” But this would be unacceptable

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COORDINATES OF
AB LINES CAN BE
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“TRACTOR IMPLEMENT MANAGEMENT MEANS YOU CAN PUT A LESS SKILLED OPERATOR TO WORK – A CONTRACTOR, FOR EXAMPLE. IT’S USEFUL FOR ANY FARM PROCESS WHERE THERE’S REPETITION”

Mark Benishek, technical director, Association of Equipment Manufacturers

▶ Farmers have always liked to shop around for the best farming equipment, says Jim Wilson, president of AgGateway, a farming industry body aimed at promoting the expansion of e-business in agriculture.

“I grew up on a farm in Oklahoma in the 1970s and even back then we used all different brands of farm equipment,” says Wilson. “John Deere would really like all the world to take John Deere agricultural solutions, but farmers want to make an evaluation about what is best for each function.”

Of course, shopping around might be good for the farmer, but for manufacturers it raises the issue of interoperability – in other words, how do you make a John Deere tractor connect to a Kverneland plow?

In the past, interoperability was an easier problem to overcome, says Wilson. “Back then, the issue was

connecting things physically – for example, making sure your hitch or your power take-off (PTO) was compatible. The industry has now largely solved those problems.”

But the growing technological sophistication of farm equipment means that these days the issue is about connecting devices electronically, a far more complex undertaking, says Peter van der Vlugt, chairman of the Agricultural Industry Electronics Foundation (AEF).

“The average tractor today has 8-10 ECUs [electronic control units] on board,” says van der Vlugt. “So it’s all about electronics.”

The AEF exists to address the specific problem of machine interoperability. They do this by overseeing the implementation of ISO-11783, usually known as the ISOBus standard, a protocol created by the International Organization for Standardization that is meant to

allow cross-branded farming equipment to work together.

AEF implements the ISOBus standard through a certification process. But to do this the standard is constantly having to adapt to keep pace with new advances in farm technology.

Smart farming

One such advance, which an AEF team of engineers is currently working to standardize, is Tractor Implement Management (TIM), an innovation that enables the farm implement hooked on the back to give commands to the tractor.

“It’s basically a smart farming tool,” says van der Vlugt.

He gives the example of a bailer that can command the tractor throughout the bailing process.

“When the bailer knows that the bail is ready, it can tell the tractor to stop driving because the bailer has

MACHINERY COMPATIBILITY

BELOW: ISOMatch Geocontrol software, in the ISOMatch Tellus unit, enables control of all ISObus-compatible Kverneland Group machines, including sprayers, spreaders and seeders



to be stationary for the bail to be net-wrapped and ejected," he says. "Next, the bailer can command the tractor to apply hydraulics to eject the bail. When everything is done, it can tell the tractor to resume driving."

In a round-baling process that typically produces between 40 and 45 bails per hour – and that can go on all day – bringing in this level of automation can greatly relieve the tractor operator, who already has to contend with having to steer constantly over the swath to make sure it goes into the chamber, says van der Vlugt.

"It also means you can put a less skilled operator to work – a contractor, for example," he says.

According to Mark Benishek, technical director of the USA-based Association of Equipment Manufacturers (AEM) and a member of the AEF steering committee, the TIM system is going to be extremely

useful "for any farm process where there's repetition".

The TIM technology can be applied to sprayers, says Benishek, with the sprayer programmed to command the tractor to go at variable speeds compatible with its spray setting.

Van der Vlugt, meanwhile, foresees an application in plowing: "If you have a farm management information system (FMIS) that provides a variable depth rate map for the field, and if this data is programmed into the plow, then the plow can command the tractor to raise or lower the hitch as it goes through the field based on this depth data."

Safety questions

When connecting together cross-branded equipment in this way, it's not just the question of interoperability that the AEF has to



ABOVE: ISObus devices promise plug-and-play compatibility



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THE GROWING PAINS OF THE ISOBUS STANDARD

While work on ISO-11783, usually referred to as the ISObus standard, began in the early 1990s, it was not until the early 2000s that manufacturers began to sell products conforming to it.

"It was developed by the International Organization for Standardization (ISO) through a working group over about eight years," says Peter van der Vlugt, chairman of AEF. "The working group was composed of experts taken from different, established industry and research groups."

As the standard became the industry norm, tens of thousands of ISObus implements, tractors and components came onto the market.

But, while farmers were promised that their purchases would offer a secure plug-and-play solution, some of these early ISObus-compatible products were dogged by a variety of frustrating functionality problems, says van der Vlugt.

"We found that there was a lot of variability in terms of reliability," he says. "This was very confusing and

frustrating for customers and manufacturers alike."

Mark Benishek from AEM says the problem was in part the complexity of the ISObus standard.

"It's thousands of pages long," says Benishek. "Perhaps because of this it seemed that when each manufacturer was looking at the standard, they were interpreting it differently. That's where the problems started in the field and why the manufacturers got together and basically said, okay, we need to ensure that we're all on the same page here."

The result of this industry pow wow was AEF, founded in 2008 by seven leading farming equipment manufacturers and two industry bodies, the AEM in North America, and in Europe the VDMA, a German-based mechanical engineering association.

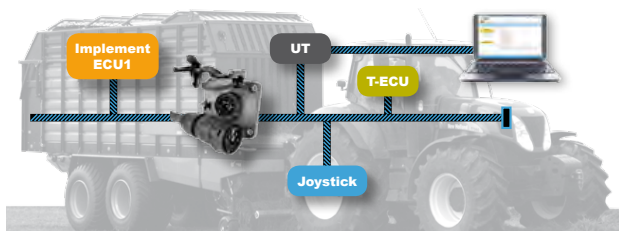
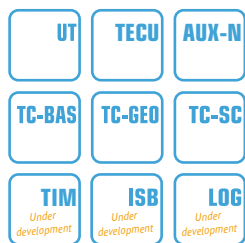
It has since grown to 200 member companies. "Almost all these companies are developing products that are compatible with the ISObus standards," says van der Vlugt.



An ISObus connector

"WE'RE WORKING ON THE ALGORITHMS FOR SECURITY PROTOCOLS NOW. NEXT YEAR, WE HOPE TO BEGIN TESTING IN THE FIELD"

Peter van der Vlugt, chairman, Agricultural Industry Electronics Foundation (AEF)



ABOVE: ISObus implement communication schematic

consider. There are also potentially thorny legal issues surrounding safety and liability. For example, the question of who is responsible when an implement's command results in the tractor causing an accident.

"We need to make absolutely sure that each piece of equipment plays by the rules of TIM, that it's AEF-certified and that it passes our security guidelines," says van der Vlugt. "This needs to be the case for both the implement and the tractor."

To do this, the AEF is working on security protocols that will ensure that when the tractor and implement meet up they exchange security certification data electronically, he says. Only after this exchange will the devices be unlocked and the tractor able to receive commands.

"We're working on the algorithms for these security protocols now," he says. "Next year, we hope to begin testing in the field."

Richer data

Another area of interoperability the AEF is seeking to make ISObus-

compatible is the interface between FMIS and farming equipment.

Much of this interfacing involves the collection and transfer of agricultural data, says Benishek.

"There's a lot of emphasis on handling data right now," says Benishek. "Data relating to the machine itself, but also information on how much produce is being collected and transferred, ultimately to the granary."

AEF has teamed up with AgGateway on this project, with AEF focusing on the data transfer between machines and to the FMIS, and AgGateway looking at the rest of the chain.

"A supplier or a researcher might want to know if there's a correlation between planting depth and crop yield, for example," says AgGateway's Jim Wilson. "We can liaise with AEF to see if machines are capable of collecting that data and transferring it to the FMIS."

Another important project currently underway at AEF is enabling wireless in-field

MACHINERY COMPATIBILITY

HOW TO ACHIEVE AEF CERTIFICATION

The Agricultural Industry Electronics Foundation (AEF) has two key strategies for cementing and growing the standardization of farming technology interoperability.

The first and main approach is regulatory. Any new product that wants to be declared ISObus-compatible must be certified.

To do this the manufacturer must request a time slot at an AEF test lab (there are five across the world – four in Europe and one in North America, the Nebraska Tractor Test Laboratory in Lincoln, Nebraska).

To help manufacturers improve their odds of passing the test, AEF licenses out its own

in-house 'conformance test' that can be used in the development phase of the new product to verify that it is compatible.

"Once the product is certified, it goes onto our online database, where customers can verify all the products that meet the standard," says AEF chairman, Peter van der Vlugt.

The second strategy is through showcasing AEF work. This is done through the twice-yearly Plugfest events hosted by AEF. The events, which alternate between locations in North America and Europe, bring together developers from different manufacturers to test the interoperability of their products against one another.



“A RESEARCHER MIGHT WANT TO KNOW IF THERE’S A CORRELATION BETWEEN PLANTING DEPTH AND CROP YIELD... WE CAN LIAISE WITH AEF TO SEE IF MACHINES ARE CAPABLE OF COLLECTING THAT DATA”

Jim Wilson, president, AgGateway

communication – helping a fleet of farm machines to communicate with each other wirelessly.

A team of engineers has already identified the best radio frequency for the wireless connection: a 5GHz band, the same bandwidth used in most wi-fi connections.

The practical applications for the wireless communication range from the relatively simple – a combine harvester with a full bin signaling to a tractor-wagon combination that it needs to unload, for example – to more complex data-sharing, such as coverage maps and AB line coverage.

Coverage map sharing would allow the operator of one machine to visualize the work area already covered by another.

"So, for example, if a machine has been out fertilizing the field and a spraying operation is going to follow, then the second machine with the sprayer can see exactly what's been covered so far," says van der Vlugt.

AB line coverage, meanwhile, refers to the tram lines cut into the field when seeds are first put down.

When the farmer comes to drop fertilizer later on, they can avoid wastage by keeping the vehicle within the confines of the lines, known as AB lines.

"If the exact coordinates of these AB lines can be exchanged between the machines, this could be very helpful," says van der Vlugt.

The coordinates of swath lines produced when drying hay could also be useful to communicate to other machines that are coming to collect the swath, he adds.

Seeing the future

The AEF team is also looking at standardizing wireless communication between cameras mounted on farm equipment, says van der Vlugt. Allowing different machine operators access to what others are filming could be helpful in the case of combine harvesting, he says.

The spout at the back of the combine harvester that sprays grain into the tractor-wagon combination that follows behind is usually already fitted with a camera so that the operator can monitor the process, and the position of the tractor-wagon, too.

To distribute the grain evenly throughout the wagon, the tractor operator has to drive at different speeds so that the spout is directed at different points up and down the length of his wagon.

"Having access to each other's cameras during this operation would help both operators be able to adopt the best possible driving strategy," says van der Vlugt. **ivT**



LEFT: Complex attachments such as sprayers can be made more effective if greater communication with the tractor is enabled

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In the driving seat

DESIGNING THE PERFECT INDUSTRIAL VEHICLE CAB HAS BEEN A HOT TOPIC EVER SINCE THE 'CAB CONCEPT CLUSTER' UNVEILED ITS GENIUS CAB IN 2016. NOW, AS THE GROUP PREPARES TO REVEAL ITS LATEST WORK AT AGRITECHNICA 2017 IN HANNOVER, WE TAKE A LOOK AT SOME OF THE OTHER INNOVATIONS AND CONCEPTS TAKING SHAPE IN THE FIELD OF ERGONOMICS



Alberto Seco's concept Valtra Hexagon tractor takes cab ergonomics to a new level with a repositionable, 360° rotatable cockpit



**“IN AUTONOMOUS MODE, THE FARMER
COULD USE THE CAB AS AN OFFICE. THE
CAB WOULD BE A CONVENIENT PLACE
FROM WHICH TO CHECK THE REAL-TIME
STATUS OF CROPS”**

Alberto Seco, industrial vehicle designer



ERGONOMICS

▷ There is no computer system that is as adaptable as the human mind. Artificial intelligence is just that. So for the foreseeable future, someday or somehow we will be engineering a human into machinery. If we are to get the best from our machine, it is essential that our operator can comfortably access the machine's facilities and can do this without undue fatigue or stress. We call this ergonomics.

The companies within the CAB Concept Cluster (CCC) – a union of component manufacturers dedicated to pushing cab design forward – make much of their ability to synergize and optimize designs through liaison, but that does not mean that theirs is the only or even the desired route. There are other companies that are working on optimizing the operator experience and deserve just as much recognition for their efforts. We take a look at some of these companies who still offer OEMs the ability to decide how and with whom they work and what mix of components suits their machines perfectly.

With Agritechnica on the horizon, the emphasis for many shifts toward the agricultural

markets and it is no surprise that many OEM suppliers will use developments that have been honed in the wider industry to address the requirements of this market. Cabin manufacturer and designer Fortaco indicate a continuing trend to crossover concepts from the automotive sectors. Jochen Adam-Mueller, vice president, marketing and business development at Fortaco, confirmed that operators are expecting cabins to be “more like cars”, incorporating more electronics, which means that cab frames need to be designed to accommodate such systems. Luxury functions such as keyless security,

ABOVE: Curtiss-Wright's standalone R-Module control unit and Orlaco's EMOS 2-Wire HD Ethernet camera

OPPOSITE: Alberto Seco's concept Valtra Hexagon has a drone fitted on top of the cab to improve precision of operations



where simple possession of the vehicle key arms the ignition and vehicle systems, will come. Also system-specific door hinging and even powered window and door latching is in the cards. In fact, anything that increases convenience to the operator will be welcomed.

Switch versus screen

It has long been predicted that in future agricultural cabins there will be extensive use of GUIs (graphical user interfaces) and touchscreens. Some still find these cumbersome and awkward in comparison to tactile interface, which, even in today's complex automotive sector, seems still to be the preference. Mike Iles, marketing manager of Curtiss-Wright UK, comments, “Touchpads and screens are already being used

INSIDE STORY 1: THE VALTRA HEXAGON

Designed by Alberto Seco, the Valtra Hexagon is a new tractor concept. Rather than relying on a portfolio of equipment, the next step for farmers could be the integration of all agricultural equipment into a single tool carrier.

“The design of the Hexagon concept frame is based on providing the maximum room for large pieces of centrally mounted equipment,” says Seco. The front-arm folding design enables it to be used in operations such as front-loader work. They would also be used for fitting and removing the counterweight.

The cab is based on a ‘two conventional posts plus two double posts’ structure. The glass area, apart from the forward-sloped windshield, would be covered by solar panels. Convenient access is provided by means of steps placed on the mudguards, offering a gentle slope to climb rather than a vertical ladder.

Integration of operator station and seat would make possible the 360° interior rotating of the cockpit, which would allow

the operator to choose the best view toward the task in hand. Thus the backward-sloped windshield would improve visibility with front-mounted implements such as loaders, while the forward-sloped windshield would be ideal for front-mounted combine or forage harvesters headers.

“To enable the incorporation of different equipment on the frame, the cab is mounted on an arm attached to the center of the V-shaped frame,” says Seco. This configuration enables the rotation of the cab around the center of the tractor and also around its own axle. The shape of this arm is based on a hexagon to avoid crossing of the frame in longitudinal direction.

The electrically powered 370kW Hexagon would be able to operate fully autonomously. “In autonomous mode, the farmer could use the cab as an office. The cab would be a convenient place from which to check the real-time status of crops,” says designer Seco.

“While fully autonomous, the Hexagon would also allow manual control,” continues Seco. “Several Hexagon tractors could work simultaneously, following a master tractor or in-field operator. This connectivity would allow for having a tractor without cabs. The master tractor could be harvesting, followed by a second unit with a trailer. A third unit could be pulling a chisel plow, followed by another one operating a seeder.”

A drone fitted on top of the cab, which can be seen in the designs, would support activities regarding precision by using cameras and radars. Thus, this drone would enable soft hitching of implements. It would also be an ecological way of transporting goods between the field and the farm. It could transport soil samples to a laboratory to measure the amounts of herbicides or fungicides needed, for instance. The tractor's progress could be shown on a computer at the farm by GPS, or by means of the images taken from the air, by the drone.



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“TO ENABLE THE INCORPORATION OF DIFFERENT EQUIPMENT ON THE FRAME, THE CAB IS MOUNTED ON AN ARM ATTACHED TO THE CENTER OF THE V-SHAPED FRAME”

Alberto Seco, industrial vehicle designer



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in some cabs for selecting different operating modes. I think the joystick will remain as an operator interface for the foreseeable future, since they give excellent control of multiple functions." Underlining this commitment, Curtiss-Wright presented the HE joystick controller grip to the market recently. This grip is ergonomically designed for either hand. It reduces complexity without loss of effectiveness and orientates the product line toward modular assembly at production level.

Because of the individual requirements of many vehicle manufacturers, the ability to customize has become paramount. "A modular type of approach would seem to be the way ahead," says Iles. "The main issue with these HMI controls – especially armrest systems – is the expense of developing and tooling. For high-volume vehicles, the economics work fine, but for low-volume specialists, these can be prohibitive, since every vehicle may have a unique requirement."



Unbridled joy(sticks)

Caldero in Sweden has continued to focus on joysticks and has split them into three basic families

1. Defrost vents keep front windshield clear in all weather conditions
2. Configurable foot pedals
3. Removable touchscreen IP for all machine functions
4. Closed box construction FOPS/ROPS
5. Easy access E stop button
6. Roof-mounted HVAC system
7. Configurable implement joystick
8. Configurable directional joystick
9. Powered sliding structural doors

INSIDE STORY 2: ARTICULATED BEHEMOTH

Industrial designer Phil Pope believes the ever-increasing size of farms will demand ever larger machinery, which is why he designed his cab of the future on a giant, articulated tractor.

"I see tractors only getting larger," says Pope. "Larger tractors means longer wheelbases, bigger hoods, tires, fenders and superstructure platforms, creating more visual obstruction for the operator. This translates to more stress and fatigue on the operator, reducing operator comfort and productivity."

The current industry solution on large equipment is to use cameras and video screens mounted in the cab to prevent large blindspots. But most operators would rather see what's behind them with their own eyes. But twisting and turning your torso and shoulders all day long to see what's behind you can be taxing.

"My solution is to borrow from the road machinery and scrap metal industries," says Pope. "The result is a rotating cab that can be elevated to give the operator superior visibility all around. The rotating cab enables the operator to monitor the implement and watch forward of them without having to physically twist their entire body to look behind them."

The cab would have a large mono closed-box ROPS (rollover protection structure) that expands out to both sides in the roof area to eliminate the need for A and B pillars. This is achieved with powered sliding doors on both sides made of structural glass. The result is an unobstructed 200°+ panoramic view. Rotating the cab 45° to either side will give the operator forward view and rear view of most if not all of the implement being used.

The machine is controlled and monitored by a removable touchscreen display. The display can be brought to the technician instead of the technician going to the tractor to diagnose problems.

The right joystick is for controlling attached implements. The left joystick can be configured in several different manners to operate machine travel. The same goes for the floor peddles. They can be configured to control the cab direction or to control the available skid steer option along with chassis articulation for tighter turning.

"The tractor itself has a dual articulating chassis that allows for 46° articulation to either side," says Pope. "It has eight tires set up on oscillating bogies. Each tire is driven by an electric traction motor."





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(fingertip, palm and full grip) to allow OEMs to specify the most suitable switch for their application. The CO3A fingertip controller, for example, despite being less than 28mm high, is still available as a three-axis design with full digital proportional control, while the new C15 joystick is designed as an 'unbreakable' full-grip model with the opportunity to incorporate multiple switching on the head of the grip. Operator safety is further enhanced by Caldero's 360° capacitor-based proximity switch in the handle. Erik Kauppi of Caldero explains, "This is an advanced dead man's handle. It disables the function switches unless it detects the presence of the operators hand, ensuring no system can be inadvertently triggered. No pressure is required to enable it, so this minimizes operator fatigue."

Wireless connectivity

A parallel development could also see Curtiss-Wright's CJSM2 Joystick Module, currently its most advanced product, introducing Bluetooth technology into off-highway applications. This standalone and totally wireless module was developed for the medical mobility market, but its ability to interface with multiple discipline modules, including infrared and wi-fi, could enhance future cab setups by communicating directly with smart subcomponents.

Tying into advanced communication methods, Orlaco will soon release its own EMOS 2-Wire Ethernet camera along with the accompanying communications module (WISR). Orlaco has not released too much detail, but the system will be compatible with BroadR-Reach technology, which reduces the wiring profile, while

WHAT'S INSIDE CCC'S SMART CAB?

CCC is now the designation for the Cab Concept Cluster, a German-led consortium dedicated to producing the ultimate in off-highway cabs.

CCC unveiled the Genius cabin at the Bauma expo in 2016, and with Agritechnica coming up in November, CCC is hoping for a successful launch of its agriculturally targeted Smart Cab. One can only speculate as to what will be involved in this design, but we know Grammer will be going all out to provide their best seating, possibly something using the high-strength MSG 285 suspension system that was of such interest when at Bauma. For the agricultural version, they may be tempted to add their Dual Motion seat top. Originally designed as a forklift truck concept, the upper backrest disengages from the main seat body when the operator has to swivel

his upper body to look toward the rear of the vehicle.

If the Smart Cab is to live up to its name, it's reasonable to expect a plethora of electronics. Machine management and process efficiency should be a given, as well as the opportunity to accommodate hybridization of the driveline of a vehicle. We may also expect drone control capability for optimizing harvesting or spraying patterns.

From an operational aspect, one could predict an elevated level of touchscreen or virtual instrumentation, but as the target vehicles for these cabins are yet to be fully defined, it will continue to be difficult to guess how this aspect will be configured.

One thing is certain: the CCC is keeping its cards very close to its chest and we may all have to wait until the Agritechnica exhibition to learn the full story.

RIGHT: This artist's impression of the Smart CAB is all that has been released by the CAB Concept Cluster ahead of its launch at Agritechnica. Nevertheless elements such as drone and crop-analysis technology are already being talked out elsewhere in the pages of this edition of iVT

enhancing capacity. EMOS 2-Wire can 'see' a field of up to 270°; conceptually with 'stitching' a 360° view is feasible. With HD, this could lead to object recognition and collision avoidance becoming integrated with the information, management and safety systems and falling under the control of a vehicle-based Ethernet.

Talking to your machine

The establishment of a local Ethernet opens up other possibilities – for example, voice control. Philips has been working on smart light bulbs (HUE) for some years. Smart bulbs have to communicate with each other via a 'bridge' (a virtual connection box), then each phase or parameter of the individual bulb must be given a local URL so that the system recognizes them. It's a lot of work, but is it viable? Idwal Wynne-Jones, technical advisor at Philips Lighting UK, says, "It's quite possible. Currently, HUE lamps are powered by the electrical grid, and



ERGONOMICS



communicate via a Zigbee mesh network with a bridge, which connects to the local Ethernet hub. Phones and tablets then control them via wi-fi locally or over the internet. There's partial integration with Apple's Siri, so voice control in vehicles is possible, just not with existing product."

Are you sitting comfortably?

Outside of the CCC, but still in the Bundesrepublik, W Gessmann has been busy with the Technical University of Dresden to study control position versus detrimental effects on the body. The study took into account the positioning of the

RIGHT: W Gessmann's KST 19, a multidiscipline pneumatically suspended seating module. The front edge of the seat squab is cut out, focusing support on the pelvic girdle and upper thighs

BELOW: The KST 19 accommodates multiple seating positions – and even standing work. Not just the seat, but the whole module can rotate. Control box modules, which effectively form armrests, adjust on both axes to reduce fatigue in the arms and shoulders



"[SMART LIGHT BULBS] AND COMMUNICATE VIA A ZIGBEE MESH NETWORK. PHONES AND TABLETS THEN CONTROL THEM VIA WI-FI LOCALLY OR OVER THE INTERNET. THERE'S PARTIAL INTEGRATION WITH APPLE'S SIRI, SO VOICE CONTROL IN VEHICLES IS POSSIBLE, JUST NOT WITH EXISTING PRODUCTS"

Idwal Wynne-Jones, Philips Lighting UK



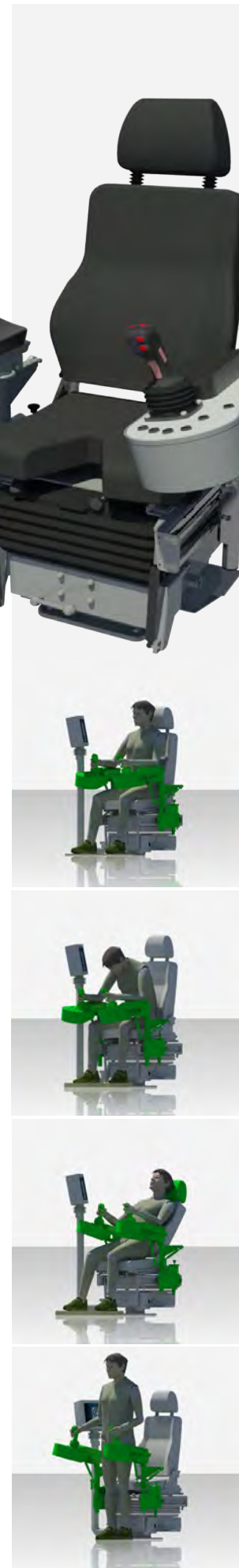
seat and control interface and considered the variables of posture, control module position and body size. It has long been widely assumed that a single specific body position should be achieved when attempting to optimize operator ergonomics. However, both from the medical and ergonomic aspect, Gessmann was advised that, for long hours in a cabin environment, the ability to change body position minimizes the risk of injury. The key was to ensure that, no matter in which position the operator chose to work, his principle muscle groups remain suitably supported, with the controls and the access screens in a similar or desirable aspect versus the operator's body. On this basis, the Gessmann KST 19 control unit was developed.

The KST 19 is a multidiscipline pneumatically suspended seating module that incorporates a seat system, integrated armrest/control modules and flexible graphic support modules. Gessmann

ensured that, in using the KST 19, no matter what preferred seating position the operator adopted, he was able to adjust the controls to fall ergonomically to hand, the seat provided the prescribed 2-7kPa support pressure, and the reference screens were comfortably within the operator's field of vision without excessive movement of the shoulder and neck muscles.

Custom made

It's hard to accurately define ergonomics. Practically, we are dealing with a range of individuals who have different perceptions of what feels comfortable and productive. We can do the math and demonstrate the science, but ultimately it is what the customer feels that sells a product. OEMs often have customers with specialized needs, so it may not always be useful to try to design the ultimate cabin, even if it looks good on paper. Choice may still be a more powerful selling point than refinement. **ivT**



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OEM PRODUCTION LINE

The new facilities are producing Deutz-Fahr 6, 7 and 9 series Agrottron tractors, plus other brand equivalents, and from next year will also make the 11 series of up to 440hp

OUTGROWING ITS AGING MID-HIGH-HORSEPOWER TRACTOR PRODUCTION FACILITY, SDF DECIDED TO CONVERT IT TO COMPONENT MANUFACTURE, AND TO BUILD A NEW PLANT ON NEIGHBORING GROUND. IVT GOT THE TOUR...

▶ While it also makes tractors in Italy, Turkey, India and China, combine harvesters in Croatia and grape harvesters in France, SDF has produced its mainstream higher-powered tractors in Germany for some years. Yet the facilities at its Lauingen site in the south of the country were, it would be fair to say, a little old-fashioned. That's not a description that can be leveled at the new manufacturing plant the company has now opened to address that issue, on a site just across the road.

Designed to take over the primary tasks of tractor assembly from the firm's long-established existing buildings, SDF Group's new factory, which is part of a €90m (US\$107m) investment ("the largest in SDF's history", according to Lodovico Bussolati, SDF's CEO) has been built on land acquired by the Italian-owned firm immediately adjacent to the existing factory buildings, which are now devoted to

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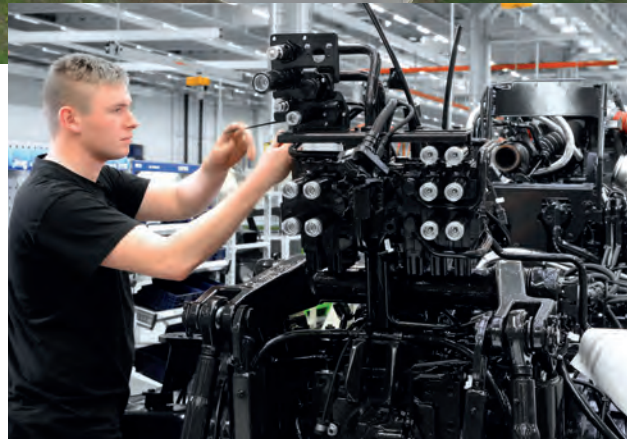
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OEM PRODUCTION LINE



150,000
size of the new SDF
factory in m²
(1,600,000ft²)



440
The maximum
horsepower engine
that will be produced
at the new factory

cab production. SDF, the business behind Deutz-Fahr tractors and other farm equipment, now has a completely new tractor manufacturing complex.

“The facility is producing four- and six-cylinder tractors of 130hp and above across all brands,” says Bussolati. And while the site will, as before, also manufacture equivalent SAME, Lamborghini and Hürlimann models, Deutz-Fahr is the ‘home’ brand as well as the group’s biggest, representing 63% of SDF revenues. For this reason, the site is regarded as a Deutz-Fahr facility, and the vast majority of its production will be of 6, 7 and the new 9 series Agrotion tractors bearing the green-and-black livery, plus SAME, Lamborghini and Hürlimann 6 and 7 series equivalents.

“By 2018 the factory will also produce the 11 series Deutz-Fahr Agrotion models up to 440hp,” says Rainer Morgenstern, commercial executive director, SDF Europe

The 150,000m² (1,600,000ft²) plot adjacent to the existing premises

was purchased specifically for the new facilities, and now houses a new L-shaped building with a covered area of 42,000m² (452,000ft²). The facility is supplied by a components warehouse comprising 4,000 storage areas for large parts and a small parts facility with 25,000 locations, served by an automatic handling arrangement: A shuttle-based system which dynamically adapts to the different throughputs, which vary throughout the day and the production process.

On the line

Based on a single conventional powered production line design that

MAIN IMAGE: SDF has built a completely new assembly plant next to the existing factory, primarily for Deutz-Fahr tractors of 130hp and above

INSET: Production capacity is reckoned to be 30-35 units a day, or four tractors an hour, depending on the model

carries machines slowly along as they are assembled, the main build area also includes innovative powered walkways for staff. Components are delivered at the moment they are required on the line, and staff walkways move in parallel to the tractor line at the same speed, making component installation easier and faster while minimizing the time workers have to spend unnecessarily moving around each machine.

Completed powertrains are passed to the next stage of manufacturing by overhead cranes.

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step, in-line hydraulic testing and a pneumatic test take place at the end of powertrain production, with up to three powertrains tested simultaneously for functioning and tightness at a hydraulic operating pressure of 220 bar. Once this is completed, the tractors move to the paint shop and then onto the final assembly.

Average build time per tractor is 16 hours, with a new machine rolling off the production line every 12 minutes. Production capacity is claimed to be 30-35 units a day, or four tractors an hour, depending on model. That translates to an annual figure of 5-6,000 units, again depending on model. Currently the factory produces three different Deutz-Fahr ranges, but there are plans for this to increase next year. Smaller Deutz-Fahr and other SDF group tractors for northern Europe are mostly built at the firm's plant in Treviglio, Italy.

Finishing touches

After final assembly, the computer-controlled final acceptance of the completed tractor takes place, with functions of all installed components tested individually



ABOVE: All installed components are tested individually for each tractor, with the front-axle and front-axle suspension fully load-tested

ABOVE: The Deutz engine business has now been a separate entity to Deutz-Fahr tractor manufacturing for over 20 years, but it remains a key powerplant supplier

for each tractor, a range of different engine and transmission speeds imposed on the machine, and the front axle and front axle suspension are load-tested.

Representing expenditure of €20m (US\$24m), the largest individual investment within the factory has been in the paint facility, where the powertrains move through a mostly automated painting process, which gives them their unique livery. After manual masking, protecting selected components through targeted

covering and closing off, the powertrains are cleaned by robots to remove oil, grease and contaminants. To shorten the first drying process before priming, cavities and recesses are blown out with air nozzles, after which primer is applied manually before the subsequent top coat is sprayed on by a robotic system. SDF claims this guarantees that all powertrains pass a salt water spray test of 720 hours without any signs of corrosion at all. As a comparison, in the car sector it is commonplace for manufacturers

OEM PRODUCTION LINE

to measure corrosion resistance using a much shorter 240-hour test.

The facility has its own electricity supply, with a combined heat and power plant generating the heat required for drying paint, as well as the electricity for the entire production process. Excess heat is used for heating the workshops, and surplus electricity is fed into the public grid.

Meanwhile, staff, dealers and customers are also expected to benefit from a new training, museum and brand experience facility for Deutz-Fahr, adjacent to the new factory.

“Customers want to see and experience how their tractors are manufactured,” says Morgenstern.

Constructed over a 10-month period, the new 3,800m² (40,900ft²) two-story Deutz-Fahr Arena houses an exhibition hall for current products, the Deutz-Fahr Museum – which includes classic Deutz and Deutz-Fahr tractors and combines, such as the DX series and Intrac – plus a cinema, merchandise shop and cafeteria. There are also conference and training rooms, while outside is a test track where visitors can operate tractors themselves. The firm says it expects the facility to host up to 3,000 dealer and importer staff, and 10,000 customers, annually. **ivT**

12
The minimum time
(in minutes) between
each new tractor
rolling off the
production line



Deutz-Fahr
tractors represent
63%
of SDF revenues

Based on a single conventional powered production line, the main build area also includes innovative powered walkways for staff

A SHORT HISTORY OF SAME DUETZ-FAHR (SDF)

Turn back the clock 20 years and, while it had a worldwide presence and a strong following in certain markets, Italian tractor OEM SAME was some way behind the big players. Acquiring the tractor interests of Lamborghini in 1972, and the Swiss tractor maker Hürlimann in 1979, brought it new buyers, but the strengths of the SAME-Lamborghini-Hürlimann group were rooted in southern Europe.

With 1995's acquisition of the tractor and farm equipment business of Germany's KHD – shortly afterward restructured as engine maker Deutz – the newly named SAME Deutz-Fahr (SDF)

group bought its way into a brand that gave it considerable market traction further afield, particularly in northern Europe. Adopting a common platform policy while retaining the distinct brands and liveries of all four makes kept loyal customers happy while going some way to countering the effects of the gradually shrinking global tractor market as farms become larger and fewer in number.

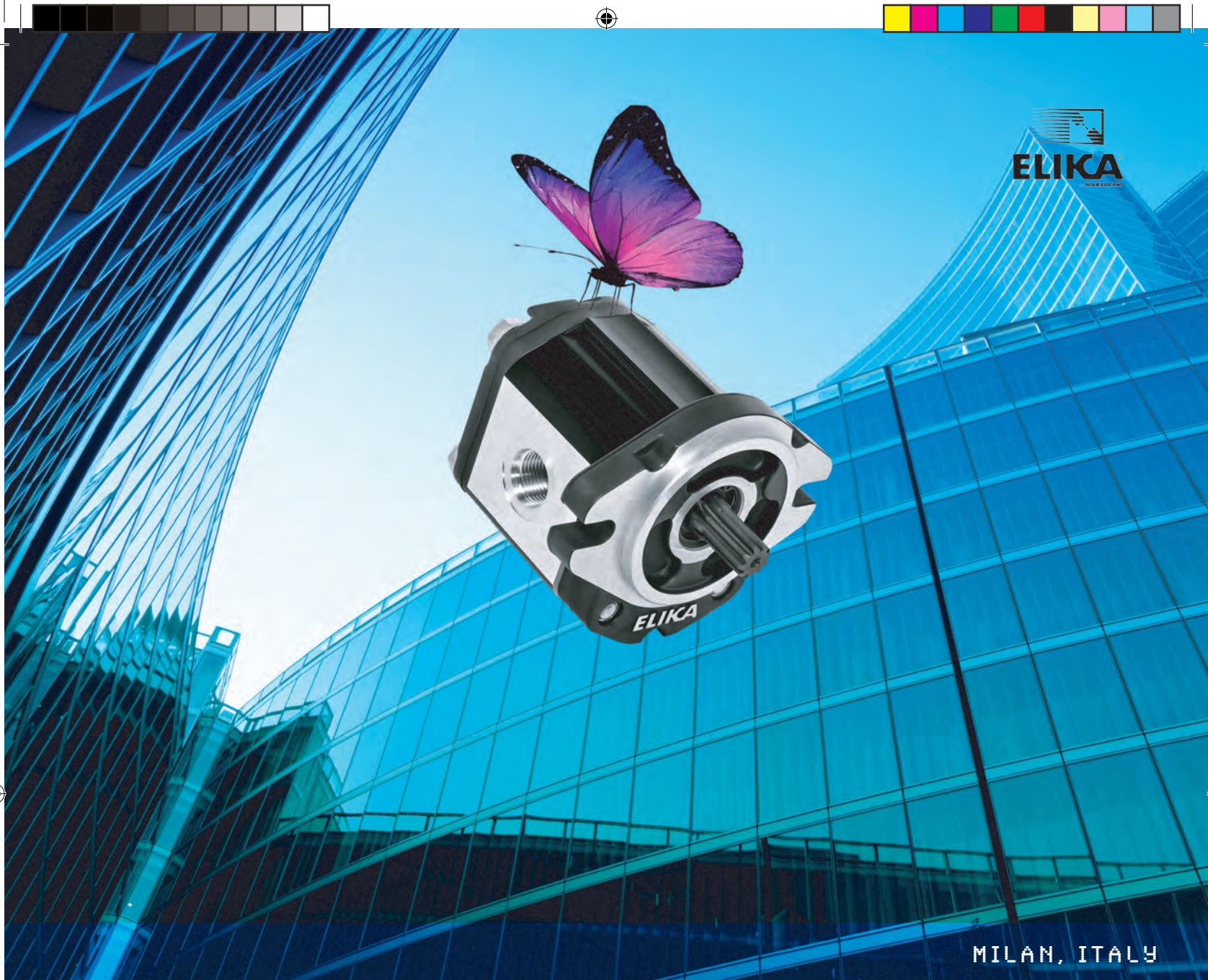
In terms of western Europe, that meant focusing smaller tractor production for all brands on the SAME factory in Treviglio, Italy, and ceasing production of large tractors there. Deutz-Fahr had

been manufacturing tractors at a factory in Cologne and combine harvesters at a plant in Lauingen, both in Germany. Faced with that shrinking market, in 1996 SDF decided to contract-out combine manufacturing for a time, close the Deutz-Fahr tractor factory in Cologne and refocus large tractor production for all brands at the Deutz-Fahr former combine plant in Lauingen.

But the aging infrastructure of the Lauingen facilities, which have been home to agricultural machinery manufacturing since 1870, gradually became an issue, particularly as demand for large

tractors grew and the old brick buildings became outdated.

Now SDF's biggest seller, representing 63% of global sales and considered its 'global' brand, Deutz-Fahr tractors have become the group's core focus. What this means is that the Lauingen facilities produce big volumes for the biggest brand within SDF, building all Deutz-Fahr 130hp-plus tractors, as well as the equivalents for SAME, Lamborghini and Hürlimann. The acquisition of adjacent land means that can now all be done in a new self-contained facility, with the old buildings switched to component production.



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Green machine

WITH THE LAUNCH OF THE S700 SERIES, JOHN DEERE HAS ROLLED OUT ITS MOST SOPHISTICATED COMBINE HARVESTERS YET, TAKING HARVEST AUTOMATION TECHNOLOGY TO NEW HEIGHTS. IT'S CERTAIN TO BE ONE OF THE NEW-VEHICLE HIGHLIGHTS AT AGRITECHNICA 2017

CASE STUDY JOHN DEERE S SERIES



CASE STUDY JOHN DEERE S SERIES



See page 30 for more John Deere innovation, explained by Dr Peter Pickel



“IT’S ABOUT USING AUTOMATED SYSTEMS TO ASSIST IN MAKING FULL USE OF THE COMBINE’S CAPABILITY AND CAPACITY”

Paul McCredie, manager for future combines and front-end equipment, John Deere

▶ Car manufacturers are beginning to shout long and loud about their latest advances in vehicle automation technology. The first fully driverless cars, we are told, will be here within five years.

Down on the farm, full autonomy is still some distance away, but John Deere and other agricultural machinery OEMs have been fitting auto-steering and telematics to their vehicles for some time. Deere, for example, has been perfecting the AutoTrac GPS system for 15 years, enabling operators to reduce overlaps and fatigue, which also helps to increase productivity. Accuracy is down to under 1in using the RTK (real time kinematic) satellite navigation technique.

“Our challenges come much more from automating the harvesting operation,” explains Paul McCredie, John Deere’s manager for future combines and front-end equipment. “It’s about using automated systems to assist in making full use of the combine’s capability and capacity. The new

Combine Advisor package automates certain parts of the combine to maintain consistent performance. Based on the customer’s desired performance level, it will maintain the grain quality, acceptable grain losses, the cleanliness of the grain tank and its capacity.”

Set and forget

Combine Advisor is a key feature of the latest S700 Series rotary combines that go into production this November in the USA and Germany, and will be showcased at Agritechnica in Hannover. It builds

on earlier developments that are part of the existing S600 Series such as the HarvestSmart system, which controls ground speed, and Active Terrain Adjustment, which automatically adjusts the fan speed, chaffer position and sieve position as the combine traverses hills.

Those two technologies reappear on the S700s in upgraded form but are joined by ActiveVision cameras – high-definition cameras in the clean-grain elevator and in the tailings elevator that monitor the cleanliness and quality of the grain, as an input into managing the



3.8
 The unloading rate for the S790 grain tank in bushels per second (135 l/sec)



ABOVE: S700 combines are able to constantly monitor quality and cleanliness of grain
LEFT: The 4600 CommandCenter is an app-based touchscreen display that's also found on John Deere tractors and sprayers

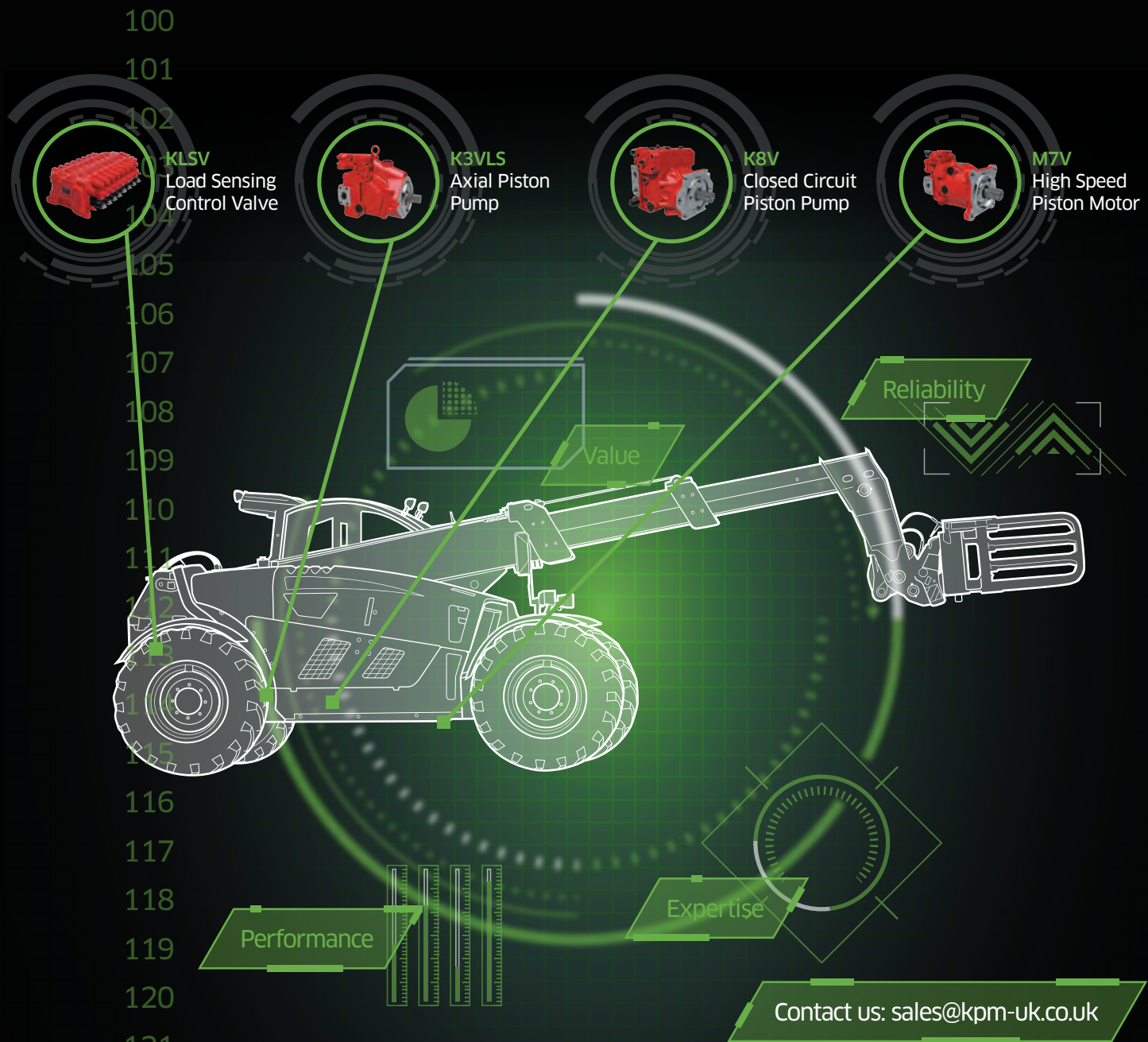
settings of the machine. Other inputs are sets of loss monitors on the back of the machine at the shoe and on the separator.
 "The level of performance the customer sets will depend on several factors," says McCredie, "including the capacity of the machine, grain loss management, what pressures they're under as to how many acres they need to harvest, whether

there's a storm coming, etc. The camera then takes a snapshot of what's happening in the elevators at that time – how many cracks there are, how much trash there is – and the readings on the loss sensors are noted. Combine Advisor will then adjust the machine to maintain that level as field conditions vary."
 As well as maximizing the harvest by seamlessly adapting the

machine to higher- or lower-yielding areas of the field, the system can free up the machine owner or lead combine operator to other tasks and leave the driving to a non-expert operator. Once the system has been set to auto-maintain, the driver is able to focus on driving rather than on what the machine is doing, providing additional peace of mind for the owner.
 Obtaining accurate yield data was the goal of another new addition for the S700 Series, ActiveYield.
 "One of the challenges prior to S700 was the need to manually

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“WITH ACTIVEYIELD, THE SYSTEM WILL CONTINUALLY CALIBRATE THE MACHINE AS YOU MOVE TO HIGHER- OR LOWER-YIELDING AREAS OF THE CROP”

Paul McCredie, manager for future combines and front-end equipment, John Deere

calibrate the combine's yield monitor, which measures yield via a mass flow sensor in the clean-grain elevator," McCredie explains. "But as the flow rate changes, so calibration changes.

"With ActiveYield, the system will continually calibrate the machine as you move to higher- or lower-yielding areas of the crop, therefore providing a much higher level of yield data accuracy."

The system works via three load cells in the grain tank that measure the weight of the grain pile within. Roughly every third-fill of a tank, the system is recalibrated to maintain the accuracy of data.

Combine comfort

Some of the other new features for the S700 are concentrated within

ABOVE: High-definition cameras form part of the ActiveVision technology that monitors grain levels and quality on John Deere's S700 combines

the cab itself, with a focus on ergonomic design to enhance operator comfort and ease of use.

The 4600 CommandCenter is an app-based touchscreen display that's also found on John Deere tractors and sprayers, but new to the S700 are apps that are specific to the harvesting operation. However, as McCredie acknowledges, the harvesting operation is so complex that even an app might not make the process as easy as one would wish. That's why so-called 'run

pages' have been developed for the display with shortcuts to the most important adjustments.

"The run pages have widgets that take you straight to a setting – for example, a shortcut into the app to adjust the residue system," he says. "It's the same process if I want to adjust the sieve or the chaffer. Instead of having to find the right apps – because there are lots of them, for machine and header settings, for AutoTrac and other things – we can shortcut in and the

THE CHALLENGES OF COMBINE TESTING



The combine harvester must be one of the world's most climate- and season-dependent vehicles when it comes to testing new models.

Laboratory simulation and test stands will get the program so far, but as Paul McCredie says, "It all has to come together as a solution and for that we have to test it in the field, with all the right crops and conditions, to verify that it does

what it needs to do. That process is very extensive and very expensive."

S700 Series development was led from John Deere's Global Crop Harvesting Product Development Center in East Moline, Illinois, in collaboration with development centers in Brazil and Zweibrücken, Germany, to make sure that the combines can handle not only local crop conditions, but also local homologation requirements.

"It typically takes anything from 3-5 years to develop a machine," says McCredie.

"Our customers have high expectations for quality and reliability, so it's about building in enough testing to ensure that we meet those expectations. Combine

Advisor is designed for the main five crops – wheat, barley, canola and oil-seed rape, soybeans and corn – so we have developed and tested the system for those five crops in South and North America, and in Europe.

"One of the challenges with combine development is that crop conditions change all the time," he adds. "We have to manage those variations with our systems, which normally means several years of harvest [in testing phase] before we can put something in production."

Limited-production S700 combines have been undergoing their final tests during the 2017 harvest season ahead of the start of full production in November.

customer can find everything they need straight away. The screen is customizable but we've worked with customers from an early stage to build what they need and I would say that most will never need to customize it."

One run page might be devoted to machine setup, with shortcuts into the apps to adjust the settings. When it's set up, the operator scrolls across to the harvesting run page, with shortcuts for monitoring or tweaking the machine's performance.

Also new is a redesigned, multifunction-control joystick,

"IT TYPICALLY TAKES ANYTHING FROM 3-5 YEARS TO DEVELOP A MACHINE... ONE CHALLENGE IS THAT CROP CONDITIONS CHANGE ALL THE TIME"

Paul McCredie, manager for future combines and front-end equipment, John Deere

which has a more comfortable shape and is said to be easier to use. To reduce fatigue from long stints in the cab, the seat has a new cushion, better ventilation, and now swivels in both directions. There are new foot pegs and additional mirrors that show through windows the grain tank's state of fill, as a supplement to the grain tank fill-level sensors.

Mechanical advances

Alongside numerous detail changes for better reliability, a mechanical highlight of the S700 Series is the 700C/FC Series corn heads with the RowMax row unit. The latter is said to provide up to a 50% increase in the life of the row unit gathering

400

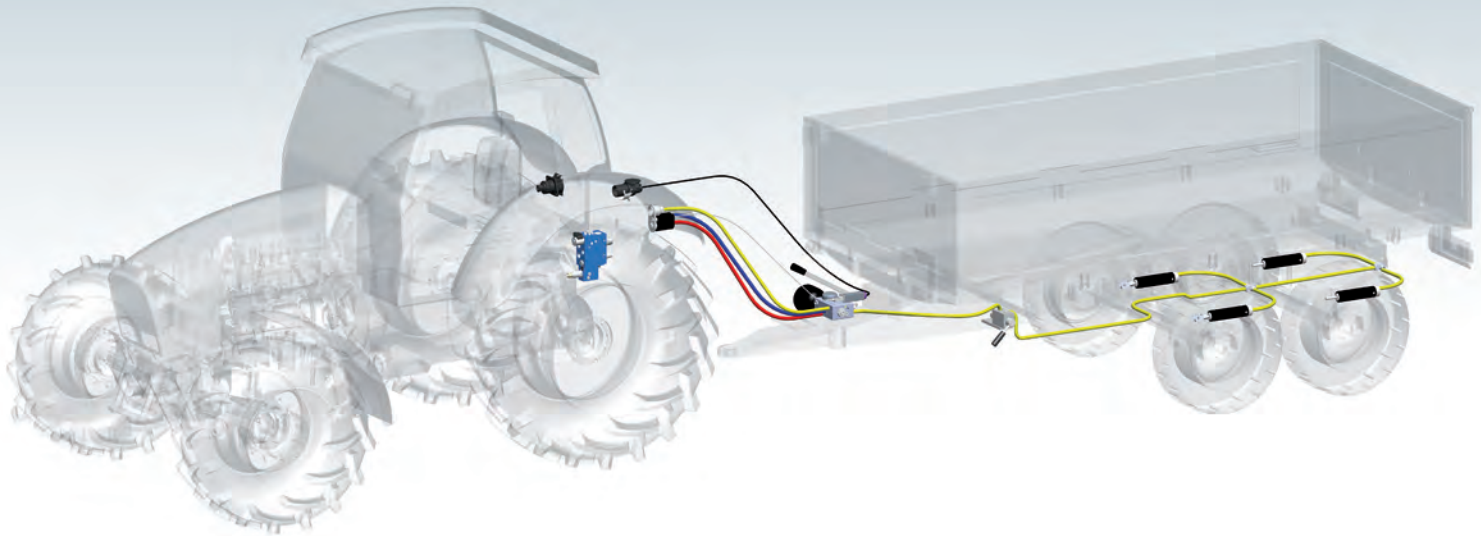
Grain tank size for the S790 in bushels (bu) (14,100 l)



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RVBR (EU 2015/68) introduction steps : 2016-2018-2020



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60-70%
of the crop acreage
in North America is
now farmed using
automatic guidance
systems



The S700 combines are bristling with new technology, inside and out

GAINING ACCEPTANCE FOR NEW TECHNOLOGY

Like other major pieces of agricultural equipment, combines are now more sophisticated than ever before. Is there a danger that too much technology might alienate farmers who grew up without touchscreen devices? Not so, says Paul McCredie.

“A combine is a complex piece of equipment and the easier we make it to do its

job, the more the customers like it,” he says. “That doesn’t necessarily mean not having sophisticated systems on it; what it means is that as an operator, I can achieve what the machine is capable of without a lot of challenges and complexity. That attitude is pretty consistent across the generations.

“Take AutoTrac, for example. You set lines for the guidance

system across the field and the machine will follow the track. As long as it’s understandable and easy to use, customers of all generations like the system.”

The stats agree with him. According to figures from John Deere, 60-70% of the crop acreage in North America is now farmed using AutoTrac or similar systems. In Australia, that number exceeds 90%.



“WE’VE ALSO INCREASED THE LIFE OF THE STALK ROLLS BY UP TO 25% BY USING A HARDER MATERIAL AND ADDING A NEW WEAR COATING ON THE FRONT AND TRAILING EDGES OF THE BLADES”

Brittney Guidarelli, product manager for front-end equipment, John Deere

chains. Solid-alloy bushings reduce pin and bushing wear.

“We’ve also increased the life of the stalk rolls by up to 25% by using a harder material and adding a new wear coating on the front and trailing edges of the blades,” adds Brittney Guidarelli, product manager for front-end equipment. “As a result, we’ve decreased the cost of operation by reducing how frequently wear parts need to be replaced. Producers will experience a saving of up to US\$20,000 over five

years compared with previous John Deere combine models.”

The four models in the S Series are designed to provide the perfect fit for different farm sizes. There are two different, six-cylinder engine options, each with two power levels, and two grain tank sizes. In addition, European-built machines will feature specific headers, material handling components, residue package, sieves, chaffers and concaves, all designed to handle the continent’s smaller, high-yield crops and more straw. **ivT**

On the Web

For a video overview of the new S700 features visit www.ivTinternational.com/s700

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High climber

1,300

The total number
of Lindner tractors
manufactured
each year

Small but steep slopes, obstacles such as trees, rocks on green areas and narrow roads are challenges farmers face daily in the mountain regions of Austria, Switzerland and southern Germany.

Tractor OEM Lindner specializes in machines for exactly this type of

Switzerland, France, Italy and Slovenia are also important markets.

Innovation has always been an important focus for the company. In the past few years, its R&D budget has increased from 2% to 4% of total revenue.

One of its recent models is the Lintrac 90: the world's first standard tractor available with continuously variable transmission and steered rear axle. The rear axle can be steered up to 20°, which results in the excellent maneuverability of this already compact vehicle. It is already selling extremely well.

"We expected that half of all Lintracs sold would be equipped with a steered rear axle. In practice, we deliver 90% of vehicles with it," says David Lindner, the marketing and

"WE EXPECTED THAT HALF OF ALL SOLD LINTRACS WOULD BE EQUIPPED WITH A STEERED REAR AXLE. IN PRACTICE WE DELIVER 90% OF ALL VEHICLES WITH IT"

David Lindner, marketing and export manager, Traktorenwerk Lindner, Austria

application area. For 70 years, the medium-sized family business from Kundl, in Tyrol, Austria, has developed and produced tractors and vans for mountain and meadowland farming. With over 220 employees, it produces 1,350 vehicles each year. They come to market under the brand names Geotrac, Lintrac and Unitrac.

Lindner exports around 50% of its output, and beside Germany and

export manager of Traktorenwerk Lindner, and son of the company's CEO. Some 550 of these tractors have been sold since its launch in 2015.

Lead user method

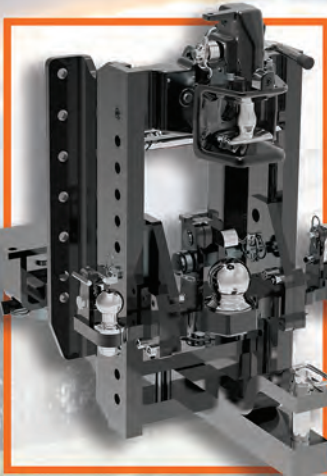
The introduction of the first standard tractor with steered rear axle is a prime example of a marketing-based

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50,000

The total number of Mobil Elektronik auxiliary steering systems sold worldwide



product development by the 'lead user' approach.

The aim of the lead user method is to integrate important customers into the development process, to develop ideas and concepts for new products or process innovations.

In this way, Lindner has analyzed the requirements of the customers and established that, especially in mountain and meadowland farming, there is demand for a more maneuverable tractor.

For a lot of smaller companies, it is important that multiple vehicles are combined in one – namely a standard tractor, a hillside mower and a farm loader. In addition to mountain and meadowland farming, this maneuverable tractor is used in viticulture, forestry and even in the municipal sector.

Ahead of the series production, selected users of Lindner's key markets tested the vehicle thoroughly. The results contributed to further development.

Besides excellent maneuverability, the additional rear-axle steering brings further benefits when using the machine on a slope. Rear-axle steering reduces crop and soil damage when turning and prevents drifting down on slopes, by enabling the rear axle to be steered manually in the same direction as the front

axle via the onboard display of the auxiliary steering system. With this diagonal drive, the vehicle is made stable on a slope.

Two family businesses

One of Lindner's key suppliers is Mobil Elektronik from Langenbrettach. Key products made by this supplier include electrohydraulic auxiliary steering systems that are well known under the name of EHLA. The company also develops and produces steer-by-wire steering systems for special-purpose vehicles.

Mobil Elektronik is a family business, too. It's not quite as old as Lindner, but it has been trading for more than 40 years and has more than 50,000 auxiliary steering systems in operation worldwide.

With EHLA systems, not just one axle is steered, but as many as the vehicle needs. The steering system is built out of standard components. If one steering computer is insufficient, multiple computers are used that communicate with and support each other, in case of an error. For instance, in the case of mobile cranes, it is possible for



CASE STUDY LINDNER LINTRAC 90



as many as six axles to be steered individually.

The task for Lindner was a bit easier. For the Lintrac, the EHLA Plus system was used. As with all EHLA systems, the steering computer, hydraulic unit, steering cylinder and angle transducer form a closed control loop.

The set point of the axle to be steered is calculated in terms of different influencing variables such as geometry of the tractor, steering angle of the front axle, and so on. If there are deviations to the set point, it is automatically readjusted. The steering angle of the front axle is recorded by an angle transducer. The vehicle speed is read redundantly by the CANbus or magnetic encoder. For the hydraulic supply, a motor-powered fixed displacement pump is used.

"It was important to us to get an individual system customized for Lindner," says David Lindner. As a result, Lindner's own hydraulic components have been integrated by Mobil Elektronik into the system for the rear-axle steering.

Road traffic and safety

The auxiliary steering system meets the requirements of the ECE-R79 Annex 6, so that it can be used on public roads. This was an important prerequisite for the Lintrac. The rear-axle steering is only active in field operation, being disabled for on-road use. This is safely achieved by a system that hydraulically

centers and locks the rear axle using block valves.

In the case of a safety relevant system error during field operation, the axle is also hydraulically locked in position by the EHLA Plus auxiliary steering system. This also happens using block valves.

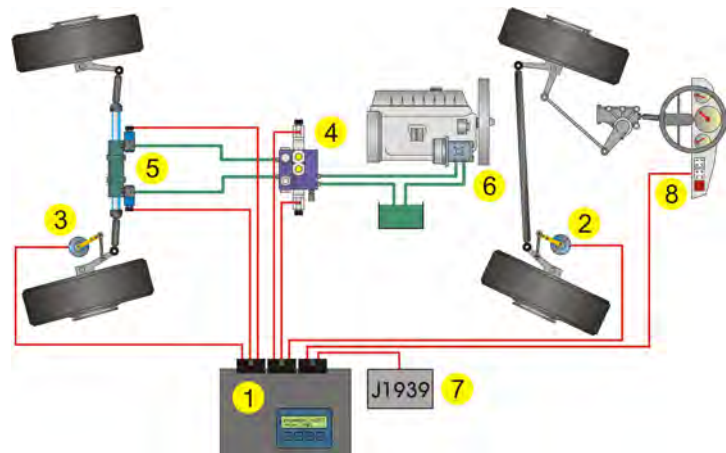
Different steering programs

During field operation, several useful steering programs can be activated. One of these programs is the snow-chain mode, which has been created individually for Lindner.

"ONCE YOU HAVE TRIED THE REAR AXLE STEERING, YOU'LL NEVER WANT TO DO WITHOUT IT AGAIN"

David Lindner, marketing and export manager, Lindner

- RIGHT: System diagram of a hydraulic rear axle steering type EHLA PLUS
1. Safety steering computer
 2. Safety angle transducer
 3. Safety angle transducer rear axle (actual value)
 4. Proportional hydraulic unit for fixed displacement pump
 5. Steering cylinder with block valves or after tube installation
 6. Fixed displacement pump
 7. Peripheral switching signals, speed signals, CAN connection J1939
 8. Connection of the steering system with CANbus operational and display terminal



The safety steering computer (1) forms – together with the proportional hydraulic unit (4), the steering cylinder with block valves (5) and the safety angle transducer of the rear axle (3) – a closed control loop

ABOVE: On the Lindner Lintrac tractor, steering is from both the front and rear axles

If this program is activated (via a cabin button), the steering angle of the rear axle will be limited electronically in order to avoid contact of the snow-chain-covered tires with other parts of the tractor.

Another helpful steering program is the mowing mode. Using this, the rear steering will only be activated if the front axle is steered by more than 20°. Other standard steering programs of EHLA Plus include all-wheel-steering and soil protection.

Apart from selecting the different steering programs, the user terminal shows the actual status of the steering system and alarm messages.

Positive future

"Once you have tried the rear-axle steering, you'll never want to do without it again," says David Lindner, who has a positive outlook for the future. Due to strong demand, there are plans to extend the Lintrac portfolio, and tractors with a greater variety of engine sizes will be available soon.

This is also good news for Mobil Elektronik as the agricultural machines sector is one of its core markets. Almost a quarter of all EHLA systems find their homes within this market.

Mobil Elektronik will be at this year's Agritechnica 2017 in Hannover, Germany, where it will be making new announcements.

The established EHLA Agritrailer systems will be face-lifted completely in November. **ivT**

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THE ALL-NEW AXION 900 RANGE FROM CLAAS IS MORE POWERFUL, MORE EFFICIENT AND EASIER TO USE – AND CERTAIN TO BE GAINING NEW ADMIRERS AT THIS YEAR'S AGRITECHNICA EXPO



claas

445hp

The power output
of the largest
Axion tractor,
the 960

act

CASE STUDY CLAAS AXION 900s

▷ Claas, the German manufacturer of agricultural machinery, has upgraded every detail of its Axion 900 tractor range, which was first introduced to the market in 2011. The company says that the refinements, and the upgraded parts, result in higher torque and superior traction performance. The maximum output of the new Axion 920 to 960 models is between 325hp and 445hp.


“We started work in 2012 and it took four years to upgrade every part of the tractor and push its performance a little bit further. You can go from front to back, or from side to side, and every component has been improved,” says Henning Ressmeyer, product manager for the Axion range of tractors.

Claas is a relatively new player in the tractor market. The company was founded in 1913 in Clarholz, Germany, and developed its reputation over the next few decades as a manufacturer of high-quality harvesters, as well as other agricultural machines. But tractors were not part of its portfolio until

1993, when the Claas Xerion 2000 large tractor was presented to the public for the first time. Following the company's acquisition of a majority share of Renault Agriculture, Claas expanded its product range to include conventional tractors in 2003. Initial ranges included the Xerion and Axos tractors and, in 2011, Claas presented the Axion 900 range at the SIMA show in Paris, France.

In on the Axion

The Axion 900s are the largest conventional tractors that Claas manufactures. Ressmeyer says two-thirds are used in large-scale arable farming, mainly for heavy pulling and applications like cultivating, plowing and seeding. Meanwhile, about 35% of Claas Axions are deployed by contractors for other applications such as material handling, pulling slurry tankers, spreading manure, or for compacting in silage pits. “The upgrades will make it easier to perform all these tasks. The new parts will increase the tractors’



“IT TOOK FOUR YEARS TO UPGRADE EVERY PART OF THE TRACTOR AND PUSH ITS PERFORMANCE A LITTLE BIT FURTHER. YOU CAN GO FROM FRONT TO BACK, OR FROM SIDE TO SIDE, AND EVERY COMPONENT HAS BEEN IMPROVED”

Henning Ressmeyer, product manager, Claas Axion range

€250

Annual average fuel savings (US\$300) thanks to Claas Eco PTO mode



LEFT: The Axion 900 series powertrain has been fully upgraded



ERGONOMIC UPGRADES

Claas has upgraded its Cebis control system for its new Axion 900 and Arion 600/500 tractor series. The redesigned system includes a high-resolution Cebis with a 12in touchscreen display. The previous Cebis display has been retained, but transferred to touchscreen operation.

The interface now has large icons to allow for simple selection of functions by touch. The direct access system functions by means of a picture of a tractor on the screen, known as the 'tractor silhouette'. The driver touches the required function area, such as the PTO or the engine, and it opens the relevant dialog window. Hydraulic spool valve settings can also be selected from the main screen.

Drivers can use the 'direct access' button on the armrest (or the Cebis terminal) to go to the last viewed tractor function and fine-tune operations. Only two controls

– the rotary/push switch and the ESC button – are needed to open and set all the Cebis functions. The CMotion multifunction control lever, integrated in the armrest, can be operated with three fingers. All main functions can be controlled using the thumb and first two fingers.

Other new features include the controls for the hydraulic spool valves that can be freely assigned to the spool valves. A ramp-up and ramp-down for each spool valve can also be defined in the new Cebis terminal. This enables the driver to specify how quickly a spool valve should deliver the preset flow. The driver can also now assign priority to any spool valve. The preset oil volume for the selected spool valve then remains almost constant even when other spool valves are in use. The screen for the new Cebis can also display video images from external cameras.

ABOVE: The cabin interior is completely upgraded with a new 12in touchscreen Cebis control system and ergonomic switches

engine power and efficiency in the field," says Rössmeier.

The upgraded Axion 900s are fitted with a more powerful six-cylinder FPT Cursor 9 engine with 8.7 liter cubic capacity. It meets the Stage IV (Tier 4) emissions standard and has several advantages over the 2011 model's engine. One of the main improvements is the inclusion of a 'variable geometry turbo' as standard. The company says it delivers "optimum charge-air pressure according to the current load and engine speed". Although the component was available previously on smaller Claas tractors, it was not on the 2011 Axion 900 tractors.

"There are now variable flaps in the turbocharger so we can adapt

CASE STUDY CLAAS AXION 900s

85%

The proportion of the time it is appropriate to reduce idling from 800-650rpm in order to save fuel. The Claas Axion recognizes the correct times to do this automatically

the loads and we get more torque and lower engine RPM,” says Ressmeyer. “We had to change the position of the turbo charger to get the variable module integrated. The new one is electronically guided and can provide higher torque and performance and lower engine RPM.”

A second important engine refinement is the inclusion of an ‘advanced low-speed’ facility. The new engine develops 18% more torque than the previous model. It enables the machine to work in the field under full load conditions at 100-150rpm less. “At lower RPM the customer experiences less vibration and noise from the engine. And the tractor consumes less petrol because there is more flexibility in performance,” says Ressmeyer.

Improved efficiency

The tractors achieve further fuel savings by automatically reducing idling speed from 800-650rpm when the vehicle is stationary. The new models recognize when it’s appropriate to reduce the RPM, which Claas estimates is in 85% of cases. Only when more power is required for other

8.7l
The cubic capacity of the Axion 900s six-cylinder FPT Cursor 9 engine

“THERE ARE NOW VARIABLE FLAPS IN THE TURBOCHARGER SO WE CAN ADAPT THE LOADS AND WE GET MORE TORQUE AND LOWER ENGINE RPM”

Henning Ressmeyer, product manager, Claas Axion range

tasks, such as running lights and climate control on full blast, is the reduction not made. In Eco PTO (power take-off) mode, up to 95% of the maximum engine output is transferred to the PTO shaft despite the reduced engine speed, allowing heavy implements to be operate at a lower engine speed.

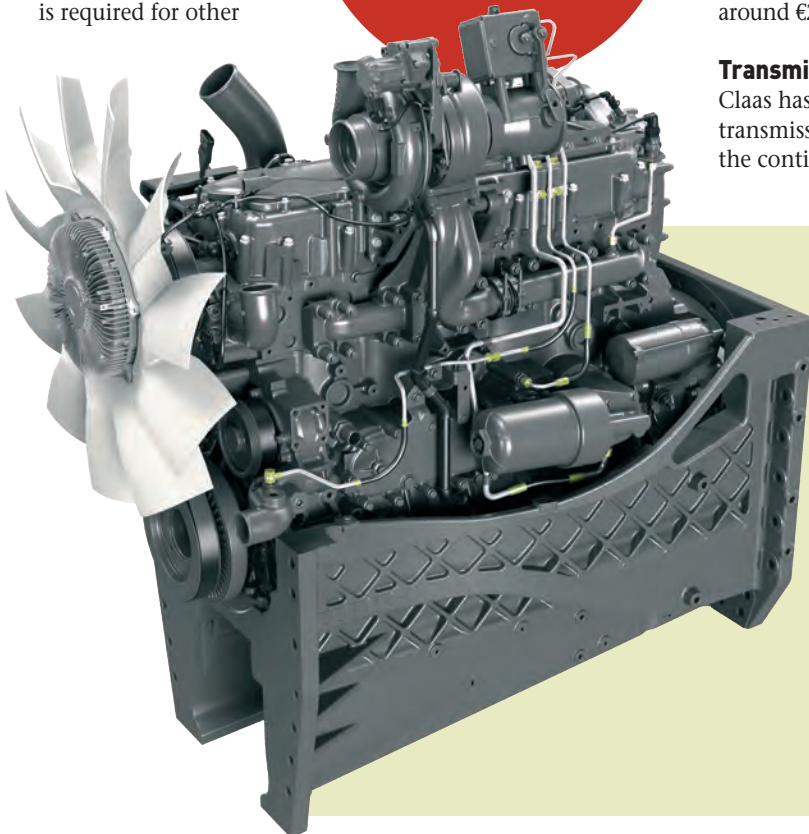
“When we started analyzing customer behavior, it was striking how much time they spent idling. Central and middle European customers spent an average of 20-25% of idling time. They jump off the tractor to refill the seeder, or do maintenance on an implement, but leave the engine turning over,” says Ressmeyer. “If you have 1,000 hours of use per year and 200 hours idling, then a reduction to 650rpm means saving 1.5 liters an hour, which is around €250 a year in fuel [US\$300].”

Transmission transition

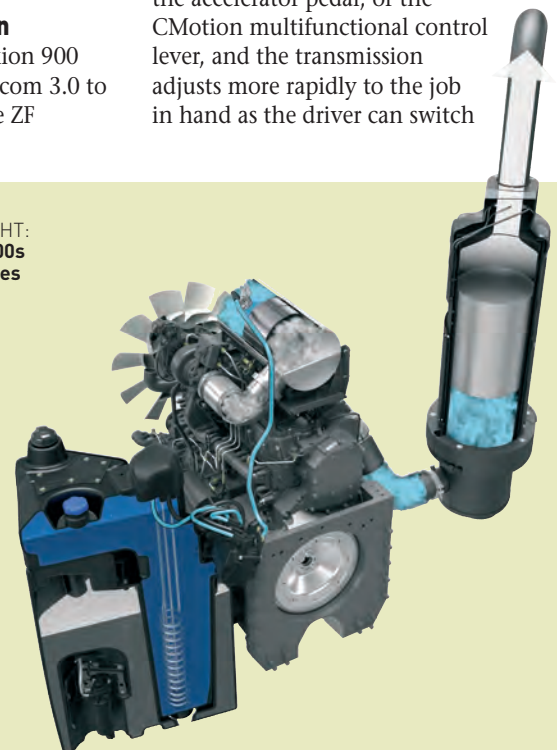
Claas has updated the Axion 900 transmission from the Eccom 3.0 to the continuously variable ZF

Terramatic 45 transmission. Engineers have adapted its performance to the higher output of the 900 range. It means the Axion 960 top model can operate at a higher torque level, although the engineers have had to make the tractor more robust to cope with the extra demands. “The higher torque level is a risk factor for all the hardware so we reinforced all the bearings for the entry speeds and we have reinforced the housing and also increased the capacity of the hydrostatic and mechanical parts. It means we can operate the tractors with more weight and power in the hydrostatic unit. The whole unit runs a stage smoother.”

The CMatic transmission control system uses a new generation of software, which incorporates new customer requirements. For example, cruise control can be deactivated with the accelerator pedal, or the CMotion multifunctional control lever, and the transmission adjusts more rapidly to the job in hand as the driver can switch



LEFT AND RIGHT: Claas Axion 900s use FPT engines



CASE STUDY CLAAS AXION 900s

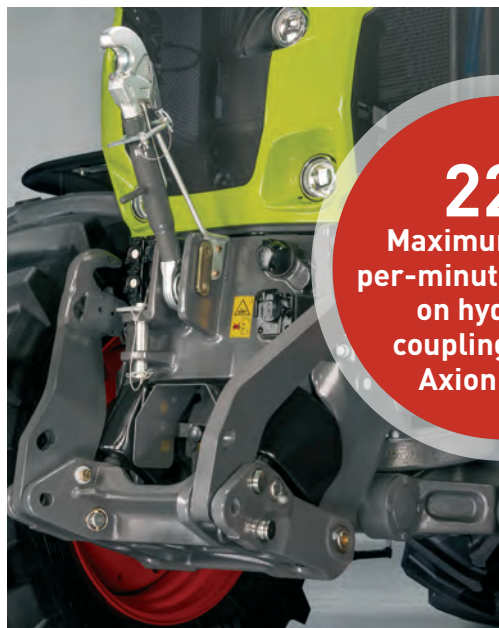
between two saved engine droop values by pressing a button.

The revamped Axion 900 range comes with an upgraded Cebis terminal, which the driver can use to access functions by tapping a machine silhouette. "The new shortcut functionality is a much faster and more convenient way to change the functions of the machine," says Ressmeyer (see box, *Ergonomic Upgrades*)

The Axion 900 tractors also have load-sensing hydraulics with an output of 150 or 220 liters per minute and release levers for all hydraulic couplings at the rear. Up to eight spool valves are available, operated electronically by means of rocker switches in the armrest and the 'electropilot' four-way control lever. In addition, the function buttons on the armrest and multifunction control lever can be configured for any of the spool valves. Claas says this reduces the driver's workload, as there is less need to change hand position.

Seeing the lights

There are a number of other improved functions not related



ABOVE: The Axion is designed for ease-of-use, with hydraulic and non-hydraulic attachments

220
Maximum liters-per-minute available on hydraulic couplings in the Axion range



directly to the engine. All new Axion 900 tractors are available with different LED lighting packages, including up to 20 LED work lights and LED road lights. All models can be fitted with a removable tool drawer with telescopic runners, which Claas says was a popular function in the Axion 800 series. The drawer is big enough to hold a toolbox, allowing the onboard tool kit to be changed to suit different types of work. Meanwhile, Claas says there is an easily accessible external battery terminal that allows each tractor to be used as a power source, for example for in-field refueling. Wide-angle mirrors and a compressed air connection are also standard fittings.

Ressmeyer is confident the improved range will satisfy existing customers and attract new ones. "In Europe, most of our sales are in Germany and France, whereas outside Europe, we're growing fast in Russia and Ukraine. We're still a young player in the tractor market and we feel there's room to grow the business and the new range will help to do that. The pre-series is already on sale, but full production will start in the second half of the year and we've already taken a lot of orders." **ivT**

On the web

Watch the Axion in action with the Lexion combine at www.ivtinternational.com/axion

"THE NEW SHORTCUT FUNCTIONALITY IS A MUCH FASTER AND MORE CONVENIENT WAY TO CHANGE THE FUNCTIONS OF THE MACHINE"

A HISTORY OF CLAAS TRACTORS

1993 The Claas Xerion 2000 large tractor is presented to the public for the very first time.

2003 Following the acquisition of a majority share of Renault Agriculture, Claas expands its range to include standard tractors. In the former Renault tractor factory in Le Mans, France, the first Claas tractors to sport the company's seed-green livery are produced. The tractor range comprises all-rounder Celtis, premium-class Ares, and the larger Atlès and Xerion models.

2006 The Axion range, in development at Le Mans from 2003, is launched in five variants from 163 to 260hp.

2007 Claas introduces the Arion 500 and 600 series with ranges from 112-155hp. The Claas Axion becomes available in five variants from 163-25hp. Meanwhile, the Xerion 3800 large tractor is unveiled with a 379hp engine.

2009 Claas introduces the compact Arion 400 in six engine sizes between 90hp and 125hp and showcases its new Xerion 4500 and 5000 models at Agritechnica 2009.

2011 Four Axion 900 models, from 280-400hp, are supplemented by the Axion 800 series and the Xerion 3300-5000 range. The Axion 900 is the first Claas tractor to meet Tier 4 emissions standards, and the first to use Claas Power Systems (CPS).

2012 The four-cylinder Arion 500 and the six-cylinder Arion 600 series are launched in a 140-184hp range.

2013 The Claas Axion 800 features a new design in the 200-270hp range.

2017 Claas upgrades its Axion 900 range.

FULLY LOADED

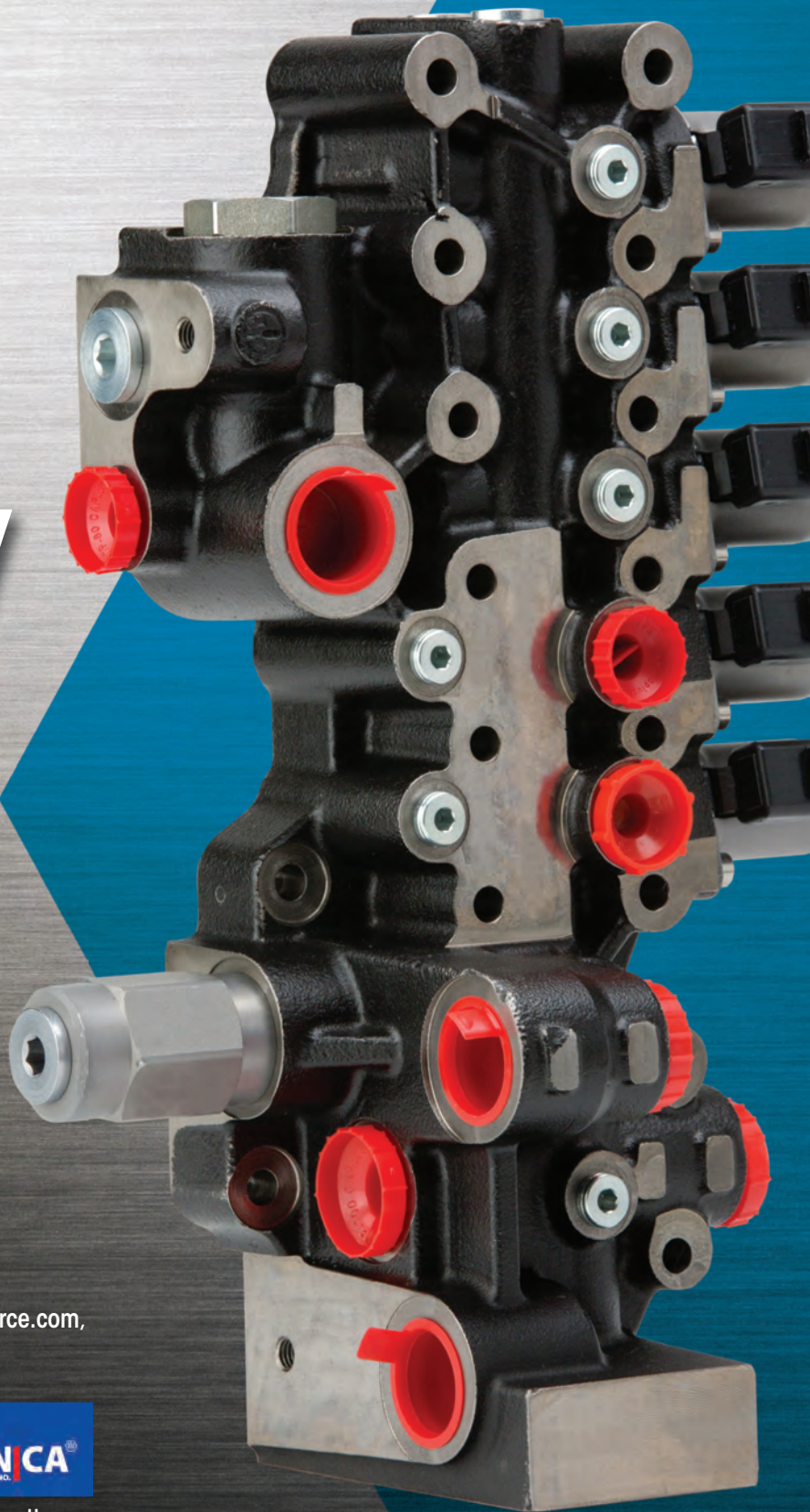
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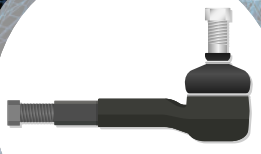


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ULTIMATE



MACHINERY
p94

A circular icon featuring a detailed illustration of a mechanical component, possibly a suspension part, in a glowing blue wireframe style. Below the icon, the text "MACHINERY" is written in a bold, sans-serif font, with "p94" underneath it.

ENGINES
p96

A circular icon featuring a detailed illustration of an internal combustion engine in a glowing blue wireframe style. Below the icon, the text "ENGINES" is written in a bold, sans-serif font, with "p96" underneath it.

POWERTRAIN
p100

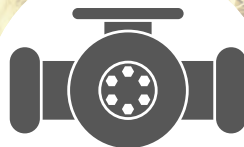
A circular icon featuring three interlocking gears in a glowing blue wireframe style. Below the icon, the text "POWERTRAIN" is written in a bold, sans-serif font, with "p100" underneath it.

TECHNICA

iVT
10
BEST NEW VEHICLES AT AGRITECHNICA

LOOK OUT FOR OUR 10 BEST NEW
VEHICLES AT AGRITECHNICA 2017.
YOU'LL FIND THEM LISTED OVER
THE NEXT 38 PAGES

IF YOU'RE GOING TO GET THE BEST OUT OF THE LARGEST AGRICULTURAL MACHINERY SHOW IN THE WORLD, YOU'RE GOING TO NEED TO DO SOME PLANNING – AND THIS IS THE PLACE TO START. IN THIS SECTION YOU'LL FIND THE KEY NEW COMPONENTS AND ENGINES BEING SHOWCASED, ALONGSIDE TOP VEHICLE LAUNCHES PLANNED FOR THE EVENT, PLUS THE INSIDE STORY FROM THE EVENT'S PROJECT MANAGER. AND IF YOU CAN'T MAKE IT TO HANNOVER, THIS IS THE NEXT BEST THING



All eyes on



THERE IS NO OTHER AGRICULTURAL MACHINERY SHOW QUITE LIKE IT IN THE WORLD. THE NO.1 ENTRY IN INDUSTRY DIARIES THIS YEAR, IT OUTSTRIPS RIVALS IN SIZE AND REPUTATION. PROJECT MANAGER MARIE SERVAIS TELLS US WHAT TO EXPECT, AND LOOKS AT HOW FAR WE'VE COME SINCE AGRITECHNICA 2015

▶ The world's largest agricultural equipment show is nearly upon us once again. Housed within 23 halls on a 45ha site at the Hannover Exhibition Grounds, Agritechnica 2017 promises to bring together vehicle and machinery OEMs with component developers, engineers, executives and customers for a true 360° view of the industry. New products will be launched, new deals will be struck and new ideas will be shared. For anyone with an interest in agricultural vehicles, it is an essential date in the diary.

In order to bring you detailed insights into what to expect from the biennial show, we caught up with Agritechnica project manager Marie Servais, who, after two years of preparation, is now eagerly anticipating the opening of the event.

"The fact that the fair will soon be underway is very exciting," she says. "The work we have done since Agritechnica 2015 will finally come

to fruition. Agritechnica was already a very international show, but it will be even more so this year, with some 60% of exhibitors coming from outside Germany."

Organizers are now anticipating an extremely successful show. "Innovations are being introduced at an ever-faster rate – in fact we have 320 new product premieres registered at this year's event."

Navigating the show

As project manager for Agritechnica 2017, Servais takes a personal interest in practical elements of the event. One of Agritechnica's unique features is its clear sector group concept, which enables visitors to find their way around quickly and easily. "This has been further optimized for this year's show, and there is also a new floor plan that guarantees easy orientation and will help visitors make optimal use of their day at the fair," says

Hannover



60%
of Agritechnica
exhibitors come from
outside Germany

400,000
The number of
visitors expected at
Agritechnica 2017

320
The number of
product premieres
registered for
Agritechnica 2017

Servais. "Finding out how these developments work in practice will be immensely satisfying."

"ONE WORD SUMS UP THE BIG CHANGES THAT HAVE OCCURRED IN THE PAST TWO YEARS, AND THAT'S 'CONNECTIVITY'"

Technical innovations

With so many different elements at Agritechnica, it's guaranteed that no two visitors will have the same experience. Farm machinery for every purpose will be showcased, and there will also be the opportunity to meet service providers and representatives from agricultural organizations. There is a high-level technical program,

including conferences, workshops and forums, for those that want to increase their knowledge.

Of particular interest to readers of *iVT* will be the Systems & Components feature. “One word sums up the big changes that have occurred in the past two years, and that’s ‘connectivity,’” says Servais. “It is a clear trend, both in this year’s Systems & Components special feature, where there’s a focus on making the different parts that go into building farm machines that communicate with each other to achieve optimum performance. More generally in the exhibition halls, more and more machines are continuously linked to the internet, uploading and downloading data that helps them do a better job. The speed of this digitization and networking of agricultural businesses is staggering, and many of the 320 new products that we know will be shown at Agritechnica will feature technology that we couldn’t have imagined even a decade ago.”

Sustainable future

Everyone who visits Agritechnica 2017 will learn something from the experience, even if they simply walk round the exhibition halls to talk to fellow visitors, but there is so much more going on.

Agritechnica 2017’s overall theme is ‘Green Future – Smart Technology’, which highlights the event’s aim of presenting the latest technologies and trends that help increase agricultural productivity in a sustainable way.

“For anyone involved in the farm machinery trade, the conference series ‘Ag Machinery International – Access to emerging markets’ will be held again this year,” says Savais. “Each day, the conference will focus on a different agricultural machinery market, including eastern Europe, China and southeast Africa. This year, for the first time, it will also look at markets in Southeast Asia. At each session, experts will explore market potential, market access,

AGRITECHNICA INNOVATION AWARDS

All companies exhibiting at Agritechnica can enter new products into the Innovation Awards. Every entry is examined in depth by an independent jury.

Gold Agritechnica Innovation Awards are conferred on products that present a new concept and changed functionality, and the application of which gives rise to a new process or marks a substantial improvement to an existing process. Silver Agritechnica Innovation Awards, meanwhile, go to new products that have been enhanced to such an extent that there has been a substantial improvement in their functions and processes.

GOLD MEDAL WINNER: Claas Cemos Auto Threshing

Cemos Auto Threshing is the first system that sets the tangential threshing system on straw walker and hybrid machines automatically. Depending on the strategy entered into the system by the operator, it sets the drum speed and the concave gap for optimum results.



The USP of the entire system is the fact that all controllers can communicate with each other. For example, the throughput controller operates via a special communication module to control the throughput relative to the threshing controller, as well as the separation and cleaning controllers.

Another module in the system is Auto Threshing, which, for the first time, completes the enormous complex technical step of implementing fully-automated threshing.

On such a harvester, users no longer need to know which settings they have to use to get the desired results. Instead, they can enter the harvesting strategy, which is then used by the auto-learning system to optimize all parameters.

GOLD MEDAL WINNER: Kemper/John Deere StalkBuster
StalkBuster is the first stubble-destroying technology that forms an integral part of a maize header.

It is the only machine on the market that destroys all the stubble before it is driven on by the forager or the tractor and trailer.

Traditionally, about 30% of the stubble remains intact, and as the corn borer pest winters inside it, a high percentage of undestroyed stubble means they can infest the area again the next year.

The new topper is lightweight and has a low power input requirement, so no extra limitations apply for legal road transport.

Turn to p127 to see the Silver Medal award-winners...



“ONE CHALLENGE THAT IS JUST AROUND THE CORNER FOR THE FARM MACHINERY SECTOR IS HOW IT IMPLEMENTS AUTOMATION OF FARMING TASKS”

financing frameworks and technology requirements.

Challenges for tomorrow

It is impossible to predict every new challenge the agricultural sector will be facing by the time Agritechnica 2019 opens its doors to visitors, but there is no doubt that there will be a focus on sustainable farming as the world continues to try and feed a growing population with limited resources and ever increasing scrutiny of farming practices.

“One challenge that is just around the corner for the farm machinery sector is how it implements automation of farming tasks,” says Servais. “We are already seeing innovations that make the operator’s job easier by automating tasks like setting up a combine

harvester for optimal efficiency, but the next step will be removing the operator from the harvester completely, and that will present a number of challenges that both farmers and machinery manufacturers will have to deal with.”

It is challenges like this and the technical problems they present that Agritechnica is perfectly positioned to help solve – bringing together technical minds and industry experts to speed the rate of change. **iVT**

Over the next 70 pages, look out for Agritechnica exhibitor highlights – and don’t miss our previews of some of the top vehicle launches planned for the event

2
The number of Gold Medals that will be presented at the Agritechnica Innovation Awards



YOU HAVE THE POWER

>> NOW RUN WITH IT.

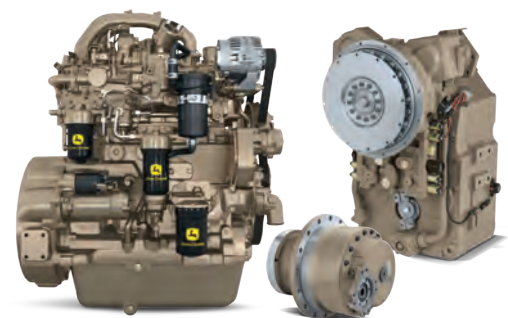
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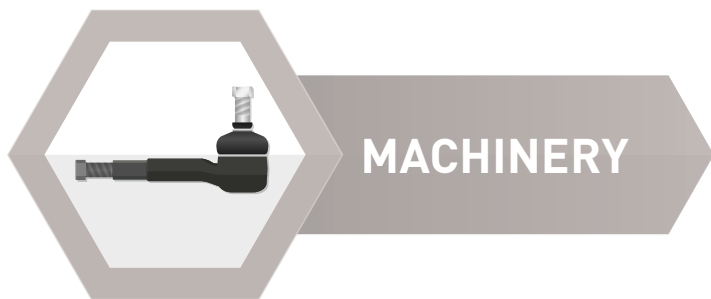
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AGRITECHNICA PREVIEW MACHINERY



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The keys to the company's success are an application-oriented product range, high-quality products, as well as its dedication to innovation and individual solutions.

Modern finite element model (FEM) calculation programs are used to determine and improve the geometries of elements. GMT's R&D



facilities enable it to analyze and enhance components and check the related specifications.

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Merlo Multifarmer telehandler

Merlo has some exciting launches lined up for Agritechnica. It is set to launch the new Multifarmer Medium Duty 34.7 and 34.9, both of which are available in three versions: standard, continuously variable transmission (CVT) version with Merlo CVT (CVTronic), and CS-CVT with CVTronic and cab suspension (CS).

Due to the compact dimensions, the new models will be able to operate even in narrow spaces where bigger machines would have limited movement.

The models also have the Category 2 rear three-point linkage – 4,000kg of lifting capacity, and the mechanical rear power take-off.

The position of the cab and the work that has been carried out on the engine layout, hood and boom enable absolute visibility to be achieved around the vehicle.

Merlo says these new models will also feature an EcoPowerDrive (EPD) system that will ensure an important consumption reduction together with lower noise emission and ease of use.

With the EPD, the operator is able to choose between three working modes: heavy duty, speed control, and self-accelerating joystick.

PIVOTING FRONT LINKAGE

The LHLink pivoting front linkage, manufactured by **LH Lift**, was first introduced at the Agritechnica trade fair 10 years ago. The innovative pivoting front linkage attracted enormous attention internationally and it was awarded the Silver Medal at the Innovation Awards, hosted by DLG (the Agritechnica organizer).

At its launch, the LHLink was attached to the front of a Valtra N Series, but now the pivoting front linkage can be retrofitted to any brand of tractor. OEM deliveries to tractor manufacturers are also available. The LHLink pivoting front linkage has already been retrofitted to John Deere, Fendt, New Holland, Steyer and Case IH tractors.

Customers love LHLink's pivoting front linkage, because it can improve productivity by 25-30% – for example, when mowing, snowplowing and sweeping roads. The pivoting front linkage can turn either in relation to the front tires, or independently, as the driver chooses. The pivoting front linkage can turn up to 35° in both directions and can carry loads of up to 3.5 metric tons (3.8 tons).

LH Lift Oy, manufacturer of the LHLink pivoting front linkage, is a 40-year-old family-owned company with factories in Finland and China. LH Lift specializes in the design and manufacture of couplings for tractors and other machinery. LH Lift is a proud

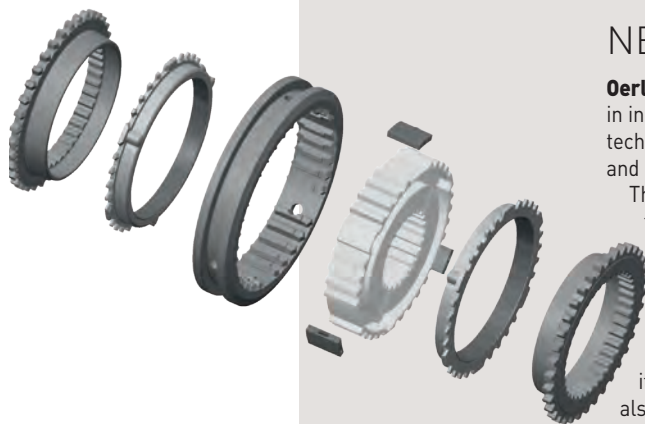
OEM supplier to Valtra. The LH Lift factory in Ningbo, China, purchases machines, and assembles and delivers components for OEM customers in China. Designing, manufacturing and marketing takes place at the company's home factory in Laukaa, Finland.

LH Lift supplies a wide range of components, including top links and lift rods, lower link arms, lower link arm stabilizers, quick coupling hooks, rear hitches and drawbars, front linkages and accessories.

**AGRI
TECHNICA**
THE WORLD'S NO. 1
LH Lift
Hall 26, Stand H31h

READER INQUIRY SERVICE

To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **502**



NEW SERIES OF WHEEL DRIVES

Oerlikon Graziano's new compact slotless synchronizer (CSS) is a step ahead in innovation for shifting solutions. It can be applied wherever synchronizer technology is required: in passenger cars, trucks, and in industrial, agricultural and construction machinery.

This innovation is aimed to improve the overall performance and efficiency of transmissions through improved shiftability, increased power density and the use of innovative friction materials specifically developed for heavy-duty use.

The main innovation is the integrated tangential long-life activation system, comprised of a roller, spring and plastic case in one assembled piece.

Compared with a standard solution, the new CSS offers up to 25% wider friction surfaces in the same envelope and thanks to the improved hub design, it can be installed on larger shafts for heavy-duty applications. The new hub also offers benefits on synchro shifting quality. Due to not having any slots, it is less sensitive to heat treatment deformations on functional spline.

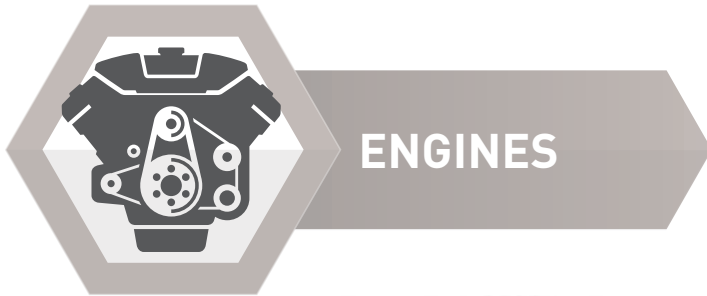
The ring indexing function is offered in two different arrangements: by pins, which replace the knuckle (in heavy-duty applications, where the synchro ring can also be produced by machining); or by knuckles that have optimized geometry (for standard applications with a synchro ring produced by sintering, and obtaining a shapeless sensitive knocking effect). CSS synchro assembly is easy and interchangeable with standard solutions.

**AGRI
TECHNICA**
THE WORLD'S NO. 1

Oerlikon Graziano
Hall 15, Stand D12

READER INQUIRY SERVICE

To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **503**



**AGRI
TECHNICA**
THE WORLD'S NO. 1
FPT Industrial
Hall 16, Stand C35

SHOWCASING STAGE V COMPLIANCY

FPT Industrial will be one of the exhibitors at Agritechnica 2017, displaying its agriculture engine line-up that is compliant with Stage V emissions levels. In order to comply with this regulation, which is set to come into force in 2019, FPT Industrial will adopt HI-eSCR2 – the second generation of its renowned and patented high-efficiency selective catalytic reduction aftertreatment system for use in all engines over 56kW.

HI-eSCR2 integrates a particular filtration system on a selective catalytic reduction (SCR) module, which does not require any vehicle modifications. It is also easy to install, and ensures high productivity, as well as best-in-class power and torque density. Furthermore, HI-eSCR2 adopts an aftertreatment system 'for life': it means that end users have no maintenance costs, cutting down the total cost of ownership (TCO). Thanks to there being no active regeneration, when considering high load or high power applications, operators will have no need to stop the running of equipment during operation time – therefore maximizing uptime and increasing safety.

At Agritechnica, FPT Industrial will also exhibit its new NG engine, specially designed for agricultural applications. It will be equipped on the new New Holland Agriculture methane tractor concept. It is a six-cylinder NEF Natural Gas engine, which guarantees the same performance as its diesel equivalent, in terms of its maximum power and torque. This powertrain features 180hp peak power and 740Nm maximum torque. It also uses specifically developed FPT Industrial technology that minimizes fuel consumption to provide day-long autonomy.

READER INQUIRY SERVICE

To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **504**

A COMPLETE ENGINE FAMILY

At Agritechnica 2017 – the largest agricultural equipment trade fair in the world, and is hosted in Hannover, Germany – **MAN Engines** will be presenting a diesel engine with 9-liter displacement to the international public for the first time. From the outset, the straight-six engine was designed and constructed as a completely new conception, especially for off-road uses.

This allows the latest unit in MAN Engines' portfolio to close a gap in performance between the existing D08 and D26 engine series. Conventional applications for the 9-liter unit are agricultural, such as in tractors or harvesters.

For the first time, MAN Engines is also exhibiting an E32 series-based gas engine with 450 kWmech. The 12-cylinder gas engine achieves this performance level in 50Hz operation

at 1,500rpm, as well as in the 60Hz variant at 1,800rpm. The E3262 LE2x2 is designed for operation with biogas or special gases. The possible applications also include the very wide field of cogeneration for the industrial, commercial, municipal and leisure sectors. This also sees MAN Engines bridge a gap in the existing range of gas engines. At the same time, customers will receive a modern unit with improved efficiency levels.

Both new products can be viewed at Agritechnica between November 12 to 18 at the exhibition center in Hannover at the MAN Truck & Bus booth.

READER INQUIRY SERVICE

To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **505**



**AGRI
TECHNICA**
THE WORLD'S NO. 1
MAN Truck & Bus
Hall 16, Stand C45

SWAP TO SAVE ON FUEL

Yanmar's search for efficiency and economy has led the company to increasingly consider variable-speed engines where once a constant speed unit would have been fitted. This philosophy stems from a desire to offer customers precisely what they need by observing trends in the marketplace.

Advances in electronics have made this option more attractive in recent years. One recent success is a collaboration with IPT Powertech to supply engines for gensets on African communications masts.

As well as fuel economy, other matters complicated the project. Due to the remoteness of the installations, reliability is an absolute must, because frequent maintenance trips are not feasible.

Variations in local fuel quality meant that the engines supplied (the direct-injection three-cylinder 3TNV88-B) had to be flexible enough to cope.

Emilio Tognetti, from Yanmar's sales division, says, "As with any customer, fuel economy is crucial, and even we were surprised by the savings offered by switching to a variable-speed engine. When we compared the 3TNV88-B to the equivalent 4TNV88-B fixed-speed unit at peak output, which is just over 16kW, the fuel savings were almost one-fifth."

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: 506



**AGRI
TECHNICA**
THE WORLD'S NO. 1
Yanmar
Hall 16, Stand D40



**AGRI
TECHNICA**
THE WORLD'S NO. 1
JCB
Hall 9, Stand D25

JCB TM420 telescopic wheel loader

JCB will launch its brand-new JCB TM420 telescopic wheel loader with a whopping 4.1 metric ton lift capacity at Agritechnica.

The company says the new model will have extra lift height to 5.4m (17.7ft) – ideal for high-sided diet feeders.

This new model uses a 108kW (145hp) JCB EcoMAX engine that meets Euro Stage IV/US Tier 4 Final emissions using SCR but no diesel particulate filter (DPF).

Other new features over previous models include regenerative hydraulics circuit giving faster boom lowering for quicker loading cycles and a tougher chassis with larger pins and bushes for the center pivot and loader.

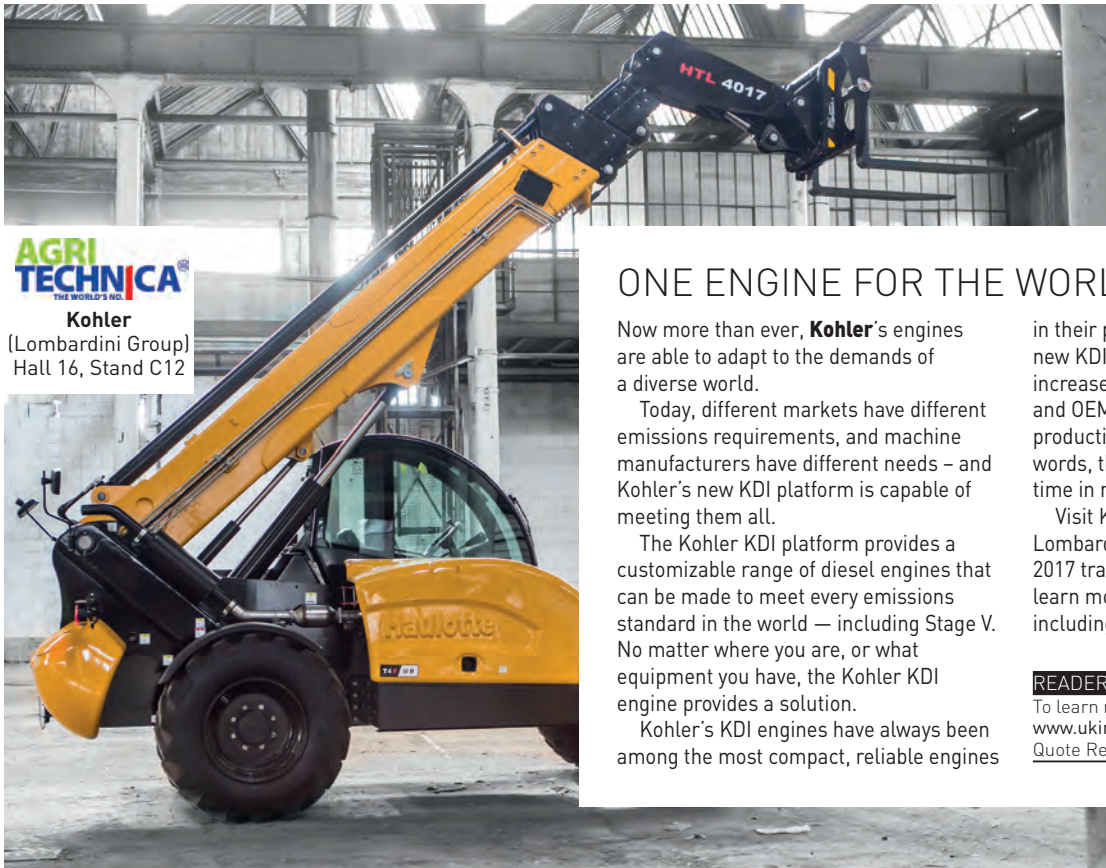
It also has heavy-duty JCB axles with permanent four-wheel drive

to handle the increased payload and 26in (66cm) wheels with larger tires to optimize traction.

Tim Burnhope, JCB chief innovation and growth officer, says, "The new JCB TM420 delivers more performance and increased capabilities to meet customer demand for greater productivity and lower costs."

A larger lift cylinder fed by the 160-liter/min piston pump provides 4.1 metric tons of lift capacity from ground level to full height, which is 32% more than from the TM320S, while the first application on a telescopic wheeled loader of JCB's regenerative hydraulics speeds up repetitive loading cycles – such as when using a 4.1 cubic meter grain bucket.

AGRITECHNICA PREVIEW ENGINES



**AGRI
TECHNICA**
THE WORLD'S NO. 1
Kohler
(Lombardini Group)
Hall 16, Stand C12

ONE ENGINE FOR THE WORLD

Now more than ever, **Kohler's** engines are able to adapt to the demands of a diverse world.

Today, different markets have different emissions requirements, and machine manufacturers have different needs – and Kohler's new KDI platform is capable of meeting them all.

The Kohler KDI platform provides a customizable range of diesel engines that can be made to meet every emissions standard in the world — including Stage V. No matter where you are, or what equipment you have, the Kohler KDI engine provides a solution.

Kohler's KDI engines have always been among the most compact, reliable engines

in their power range – and the company's new KDI engines are even better. With increased power and torque, end users and OEMs will experience even more productivity and less downtime. In other words, the machines will spend more time in motion.

Visit Kohler, which is part of the Lombardini Group, at the Agritechnica 2017 tradeshow in Hannover, Germany, to learn more about all the solutions it offers, including the Stage V-built KDI engines.

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **507**

FIRE-PROOFING THE EXHAUST LINE

Requirements for the engine compartment and the exhaust line on modern agricultural machinery are particularly complex: Fire protection for both man and machine is the highest priority, while high temperatures are necessary for an efficient exhaust aftertreatment process.

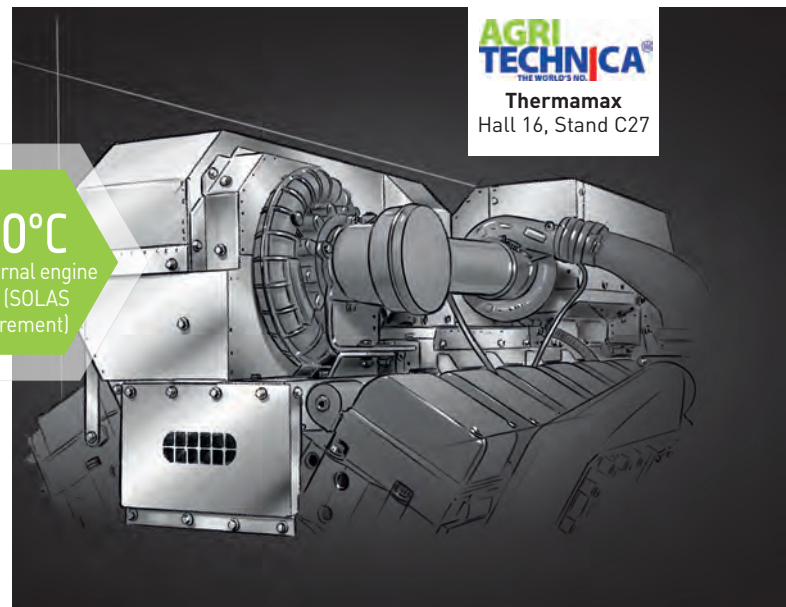
With its products and know-how, **Thermamax** manages to solve this dilemma. The Tmax-Insulation Cladding meets the highest fire protection requirements, while maintaining the necessary high temperatures in the exhaust line with exhaust elbow and turbocharger effectively insulated. This design was originally developed for the marine industry and meets their strict SOLAS (Safety of Life at Sea) requirements: No point on the engine surface is allowed to exceed 220°C, thereby preventing ignition of even the smallest dust particles.

Fitting Tmax-Integral Insulation means Thermamax is making an important contribution to reaching the strict emission standards. This solution is used for example to insulate exhaust pipes, ensuring that the necessary temperature within the system remains constant and process-safe, thereby allowing a clean and efficient combustion process. This type of insulation is also available with a special perforated outer shell, i.e. Tmax-Sonetherm, that absorbs and reduces radiated noise.

Thanks to its simulation know-how, Thermamax can promptly analyze, evaluate and optimize all ideas and designs in order to reach a production-ready status much quicker. That means short development times and cost-effective design solutions.

220°C

Max external engine temp (SOLAS requirement)



**AGRI
TECHNICA**
THE WORLD'S NO. 1
Thermamax
Hall 16, Stand C27

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **508**

Agricultural machinery engine
MAN D3876 LE



RIPENED FOR SOWING AND REAPING.

Robust. Economical. Compatible.

We can plough. And chaff, reap and shred. And we've been doing this for many generations. MAN Engines has a long history in agricultural engineering, but also leads the way when it comes to new technologies. Such as the D3876 being named "Diesel of the Year 2016". But the thing that really sets our engines apart is technology that is produced on a large scale for your benefit with a high level of fit accuracy – whether it's for large customers or in special applications. Harvest some compelling information here: www.man-engines.com.

MAN Engines

VISIT US!
AGRITECHNICA
Hall 16, Stand C45





POWERTRAIN

MAXIMUM PRESSURE PUMPS

PMP Industries' PMH series, which includes axial piston pumps and motors and plug-in fixed and variable displacement motors, are designed to be used on heavy-duty machines for traction and auxiliary functions, providing efficiency and durability while bearing pressure of up to 500 bar.

Premium materials, tight tolerances and precision machining result in products that are made to last. The geometry of the components is optimized to reduce wear and provide the most efficient oil flow.

Similarly, the global structure of the transmission is designed to handle pressure and loads without deformation; in this way, efficiency is also maintained in high-pressure working conditions.

The PMH series comes in different sizes and with a variety of features (pumps are available with different control options including manual, electric proportional, remote electric, electric volumetric, hydraulic proportional controls) and can be matched easily with PMP gearboxes for superior, complete solutions.

Visit PMP at Agritechnica, at Hall 15 Stand D47, to discover complete solutions for the agricultural and forestry sectors.

READER INQUIRY SERVICE

To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: 509



AGRI
TECHNICA
THE WORLD'S NO. 1
PMP Industries
Hall 15, Stand D47



WORLD FIRST!

Fendt e100 Vario electric tractor

AGCO Fendt won a silver medal at Agritechnica's Innovation Awards for its world-first all-electric tractor: Fendt e100 Vario.

Power comes from a 650V lithium-ion high-capacity battery with an actual capacity of around 100kWh, which can be charged up to 80% in 40 minutes and stores enough power to work for four hours at an average workload.

Using the powertrain of a 50kW Vario model, it replaces the combustion engine, the exhaust, air and fuel systems, and the radiator by the battery block, a compact electric motor and the necessary electric control system.

An innovative thermal management system, comprising a heat pump, ensures the cab temperature is controlled efficiently. The battery pack can also serve as intermediate storage for farm-generated power.

The exhaust-free and very quiet machine is ideal for use in buildings, as well as for transportation work in cities.

AGRI
TECHNICA
THE WORLD'S NO. 1

Agco-Fendt
Hall 20, Stand A26a

NEW SERIES OF WHEEL DRIVES

Bonfiglioli, a leader in the construction equipment market, has developed a wide range of traction gear motors, specifically designed for use in agricultural applications, such as self-propelled sprayers, windrowers, mower conditioners and harvesters.

Bonfiglioli's 600W series wheel drives have been successfully validated in the field and have proven their reliability in terms of their capacity to carry high radial loads, even in the most demanding applications. These products have been optimized in terms of thermal performances in order to ensure best-in-class productivity, even when the machine is required to operate for long distances at maximum speed for long periods of time.

The integrated oil immersed multidisc brake is designed to provide smooth and effective dynamic braking. It replaces the external disc and caliper system, thus eliminating the need for maintenance and periodical settings.

Furthermore, Bonfiglioli has developed a special version – the 606XT, which will be on display at Agritechnica – with an integrated hydraulic axial piston

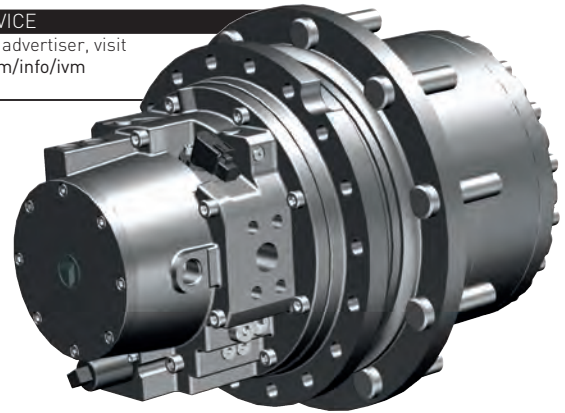
motor with electroproportional variable displacement, therefore addressing continuous efforts to provide an extremely compact package.

The 600W series wheel drives can be supplied with electric motors for integration in electric-hybrid powertrain systems: these units integrate a high voltage, liquid cooled electric motor and can be equipped with a 2-speed gearbox to maximize the efficiency in all the machine working points. Bonfiglioli's 610W2/3E will also be on display at Agritechnica.

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **510**

**AGRI
TECHNICA**
THE WORLD'S NO. 1
Bonfiglioli
Hall 15, Stand 14



COST-EFFICIENT DRIVELINES

NAF AG has unveiled an outstanding innovation for agricultural applications: a front-bogie axle drive system for harvesting machines. As an alternative to expensive track systems as front drivelines, NAF is offering a cost-efficient bogie drive solution.

The oscillating bogie is based on NAF's long-term experience in making machinery for forestry and construction applications. It provides the operator with an integrated permanent bogie balancing system (PBBS) – an equal distribution of weight and tractive effort on all four tires – that creates similar, yet cheaper, driving performances to track systems.

The advantages of the system include:

- Enhanced adaptability to any application, due to NAF's modular system
- High traction forces
- Superior stability
- High-capacity, self-cooling NAF turbo brake in the planetary drives
- Reduced soil compaction

- Proven reliability/cost-efficiency
- Low maintenance/reduced wear
- NAF's multidisc differential lock

NAF's centrally driven rear steering axles with adjustable track width are an ideal choice for completing harvesters' drivelines. For the three existing axle sizes (9-12.5 tons), NAF will showcase a new size, with a 14-ton payload for class 10 harvesters.

With NAF's centrally driven rear steering axles, tractive effort is nearly doubled, compared with traditional systems using two wheel-mounted hydraulic motors. By using only one central motor, the hydraulic control and regulation system is simplified and user-friendly. One central motor also optimizes the machine weight, while the axles can easily adapt to different tire sizes. Tire pressure controls are optional.

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **511**



**AGRI
TECHNICA**
THE WORLD'S NO. 1
NAF
Hall 15, Stand E12



ENSURING COMFORT IN THE CAB

Grammer will be unveiling a new and innovative seat top at Agritechnica. This newly designed seat top features a long or short back, offering comfort to the operator. A new, two-phase seat heating and the optimized active seat climate system ensures optimum adjustability to exterior temperatures.

The seat top's adjustable side support provides even greater lateral stability for the operator. Additionally, it features numerous other comfort functions such as dual-motion and pneumatic lumbar support. It is also designed to accommodate a number of different multifunctional armrests.

Grammer will also exhibit other solutions: Grammer is a member of the CAB Concept Cluster that will present the Smart Cab at Agritechnica (sketch pictured right). This implements current trends to provide customers with added value. Featuring a multifunctional cabin for autonomous vehicles such as harvesters and field sprayers, the CAB Concept Cluster will showcase what is possible today and in the near future.

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **512**



Grammer
Hall 17, Stand D47



Caldaro
Hall 17, Stand C02

MODERN PEDAL DESIGN

Caldaro's Swedish-made P09 pedal represents a radical new approach to pedal designs. By reducing the number of components, Caldaro has managed to simplify its pedal design, as well as giving it more precision, better ergonomics, and resistance to challenging environments. This ensures a longer lifetime, improved reliability and a high end-user value.

The Caldaro team fundamentally readdressed the pedal design. The result is a better product with a reduced component count for improved reliability. Its electronics are protected by the placement inside the casted pedal house.

The P09 pedal has a low pivot point, which improves both ergonomics and control precision. Comfort is assured because the operator can rest their heel on the floor while operating the pedal.

The P09 pedal's compact and rational design, with its casted plate and slim housing, contains advanced technology that can fit into the most complex machines.

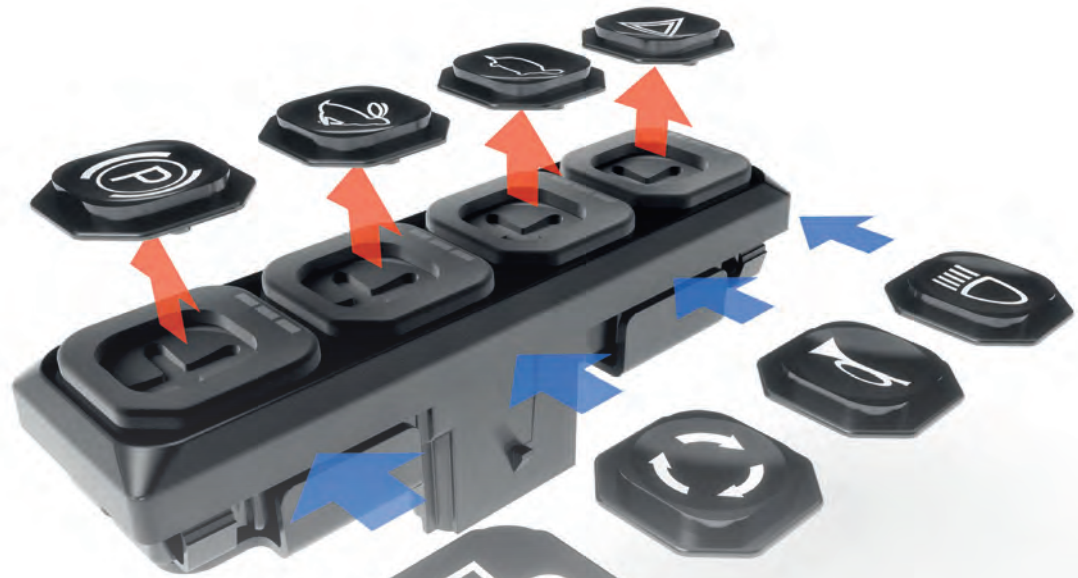
The pedal's electronics are coated and sealed. The surface of the pedal body and plate is both anodized and powder-coated. This protection enables the pedal to withstand virtually all chemicals, and acts as an effective shield to provide resistance against extreme wear.

The starting angle for standard P09 pedals is 30°. Other angles, as well as customized logotypes on the pedal plate, are available upon request.

The P09 also offers different signal outputs, for example dual independent.

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **513**



A CANBUS KEYPAD

AMA Instruments will showcase its new KeyCAN modular keyboard at the Agritechnica show. Especially developed for use in challenging environments, it is ideal for applications inside and outside of the cab. The KeyCAN is easy to configure and its minimal design makes it an ideal choice to meet consumers' aesthetic and performance requirements.

Every switch on the KeyCAN is equipped with three (red, green, blue) RGB easy-to-customize LED lights that indicate their status. Every symbol is lasered on a plastic tile that can

be hosted in the proper housing on top of every switch. This enables OEMs to customize the KeyCAN at any time in line assembly, if needed.

The KeyCAN's integrated CANbus back connector for electronic control units and display panels makes it ideal for reducing the length of wiring from dashboard to user end.

**AGRI
TECHNICA**
THE WORLD'S NO. 1
AMA
Hall 3, Stand H14

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Quote Ref: **514**

**AGRI
TECHNICA**
THE WORLD'S NO. 1
Claas
Hall 13, Stand C02



Claas Axion TerraTrac tractor

You'll find a full case study of the updated Claas Axion 900 series tractors on page 80. But the Axion gets a special extra mention here because, just before this issue went to press, Claas revealed the TerraTrac version of the series, which it kept under wraps until the announcement that it had won an Agritechnica Innovation Awards Silver Medal.

It is the first tractor to have a suspended front and rear axle for greater operator comfort, it also has a substantially larger contact area compared with Triangle tracks, which results in excellent directional stability, both in the field and in swift road travel.

Optimum adaptation to the ground contours is key for low compaction. This is achieved by a 15° pivot range, and the fact that the machine weight is distributed to all track rollers hydraulically. The machine transfers more than 450hp engine power to the ground without causing damage to the soil. At the same time, it does not exceed the statutory road width limit.

While the TerraTrac version is not officially available yet, Claas says is going to be offered as an option for all Claas Axion models. For anyone counting, all versions of the Axion only count as one entry in our '10 best vehicles' list.



Setting big things
into motion.



Industrial controller for Electro Hydraulics and Industrial Applications, Railway, Offshore and Ship Controllers as well as Crane Systems and Hoisting Equipment.
www.gessmann.com

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TECHNICA®
THE WORLD'S NO. 1

Hall 17
Stand B28
Hannover
12-18.11.17

GESSMANN
Industrial Controllers



shhark⁺⁺⁺
when less is more eats decibels.



LoNoise.

Turolla really cares about noise. We want to help our customers to be compliant with environmental legislation, enhance cabin comfort on their machines and get the most out of electric hybrid applications by eliminating noise in hydraulic components. Thanks to its revolutionary patented design, not only does Turolla *shhark*® reduce pump noise emissions on average 4 to 6 dB(A), but above all, it makes the whole hydraulic system

quieter due to the reduced pressure pulsations through all the components, eliminating the need for expensive noise reduction devices. All this will improve installation and maintenance costs. Turolla *shhark*® technology guarantees the same performance in terms of speed, pressure and lifetime as our performing standard gear units.

Find us at www.turollaocg.com/shhark

Member of the Danfoss Group
TUROLLA ▶▶
fast forward thinking

VISIT US AT
**AGRI
TECHNICA**®
THE WORLD'S NO. 1
Hall 16 stand B12



**AGRI
TECHNICA**
THE WORLD'S NO. 1
SNDC
Hall 17, Stand D18

OPERATOR SPRAY PROTECTION

In accordance with European standard EN 15695, category 4 cabins are required to optimize the protection of the user during spraying work.

However, simply adding a pressurization and air-filtration device will not help to overcome the many and varied tasks occurring within the cabin, including: operating the machine, providing fresh airflow, maintaining a stable pressure level – and doing all of this while providing the appropriate performance and comfort levels required by ISO 14269.

The architecture of the HVAC system needs to be redesigned, from air distribution and diffusion, pressurization, air filtration, to the air-conditioning, heating and regulation.

SNDC has extensive experience and design nous – with its own climatic test center – and is capable of offering a turnkey solution for the specifications and qualification of the cabin. SNDC's design and certification process incorporates a holistic approach, covering:

- Audit of the level of cab protection, performance and comfort of the HVAC system;

- Identification of deviations from normative and client requirements;
- Design and valorization according to EN 15695 and ISO 14269;
- Prototyping and verification of efficiency;
- Certifications; and
- Follow-up.

READER INQUIRY SERVICE

To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **515**

SETTING BIG THINGS INTO MOTION

W Gessmann is a leading manufacturer of high-quality industrial joysticks and command systems. The main focus is to create customized solutions based on a wide range of Gessmann standard products.

Highly qualified mechanical and electronic engineers support the customer from prototyping stage up to end-of-product cycle. Furthermore, Gessmann develops these command systems and human-machine interfaces in cooperation with well-known universities. Consequently, Gessmann products are safe, robust, flexible and ergonomic.

The image (right) shows a console of a feed mixer. All devices are connected to the Gessmann joystick with CAN interface; no further I/O cards are needed. Up to 48 external digital inputs and 48 dimmable LED outputs can connect to the joystick. Available CAN protocols are CANopen, CANopen Safety and J1939. Command and indicating devices especially designed for functional safety (PLd, EN ISO 13849) applications are the redundant hall pushbuttons HD1, HD2, HD3, illuminated thumbwheel S12, and the mini-joystick V21. Protection class IP67 and an amazing lifetime of 10 million operating cycles characterize HD1, HD2 and HD3 as very robust pushbuttons. Easily changeable symbol plates, each in different colors, are further advantages.

At Agritechnica 2017, Gessmann will present an extensive product range, from foot pedals up to a complete operator station.



**AGRI
TECHNICA**
THE WORLD'S NO. 1
W Gessmann
Hall 17, Stand B28

READER INQUIRY SERVICE

To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **516**

FOR YOUR HEAVY DUTY PLAYGROUNDS



INSTEAD OF TRACK SYSTEMS THE TECHNICALLY MATURE DRIVE SOLUTION FOR YOUR AGRICULTURAL APPLICATIONS: NAF-BOGIE-AXLE COMBINED WITH THE DIRECTLY DRIVEN REAR AXLE WITH ADJUSTABLE TRACK WIDTH.



VISIT US: Hall: 15; Booth: E12

1

GEARED BOGIE



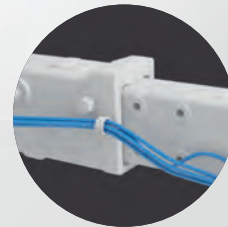
2

DIRECT MOTOR ATTACHMENT WITH SPUR GEAR DRIVE



3

ADJUSTABLE TRACK WIDTH



NAF • MODULAR-MINDED AXLES

NAFAXLES.COM



MTA Customizable Dashboards and Electronic Control Modules

All the advantages of an exceptionally versatile system

Different dimensions and shapes for an easily configurable product range, featuring elegant design and modern lines with deep attention to safety details, such as anti-reflection and anti-fingerprint treatments, guaranteeing perfect visibility.

From MTA Studio, all the possibilities to customize your instrument panels and ECUs according to your needs:

- Specific functions to program devices, graphical HMI and logic control units
- The graphical HMI is WhatYouSeelsWhatYouGet: the final graphics are already visible while creating the software
- Programming with C / C ++, LADDER, FBD, for operating logic
- Real-time debugger function
- Libraries with pre-defined blocks (SAE J1939, DM1 alarm logics, datalogger, hourmeters, ...)



- SPOT
- ZIP
- SMART
- QUIK / QUIK PLUS
- REVO / REVO PLUS
- GIOTTO / GIOTTO K
- LEONARDO
- DYNA
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are proud to belong to this family

DISCOVER MORE AT www.mta.it



We exhibit at AGRITECHNICA HANOVER, 12-18 NOVEMBER HALL 17 STAND C28

NEW HVAC PRODUCTS

Siroco's core business is to offer thermal comfort and high levels of performance for operators, thanks to specific project developments and to a complete range of standard products. "We design, develop, manufacture, assemble and commercialize heating, ventilation, and air-conditioning (HVAC) systems, including air-conditioning, ventilation and air-diffusers," says Julien Brochier, Siroco's sales manager.

Siroco's specialists will be present at Agritechnica, Hall 16, Stand C48a, from November 12-18, 2017.

At Agritechnica, Siroco will showcase its new adjustable air-diffusers with three flaps, with customizable shape and color. Available in 86.5mm, 96mm and 108mm diameters, they are ideal for use in the agricultural market. The new Sanoa air-conditioning unit is best-in-class tested.

Thanks to its parent company, Sintex Np, Siroco collaborates all necessary technologies on its unique manufacturing site in France and is able to offer them to its customers.

Siroco's engineering department offers a turnkey service and can develop any specific thermal project thanks to its know-how in the fields of specifications, the calculation of the components, 3D validation of thermal control in the cabin, and prototyping validation.

"Siroco has all the technologies and know-how to develop efficient products to meet agricultural needs," says Brochier.



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THE WORLD'S NO. 1
**Siroco Sintex NP
Group**
Hall 16, Stand C48

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Quote Ref: **517**

SENSORY ENHANCEMENTS AND FLEXIBILITY

Makersan, an innovative manufacturer of sensors, engine throttles and motion controllers, widens its product range with the manufacturing of IP67-rated joysticks at its integrated factory in Turkey. In addition to its electronic pedals, which are designed for harsh and demanding environment applications with CAN ability, Makersan will introduce a joystick that will set industrial standards in levels of ingress protection and configurational flexibility to a new level.

Offering submersible operational capabilities, joystick grips come with extensive configuration possibilities, using all buttons, switches and thumb rollers that Makersan has produced from contactless, full redundant Hall effect technology. Furthermore, the joystick can be fitted with an internal vibrator and sensor. The new illuminated pushbuttons and thumb rollers can transform the grip into a feedback display.

The pictured joystick is with a standard Makersan grip with the highest-possible configuration, built on Makersan's joystick base featuring CAN ability and IP 67 protection levels. The grip has been designed with Makersan's thumb rollers, FNR Switch, Hall effect pushbuttons and a deadman switch, to meet the industry's high quality standards.

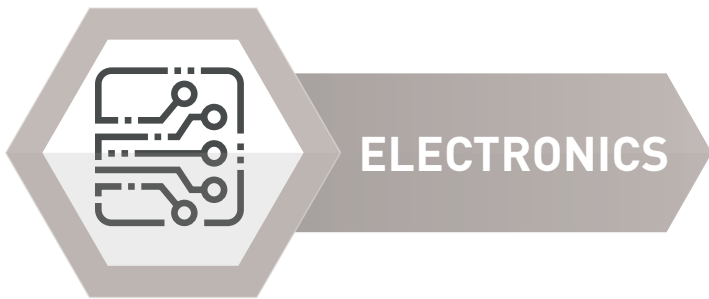
This joystick and many other products can be seen at Makersan's stand at Agritechnica: Hall 17, Stand E45.



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Makersan
Hall 17, Stand E45

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Quote Ref: **518**



**AGRI
TECHNICA**
THE WORLD'S NO. 1
Topcon Electronics
Hall 15, Stand H06d

SUPERIOR SHIFTING SOLUTIONS

"Creating the perfect interface between man and machine." This is the answer concisely given by **Topcon Electronics** when facing the question: "How can the increasing functionality of mobile machinery be handled without overloading the user?"

Topcon Electronics is inextricably linked with the world's first agricultural-based electronic operating concept developed back in 1998.

Since then the company has been optimizing its successful Opus series, which is globally known for its innovative technologies.

The Opus operator panels are distinguished by a high level of operating convenience and extreme ease of programming. Their rugged, tried-and-tested design is made to be used in harsh working environments.

At Agritechnica this year, Topcon Electronics will be presenting its flagship operator panel – the Opus A8. Setting standards with its high-resolution, 12.1in screen and aluminum casing, the Opus A8 has a high-class, modern look.

In the full line range, the Opus A8 features 1,024MB of RAM and two CANbus ports powered by an 800MHz quad-core CPU. Video inputs, A/D inputs and outputs add further convenience. Get to know Topcon at Agritechnica at Hall 15, Stand H06d.

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**AGRI
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THE WORLD'S NO. 1
**Amphenol Tuchel
Industrial**
Hall 17, Stand C55

DURABLE, LIGHTWEIGHT CONNECTORS

A plastic power connector series, **Amphenol's** ePower-Lite offers 2-, 3- and 4-pole options. The compact, robust, plastic shell is lightweight with a small footprint, and is field installable/repairable. The IP67 case can withstand temperatures up to 125°C and provides dielectric protection.

With patented Radsok technology, the connector features higher amperage, (70A) low T-rise and voltage drop, and less resistance. Also including connector position assurance (CPA) of mating, and the durability is 100 mating cycles, minimum.

UPC (Ultimate Power Connector) 2-pole and 3-pole devices offer similar attributes of small size and light weight, but are rated for higher amperages of 250A or 400A. Durability is 500 cycles, EMI shielding is

60dB/100M and sealing is to IP67 (IP69k mated). Amphenol's PCD Manual Service Disconnect offers a safe and reliable solution for xEV servicing. It utilizes a two-stage lever to open the HVIL circuit prior to separation of HV contacts. No tools are needed when disconnecting the internal high-voltage battery pack and protecting the high-voltage battery pack from short-circuit.

All HV conduction surfaces are finger-proof touch-safe. Devices are available with a variety of fuse ratings.

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Quote Ref: **520**



**AGRI
TECHNICA**
THE WORLD'S NO. 1
Molex
Hall 17, Stand B32



A SEALED CONNECTION SYSTEM

As part of its broad range of transportation solutions, **Molex** will showcase the ML-XT connection system at Agritechnica.

The reliable, securely-sealed solution helps to minimize electrical failures in grueling commercial vehicle applications, while delivering assembly cost savings. Rated IP69K, IP68 and J2030 power-wash capable, the ML-XT system features a one-piece plug housing and seal design, which is permanently bonded using cutting-edge, two-shot LSR (liquid silicone rubber) molding technology.

"Most standard systems are supplied without rear seal covers for the housing, leaving the seal exposed and unprotected," says Denis O'Sullivan, a global product manager at Molex. "The ML-XT system includes housings that are pre-assembled with the rear seal securely locked-in place and protected by a latched rear cover. In addition, the need for welding is removed. This enables Molex to deliver a cost-competitive drop-in replacement for the defacto commercial vehicle standard sealed connectors used in multiple harsh duty applications."

The ML-XT system is currently offered in 2-,3-,4-,6-,8-,12- and new 18-circuit options, providing design flexibility for a vast range of sensor technologies and low circuit-count applications. The proven Molex XRC terminals deliver current ratings up to 13.0A, while the nine color-coded housings enable the easy visual mating of harnesses to prevent mis-mating.

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Quote Ref: **521**



Fendt Rogator 600 sprayers

Fendt says its new range of self-propelled crop sprayers, namely the Rogator 600 series, will be available for sale in November 2017, following Agritechnica.

The self-propelled Rogator 600 series comprises three models: the Rogator 635, the Rogator 645 and the Rogator 655, with nominal capacities of 4,000, 5,000 and 6,000 liters respectively, and operating widths of up to 36m (118ft).

Powered by AGCO power engines ranging from 175-242hp, and combined with the stepless drive concept and the smart traction control, these machines have been designed for large-scale arable farmer and contractors.

The revolutionary single-beam chassis forms the backbone of the three self-propelled models. Alongside a very low center of gravity, this provides outstanding, balanced weight distribution, which also guarantees a very stable boom.

The hydraulic track width adjustment provides up to 2.25m of flexibility, which is especially important for contract work.

Single-wheel suspension and a new Vison cab also provide the operator with the highest amount of comfort while running the machine.



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THE WORLD'S NO. 1
Fendt
Hall 20, Stand A26a

**AGRI
TECHNICA**
THE WORLD'S NO. 1
Hella
Hall 17, Stand B35



MODULAR LED LIGHTING SOLUTIONS

Hella, a supplier of lights and electronics, presents its innovative solutions at Agritechnica. The focus will be on modular light solutions, based on LED technology, that offer manufacturers smaller quantities and the possibility to bestow their vehicle series with a distinctive image.

However, not only design and individual light signature, but also energy management, safety, efficiency and comfort, play a significant role in the agricultural sector. Hella exhibits the relevant electronic solutions, as well as its extensive standard lights and lamps portfolio.

As a member of the CAB Concept Cluster, a platform founded in 2014 by experienced OEM suppliers, the Technical University of Dresden and various partners and associations, Hella contributes with its more than 100 years of experience into the new project, introduced at Agritechnica.

Based on a multifunctional cab for self-propelled vehicles, such as harvesters and field sprayers, the CAB Concept Cluster presents its second major project at Agritechnica – the Smart CAB. As an expert in lighting and electronics, Hella makes innovative light solutions that offer more efficiency and safety.

The presentation of the Smart CAB takes place at the CAB Concept Cluster stand in Hall 17, Stand D53 and Hella itself will be exhibiting at Stand B35 in the same hall.

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To learn more about this advertiser, visit www.ukimediaevents.com/info/ivm
Quote Ref: **522**

SEEING THE FUTURE ON SCREEN

Würth Elektronik ICS can now serve its customers even more comprehensively. Thanks to the new WEcabin Display i7, products for supplying electrical power and controlling vehicle functions can be complemented with a multifunctional display and operating solution.

The i7 visualizes, monitors and controls numerous functions in mobile machines and commercial vehicles. Together with other Würth Elektronik ICS products, such as ICCS controllers and central electrical units, it provides a highly functional all-in-one solution.

With its 7in widescreen with optical bonding and a brightness of up to 1,000cd/m², the PCAP multitouch display offers perfect readability and gesture operability – no matter whether it is used in direct sunlight or in the dark. The data exchange is carried out by two CANbuses, two USB ports, one 10/100 Ethernet port, and one RS-232/485 port. Advanced features – such as PDF reader, web browser, user management, gesture control, alarm storage and video streaming – offer new possibilities in HMI interaction and vehicle use.

Thanks to the WEcabin Designer programming environment, the display can be customized in numerous ways to suit individual customer requirements by using widgets, an advanced graphical interface, and JavaScript. The designing and programming of the graphical user interface is easy and intuitive due to a drag-and-drop function.

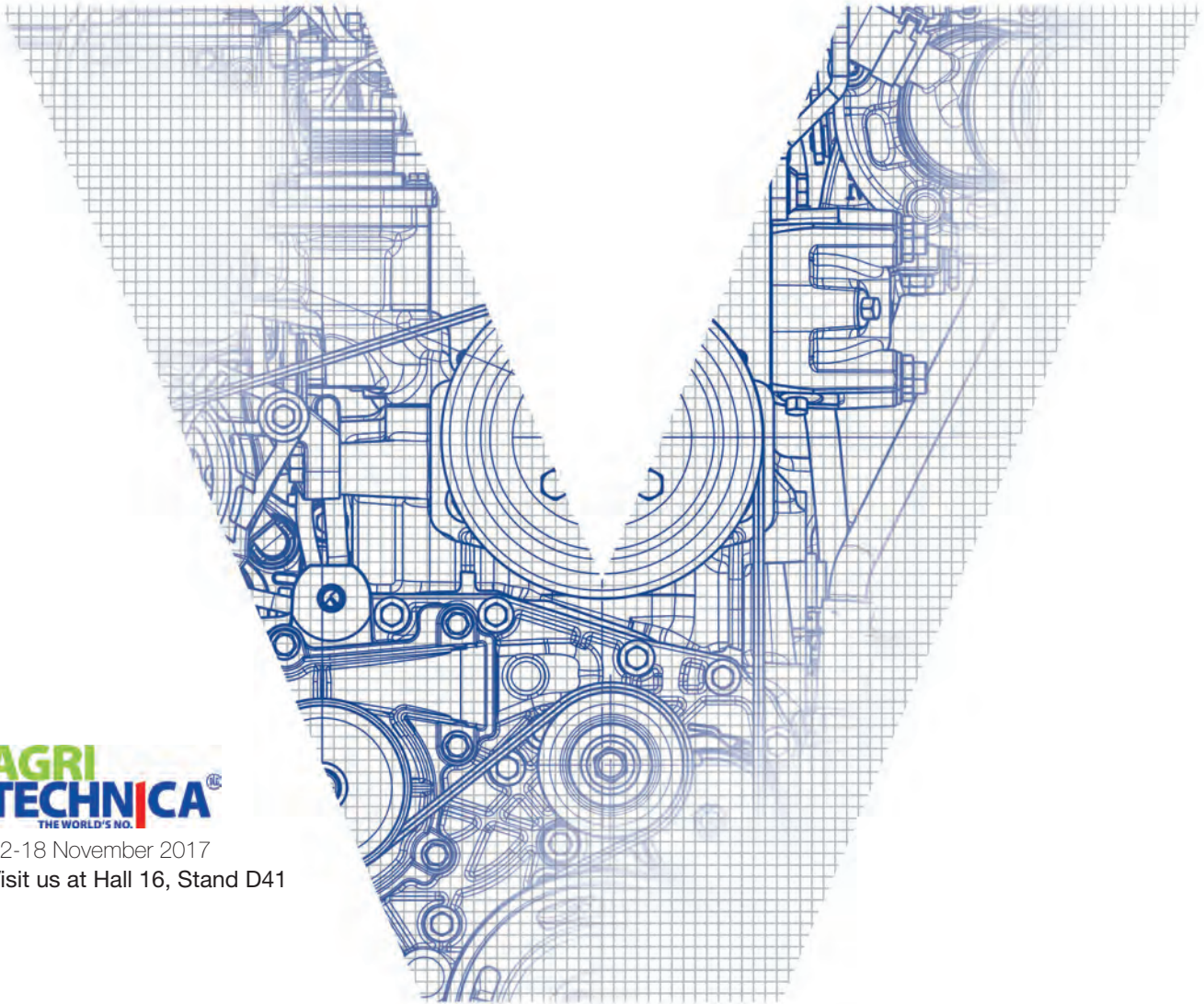


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**Würth Elektronik
ICS**
Hall 17, Stand B7

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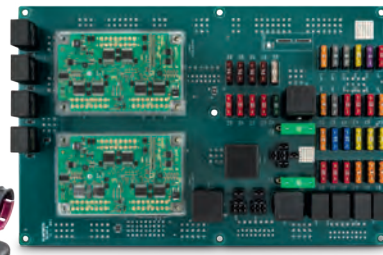
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FIELD-VERIFIED WHEEL DRIVES

Mekra Lang KG, a leading manufacturer of surround vision systems for commercial vehicles, presents its latest innovation – the Vision 4.0 System – at Agritechnica 2017.

Mekra products are highly valued because of their unique combination of high precision and robustness, resulting from over 80 years of experience in the development/manufacture of mirror/camera monitor systems. It now presents a completely new electronic camera monitor system for agricultural vehicles.

The groundbreaking new Vision 4.0 System is a mirror replacement system that substitutes mirrors for HDR cameras and monitors. It is ISO 16505-compliant and makes the use of mirrors unnecessary. The various fields of vision can be depicted, combined on a monitor, in the cabin or viewed separately, and additional information can be displayed. The sensitive camera improves night vision and reduces the effects of glare caused by direct light.

The new system greatly improves the handling of the vehicle, and surrounding areas and potentially dangerous situations are captured faster, thus providing more safety and less stress for the driver.

Visit Mekra at Agritechnica at Hall 17, Stand D51.

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Quote Ref: **524**



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Mekra
Hall 17, Stand D51



Valtra T and N series upgrades

The news from the Valtra stable in Finland is that it will launch the first four-cylinder engine tractor that can boost over 200hp.

Valtra say it is expanding its fourth-generation N and T Series ranges upward with the introduction of new high-output models, and the SmartTouch armrest on all Versu and Direct models. All new models comply with the EU's Mother Regulation, and 60km/h transmissions are available.

Demands for extra horsepower from operators carrying out power take-off (PTO) work and for road driving has seen Valtra raise the maximum output of the N174 model with a new two-step boost to 201hp.

And the T Series has been expanded with the addition of new models: the T234 Direct and T254 HiTech, Active and Versu. The new models feature two-step boost, meaning that even more power is available in the most important work situations.

Additionally, SmartTouch ergonomics bring all tractor functions within easy reach of the operator.

**AGRI
TECHNICA**
THE WORLD'S NO. 1
Valtra
Hall 20, Stand A26c

CONNECTING TRACTORS AND IMPLEMENTS

Having a tractor from one brand and implements from another is not unusual. Before the ISObus standard, implements were operated via their own terminal with proprietary communication interfaces. Having several implements meant several terminals in the tractor cabin.

Piia Vedenjuksu, a customer service engineer at **Epec**, says that this was the starting point for developing the ISObus standard, in order to create a common language for all agriculture equipment manufacturers. Standardization brings many benefits.

Tractors and implements are plug-and-play capable. All implement operations can be controlled using one terminal, which equates to less cabling and better visibility in the tractor cabin. Standardized cables and connectors also reduce costs.

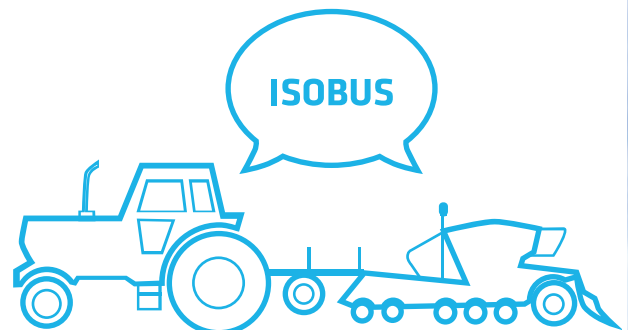
In addition to CANopen and SAE J1939 communication protocols, Epec control units and programming environments also

support ISObus protocol. ISObus-related configurations for the control unit can be carried out in Epec MultiTool, a configuration tool for the machine control system.

So, what needs to be done? When the control unit has been added to the MultiTool project, the needed ISObus components (virtual terminal client, task controller client, tractor ECU interface, ISObus diagnostic) are selected, and standard information about the implement is set. With just one click in MultiTool, a CODESYS project can be created. Configurations made in MultiTool are automatically imported to the CODESYS code template and the program developer can focus on what is most important: creating the implement user interface and functionality.

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Quote Ref: **525**



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Epec
Hall 15, Stand F54



MULTI-APPLICABLE PROCESS CONTROL

With the PocketEvo, **NBB Controls + Components** presents a brand-new generation for safety radio control systems. A robust housing ensures that the key transmitter itself can withstand extreme conditions. The integrated, circumferential protective rubber coating, in combination with the fiber-reinforced plastic core, provides optimal protection. All electronic components can withstand extreme mechanical effects from the outside.

The design of the PocketEvo offers maximum functionality, such as proportional or stepped buttons, as well as free configurable buttons.

A modular design, with three different sizes, also offers the possibility to use a 2.3in color display. Compact, handy and user-friendly, the transmitter works safely without compromising the effectiveness of machine operation. This results in a consistent optimization of the workforce potential and a minimization of the risks at work.

In case of service, the SMP technology (surface-mounted pushbuttons) means the buttons can be easily changed on-site. Even the housing remains closed when the button is changed so that no contamination occurs as a result.

The PocketEvo is an ideal solution for a wide range of process control applications including cranes, hoists, winches, skip loaders, slope mowers, mulchers, shredders, plus a wide range of construction equipment.

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Quote Ref: **526**

A SAFE PAIR OF EYES ON THE ROAD

The smart 3D sensors of the O3M series from **Ifm electronic** enable fast collision warning thanks to the three-dimensional detection of the machine environment. It actively supports the driver with automatic object recognition, thus preventing accidents and damage.

It can record more than 1,000 distance values synchronously and reliably detect and follow up to 20 objects. Functions for region and distance monitoring are available to solve even complex applications.

It can detect up to 64 three-dimensional individual segments of the sensor's visible area independently of each other and supply abstract values to the machine controller. Setting is made via easy-to-operate PC software containing templates for many applications.

The heart of the new unit is the PMD 3D sensor patented by Ifm. Robust and reliable – even interference caused by changing environmental conditions such as sunlight, rain or materials with different reflective characteristics, does not influence the repeatability of the measured data. High vibration and shock resistance, and protection ratings of IP 67 and IP 69K, are standard.

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Ifm electronic
Hall 16, Stand G34

The complete Control in the palm of your Hand



SLIMTITAN

7" rugged touch screen display



M-CLUSTER

Deep innovation on traditional cluster



DASHCONTROL

Ergonomic and multifunction CANBUS control encoder



KEYCAN

Modular CANBUS keypad

The new line of Ama Instruments devices has been engineered for all applications requiring compact and maximum versatility along with high performance and structural strength. Thanks to its innovative and minimal design, the whole range of instruments by Ama Instruments fits different applications perfectly.



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Head to p74 to read our full case study of the new **Lindner** Lintrac 90 tractor. The world's first standard tractor available with continuously variable transmission and a steered rear axle.



AGRI TECHNICA
THE WORLD'S NO. 1
Lindner
Hall 5, Stand C05

THE ELECTRIFICATION ERA AWAITS

Linak comes to Agritechnica 2017 introducing its full line of advanced programmable actuators. Features include real-time monitoring, multi-option position feedback, and service data via J1939 CANbus.

The 'electrification era' for agricultural equipment has only just begun and the path to success requires an actuator supplier that provides technology, support and know-how. Linak's application team can identify solutions with force capabilities up to 15,000N and features that include parallel, remote control, proportional speed control, LIN and CAN protocols.

The company's strong commitment to the advancement in linear electric actuator technology and automation with the world's leading agricultural equipment companies is backed by an industry focused engineering and sales team. Linak operates from concept to production with innovations that bring energy-efficient and cost-effective linear actuator solutions to its clients' products. Its worldwide locations make Linak a strong choice when seamless support and product knowledge are vitally important.

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Linak
Hall 17, Stand B29



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Quote Ref: **528**

NEW MULTIFUNCTIONAL ISOBUS TERMINALS

CrossControl is launching a new line of terminals for the agricultural market with display sizes 5in, 7in, 10in and 12in. The terminals come with ISObus Universal Terminal and Task Controller functionality and can also run other functionality in parallel with ISObus. This means you can show your ISObus UT side-by-side with your instrumentation GUI, video images from connected cameras, electronic manuals, condition/health monitoring, guidance and auto-steer, and more.

The concept of a truly multifunctional display allows equipment OEMs to offer a high value, easy-to-use system as well as opening up avenues for offering aftermarket upgrades. Separate displays for the various subsystems are

made redundant, saving real estate and cost in the cab, and operators benefit by having a single display to monitor all critical information, side-by-side, in a seamless design.

The enabler for this new offering is an open and modular software platform – LinX Software Suite – which is deployed on all CrossControl display products. To enable a truly multifunctional display and seamless user experience the ISObus UT has been 'widgetized', meaning that different blocks making up the UT are made into graphical widgets, providing flexibility in how the integrated GUI is designed.

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CrossControl
Hall 15, Stand K08





Reliable mobile machine control

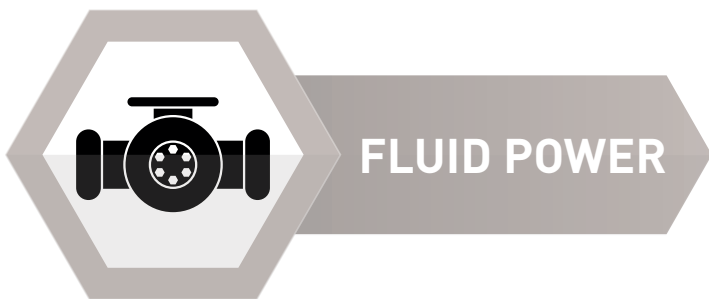


Standard and SafetyController in one unit

Modern vehicles and mobile machines require powerful control electronics. The new ecomatController has two independent, powerful 32-bit PLCs – one of them an independent safety controller (SIL2 / PI d). In addition to a variety of configurable I/O ports, two Ethernet and four CAN interfaces with CANopen, CANopen Safety and J1939 protocol are available. Robust, reliable and powerful. ifm – close to you!



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The TVH brand, CAM System, is recognized for its high standard and reliability. CAM System products consist of a wide variety of attachments (such as the hay clamp, pictured) for machines used in different sectors. CAM System products can also be tailored to the needs of its customers.

TVH prides itself on its extensive range, same-day shipment and next-day deliveries, technically trained staff, customer support in 37 languages, its online support, and its presence in 170 countries.

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Quote Ref: **530**



TVH Group
Hall 02, Stand E17A

INCREASED PRODUCTIVITY WITH EHC

In its MF6700 series, Massey Ferguson, a tractor manufacturer in Latin America, used three-point electronic hitch control (EHC) and load-sensing technology from **Bosch Rexroth** to make their farming vehicles more efficient – increasing productivity while reducing fuel consumption.

This technology electronically controls the oil flow for the cylinders set on the tractor's rear side. They are responsible for lifting equipment, such as plows, levelers and sprayers. "Usually, tractors within this power range use mechanical hitching systems," says Tiago Gruske, a sales engineer for Bosch Rexroth in Brazil. "Electronic ones increase productivity by quicker response, and they also control penetration depth and equipment power more accurately."

Load sensing brings savings to the tractor series. In this system, the hydraulic actuator activates the pump when the cylinders or motors are needed. Only then, the pump starts running to provide the required oil flow. After this demand is met, the actuator gives a new signal and the pump returns to values near zero.

"This significantly reduces energy consumption compared with a conventional pump, whose displacement always remains constant," says Gruske.

Most of the components in this tractor line are produced by Bosch Rexroth.

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Quote Ref: **531**



Bosch Rexroth
Hall 16, Stand A04

Photo: Massey Ferguson

POWERFUL BLOWER DRIVES



With rising seed costs and ever-tighter environmental protection regulations, precision dosing and distribution are becoming increasingly important in the field of sowing technology. Combining very high speeds with extremely quiet operation and maximum service life, the innovative QXM-Mobile internal gear motors from **Bucher Hydraulics** deliver impressive performance in seed drills.

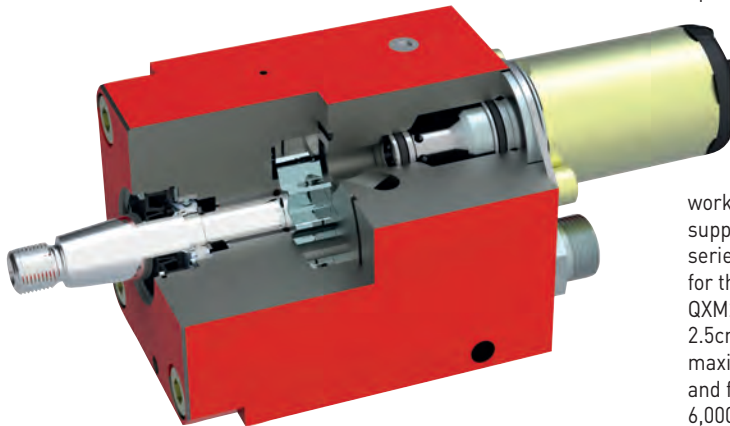
Self-propelled and towed machines both require a reliable and low-noise motor with high working speeds. Bucher Hydraulics supplements the tried-and-tested QX series with two new internal gear motors for the mobile sector: the QXM12 and QXM22, with displacements of between 2.5cm³/rev and 8cm³/rev. They have a maximum working pressure of 210 bar and forward-looking speeds of up to 6,000rpm. Thanks to their design, QXM

motors also offer higher levels of operating reliability and longer service life compared with other drives typically used in sowing technology. These internal gear motors therefore support the goal of increasing efficiency through faster filling of the machine and optimized sowing times. Quiet running, stable torque and optimal startup performance are further strengths of the internal gear motors, which enable the QXM concept to score heavily over conventional drive technology such as external gear or axial piston motors.

By incorporating an outboard bearing directly into the body, the user is saved the effort, cost and space of specially fitting the outboard bearing that would otherwise be required with external gear motors.

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Quote Ref: 532



AGCO Ideal combine

US machinery giant AGCO has just launched a new combine that will be marketed across three brands: Challenger, Fendt and Massey Ferguson.

The official price will not be released until Agritechnica this November, but AGCO has already said it will be expensive.

New features on this combine include single- and dual-rotary threshing systems and also include the 451hp MF Ideal 7, 538hp MF Ideal 8 and 647hp MF Ideal 9, plus the ParaLevel versions.

The 4.84m (15.9ft) Dual Helix rotor fitted to the MF Ideal 8 and MF Ideal 9 is the longest in the industry. It provides the largest threshing area in the business.

At the same time, it benefits from low power requirements and insensitivity to varying crop conditions, leading to fuel efficiency, low grain losses, and the gentle handling of grain and straw.

The combines feature 12,500- and 17,100-liter grain tanks (2,750 and 3,761 gallons). Reducing the frequency of unloading for improved efficiency, the 17,100-liter option is the largest currently available with approximately 18% more capacity than the largest available today.

As for transport width, even the largest MF IDEAL 9 with 800mm (31.5in) tires or new 660mm (26in) inhouse-designed track option can meet a 3.3m (10.8ft) overall width requirement.





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Through rain, ice, wind, mud, dust, vibration and chemical exposure, commercial vehicles facing the toughest conditions rely on the latest connected vehicle technologies from Molex. To enable networking, electrification, powertrain and body electronics, you need to invest in technology that pairs the latest innovation with proven reliability. Molex delivers end-to-end electronic solutions that bring connected commercial vehicles to life — even in the harshest environments.



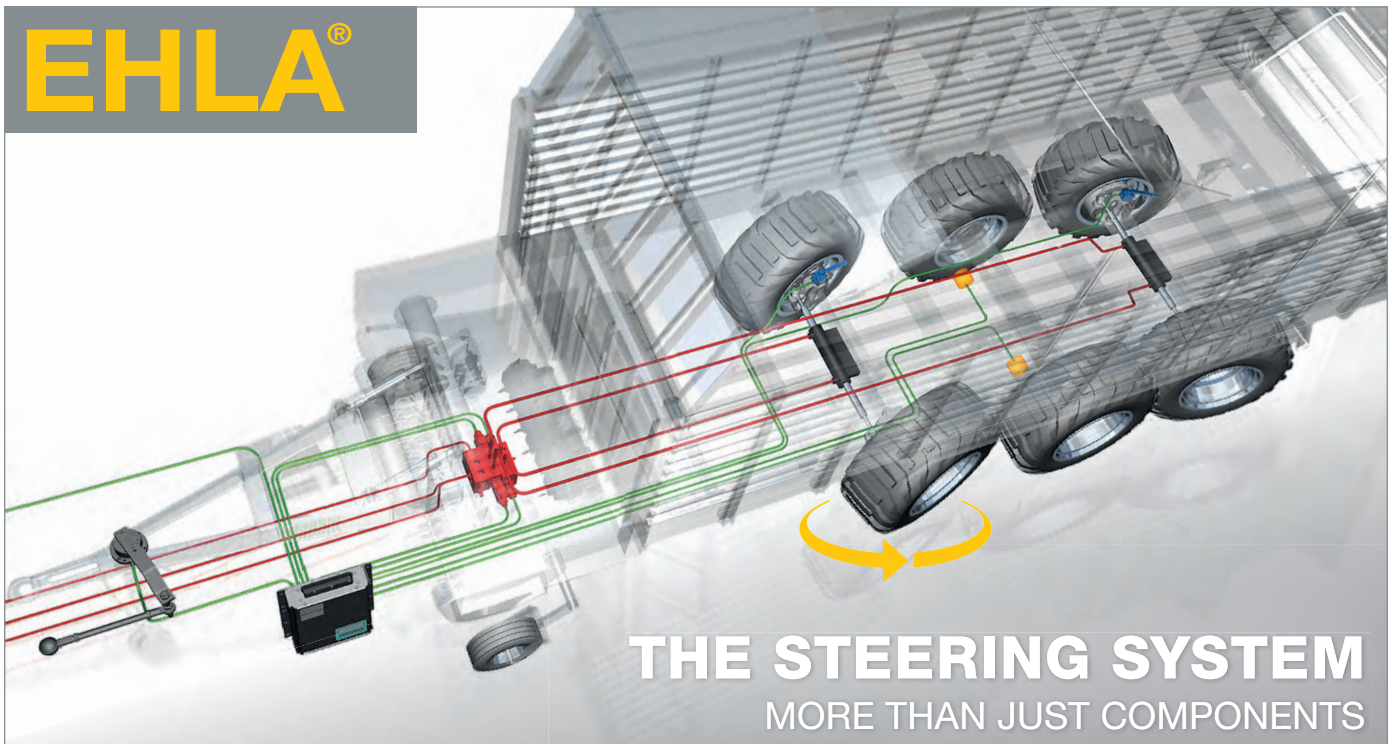
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Agritechnica 2017, Hall 17, Booth B32.

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JTEKT HPI
Hall 17, Stand G11



FAN DRIVE COOLING SYSTEM

With its hydraulic fan drive cooling system (called HMC), **JTEKT HPI** offers an innovative alternative to hydrostatic fan drives for cooling the engine heat exchanger in a range of applications, including agricultural ones. Benefits of the HMC include the regulation of different parameters (CANbus information), which will help to reduce maintenance costs and fuel consumption.

One of this solution's major features is the reverse option. Fan speed has to be increased to compensate for the decreased efficiency of clogged exchangers. Periodic cleaning is needed to keep machines working in dusty environments and this is why directional valves are available with JTEKT HPI motors. Electronically controlled fan reversal is implemented automatically, periodically or upon request; the fan runs for one minute at maximum speed – the time needed to clean the exchanger – and then smoothly comes back to its normal operational speed.

All reversing cycle parameters can be programmed depending on the vehicle's specific environment, with the dirt being blown out before it sticks to the exchanger cooling elements. As well as helping to achieve the emissions standards, this increases vehicle availability and reliability, and reduces noise and power consumption.

The quality, reliability and outstanding performance of the HMC system are examples of the expertise that JTEKT HPI solutions offers to meet its customers' needs.

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A FLEXIBLE SENSOR

The Temposonics flexible MH sensor is ideal for use in hydraulic cylinders in mobile applications. The externally threaded magnetostrictive linear position sensor is highly resistant to shocks and vibrations and has a measuring length up to 5,000mm (19.7in). It can resist extreme temperatures between -40°C and +105°C (-40°F and 221°F) and it is available with an analog or a digital output to fit a wide range of applications. A key feature is the innovative two-part design, which enables users to separate the flexible sensing element and electronics from the housing without opening the hydraulic system.

While it is manageable to install and to remove hydraulic cylinder sensors at a manufacturing facility, it can be challenging to do so in the field. Trained service technicians can remove and replace the internal components with just 200mm (7.9in) of

clearance regardless of stroke length and without breaking the hydraulic seal. This serviceability means decreased downtime and disruption, providing increased productivity. Replacement units ship as coiled rings to ease handling and reduce shipping costs.

"The high resistance to shocks, vibrations and high temperatures makes the FMH sensor an ideal solution for mobile hydraulics applications," explains André Beste, technical marketing manager at **MTS Sensor Technologie**. "And the innovative design makes it easy to use, even if there is only limited space available in the application."

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MECHANICAL STABILIZERS

Fifty years of experience in this market and a strong technical know-how, together with a continuous and accurate attention to the needs of end users, make a difference.

More and more tractors are fitted with the **CBM** automatic stabilizers, components of the three-point linkage, that guarantee a high level of reliability during when used in heavy-duty applications and excessive lateral oscillations. When used with agricultural transportation vehicles, the stabilizers have the task of centering and blocking the implement in relation to the tractor, to ensure safety and stability.

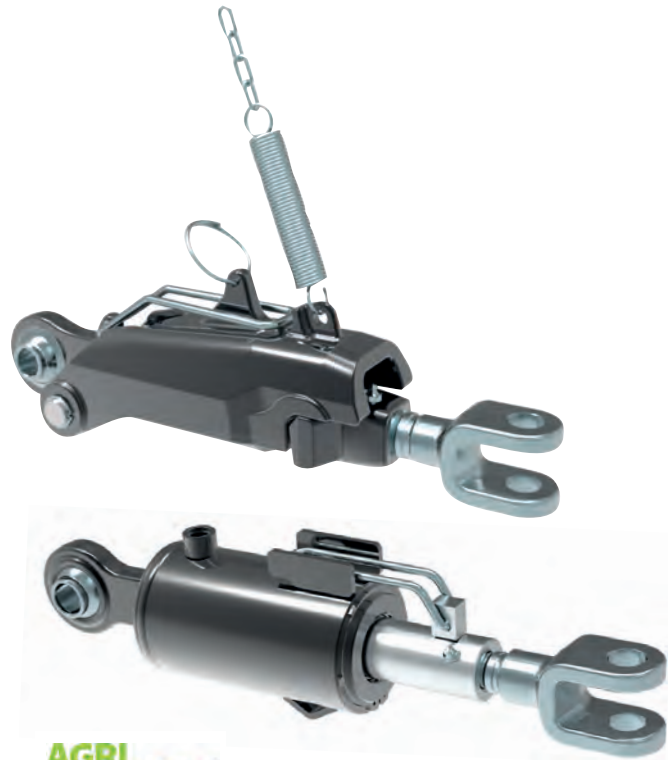
The automatic stabilizers are extremely useful for work where

both the 'floating' function and the 'blocked' function are required; these two operating conditions can be obtained autonomously and in total safety directly from the driver's seat.

The hydraulic version allows for infinite adjustments to be made and it can be activated at any height from the ground, and for a gradual passage from the floating to the blocked condition, thus avoiding the risk of accidental shocks and violent lateral oscillations that could result in damages to the three-point linkage, or to the implement.

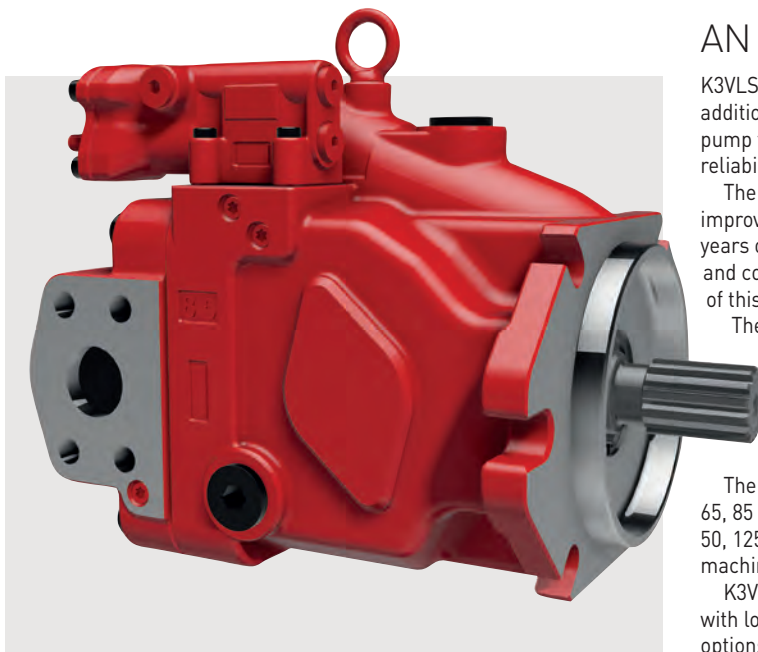
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CBM Group
Hall 17, Stand C25



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Kawasaki
Hall 17, Stand G04

AN EXPANDED PUMP RANGE

K3VLS variable displacement axial piston pumps are **Kawasaki's** latest addition to its extensive hydraulic pump range. The K3VLS is a compact pump that epitomizes Kawasaki's reputation for high-quality products, reliability and innovation.

The K3VLS series was developed to bring efficiency and performance improvements to agricultural and forestry machines. Kawasaki's 100 years of experience in hydraulic systems, and expertise in fluid modeling and computational fluid dynamics, were invaluable in the development of this new range.

These open-circuit axial piston pumps have a rated pressure of 280 bar and have best-in-class efficiency and performance. The design of the rotating parts of the K3VLS mean that they require much reduced input torque to maintain self-lubrication in the unloaded or standby condition. This gives a fuel efficiency benefit for machines with intermittent use of the working hydraulics.

The K3VLS was launched at Agritechnica 2015 in three frame sizes: 65, 85 and 105cm³/rev. Kawasaki has now extended its range to include 50, 125 and 150cm³/rev versions, making it suitable for a wider range of machine applications.

K3VLS series pumps have excellent controllability and are available with load sensing, torque limiting and electric displacement control options, making them the perfect choice for many agricultural and forestry applications.

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ESSENTIAL BRAKES

The trailer brake unit (TBU) range for tractor applications has been expanded to include two more versions. The TBU flange type has an interface that's suitable for use with common stackable valves found in tractors.

Multiple TBU sizes allow for better hydraulic efficiency and control. To perfectly fit the valves found in any size of tractor, a new high-flow TBU has been released.

More and more tractor producers are looking for a TBU that offers automatic dual-braking mode selection (RVBR and legacy). The AutoDetect feature enables towing of both old single-line and new dual-line trailers – and braking performance is automatically selected, depending on the number of lines connected. In instances where old trailers are

connected, the automatic setting of the braking mode to the type of trailer will limit the braking effort of the tractor.

For trailers, **Safim** offers two type of systems: combined SAHR+Service cylinders, and hydraulic accumulator controls actuations. For all systems, the number of components that can fit on the trailer is limited to the coupling unit, automatic valve, brake valve adjuster and cylinders.

Tractor and trailer simulators are basic equipment for the tests required to get type approval for vehicles. These can be provided by Safim, along with dedicated customer support.

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Safim
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John Deere 6230R/6250R tractors

John Deere is launching two tractors to complete its 6R Series. The new 6230R, rated at 230hp, and the 6250R, rated at 250hp, are designed for use by contractors and on large arable farms.

Thanks to an engine boost of 50hp with intelligent power management (IPM), the flagship 6250R tractor provides up to 300hp when required.

With a very light vehicle weight of 9.3 metric tons, the 6250R delivers more power than any other tractor in this weight class, along with an unrivaled power density of 31kg/hp.

The high maximum permissible weight of 15 metric tons also allows for a 5.7 metric tons payload, which means the tractor is able to transport heavier loads.

Both these new tractors are powered by a 6.8-liter PowerTech

PSS engine with dual turbochargers and advanced DPF and SCR technology, which responds very quickly to changing loads, while consuming less fuel and meeting demanding Stage IV emission standards.

The upgraded AutoPower transmission delivers maximum efficiency, with 100% mechanical power available at 3.5km/h (2mph) for heavy draft operations, 11km/h (7mph) for light draft work, 22.5km/h (14mph) for heavy transport, and 47.2km/h (29mph) for light transportation duties.

Once running at maximum road speed, RPM automatically drops and 50km/h (31mph) is maintained at 1,630rpm and 40km/h (25mph) at 1,300rpm, which results in lower fuel consumption on the road.



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BENEFITS FROM A PILOT-OPERATED MANIFOLD

Pilot-operated manifolds offer a number of advantages to the hydraulic system designer, including smaller packages, more options for control, tighter sealing, and lower pressure drop. Use of a casting can further improve pressure drop.

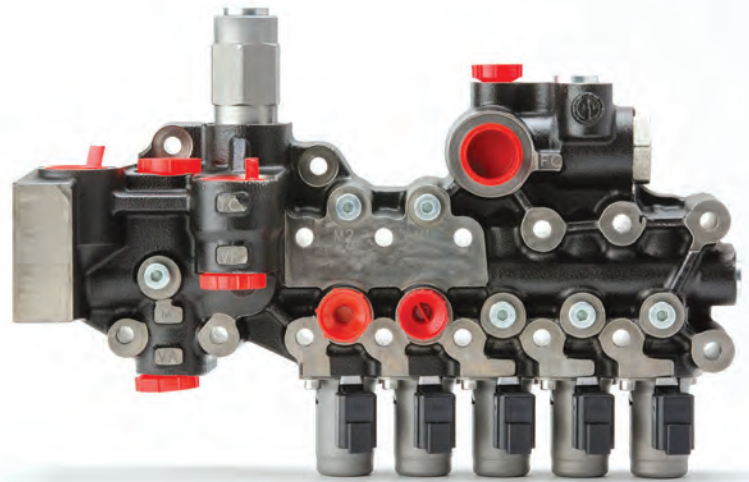
Custom hydraulic pilot-operated manifolds can be attached directly to steering units, pumps and cylinders to shorten the hydraulic flow path and boost performance. This improves hose routing and reduces the number of hydraulic connections, which in turn reduces hydraulic leakage.

Multiple control functions can be incorporated into a manifold using multifunction cartridge valves. Accessory components, such as accumulators or filters, can also be added. Valve replacement or upgrading is simplified, with little or no downtime, thanks to the use of industry-common valve cavities.

Backed by the experience of more than 6,500 manifold designs, **HydraForce** is the 'go to' resource for custom manifold design and manufacturing. Cast steel, aluminum or ductile iron blocks can be specified to the demands of the application. Anodized or zinc plating provide additional protection in severe operating environments.

All HydraForce manifolds are 100% circuit logic and function-tested and can be sourced from HydraForce manufacturing facilities in the USA, UK, China or Brazil.

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Head to p64 to read our full case study of the all-new **John Deere S-Series** combines, which take harvest automation technology to a new level.



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John Deere
Hall 13, Stand E30

Innovation Awards: Silver Medal winners

- **Claas:** Axion 900 TerraTrac semi-tracked and fully suspended tractor
- **John Deere:** EZ Ballast Wheels
- **Claas Cemos:** operator assist system tractors
- **Agco Fendt:** VarioPull
- **Agco Fendt:** e100 Vario
- **Agco Fendt:** MARS (Mobile agricultural robot swarms)
- **Pottinger and New Holland:** Camera supported seedbed preparation
- **Kuhn:** GPS-based and automated body-lift-out for plowing
- **Landmaschinen Wienhoff:** LevelTuner
- **Amazon and Rometron BV:** Swing Stop pro
- **Lechler GmbH:** ESV (electric shut-off valve)
- **Petkus Technologie:** MultiCoater CM 300
- **Claas:** Stereoscopic row-crop Culti Cam camera on mechanical hoes
- **John Deere and Monosem:** Tractor integrated implement steering with Infield auto system for high-capacity hoes
- **New Holland:** Pro-active and automatic combine setting system
- **Agco:** Ideal combine
- **Homer:** SmartTurn
- **Grimme:** Vantor 4150 – a self-propelled, four-row potato harvester with world-leading lifting system that doubles capacity
- **Pottinger:** Sensosafe
- **Bernard Krone:** LiftCab
- **GSI Hungary:** Flexwave Grain Silo Unloading System
- **Fruit-Tec Adolf Betz:** SmaArt Camera System for automated blossom thinning with Darwin
- **Fliegl Agrartechnik:** Beacon+GPS+Sigfox – Fliegl COUNTER SX / Pöttinger PÖTPRO Guide
- **Farmdok:** automation of agricultural recordings with smartphones
- **AGCO International, Amazonen-Werke H. Dreyer, DKE-Data, Grimme, Horsch Maschinen, Maschinenfabrik Krone Beteiligungs, Kuhn, Lemken, Pottinger Landtechnik, Rauch Landmaschinenfabrik, Same Deutz-Fahr Deutschland:** Agrirouter
- **Amazonen-Werke:** SmartService 4.0
- **Claas:** Telematics large vehicle alert system
- **Agrocom:** Smart crop damage identification

The right tools for the port

CONTINENTAL IS PLAYING A ROLE IN ENSURING SMOOTH LOGISTICS IN AND AROUND HARBOR YARDS WITH AN ARRAY OF TECHNOLOGIES THAT PERFORM IN CHALLENGING CIRCUMSTANCES

Ports play a key role as important transshipment hubs for a variety of goods. They are complex, high-performance centers and a key economic enabler all over the world. In this busy environment, the international technology company Continental is doing its bit to ensure that operations run smoothly, and also has a role to play in the construction of new ports.

Limitless powerhouses

The giant quay cranes and ground conveyors designed for loading and unloading ships in ports are powerhouses of staggering capabilities. Continental supplies the hydraulic lines for these giants, ensuring smooth operation.

Wireless signals allow the crane operators to locate the assigned bays for goods from all over the world. Everything works fully automatically. In tandem operation, the LHM 600 Litronic from Liebherr – a mobile dockside crane for heavy goods and project cargos – can load up to 320 metric tons of cargo.

Tight curve avoiders

Dockside cranes move very slowly and avoid tight curves. Continental offers a range of special tires for these mobile colossi. The Crane Master tires can support extremely heavy loads and, thanks to their low rolling resistance and, in turn, lower energy consumption, meet the stringent demands of these vehicles. Meanwhile, Continental's drive solutions ensure maintenance-free, low-wear system solutions for lifting systems and ground conveyors. As alternatives to chain drives, polyurethane flat belts featuring ultra-high-strength steel cord tensile members are ideal for challenging applications.

For forklift trucks, too, companies are deploying other products developed by Continental. Axle boxes help to cushion the front axles, ensuring that the chassis runs quietly.

For the Linde electric stacker 386, two special axle boxes made from natural rubber were also developed. These take up very little space and ensure mobility when the lift pole is tilted. The boxes absorb the three-dimensional loads generated when the stacker is in operation, as follows: the load from the lift pole is absorbed vertically, while the load generated when the stacker is in motion is absorbed horizontally.



In addition, the noise emissions from the forklift truck are permanently reduced.

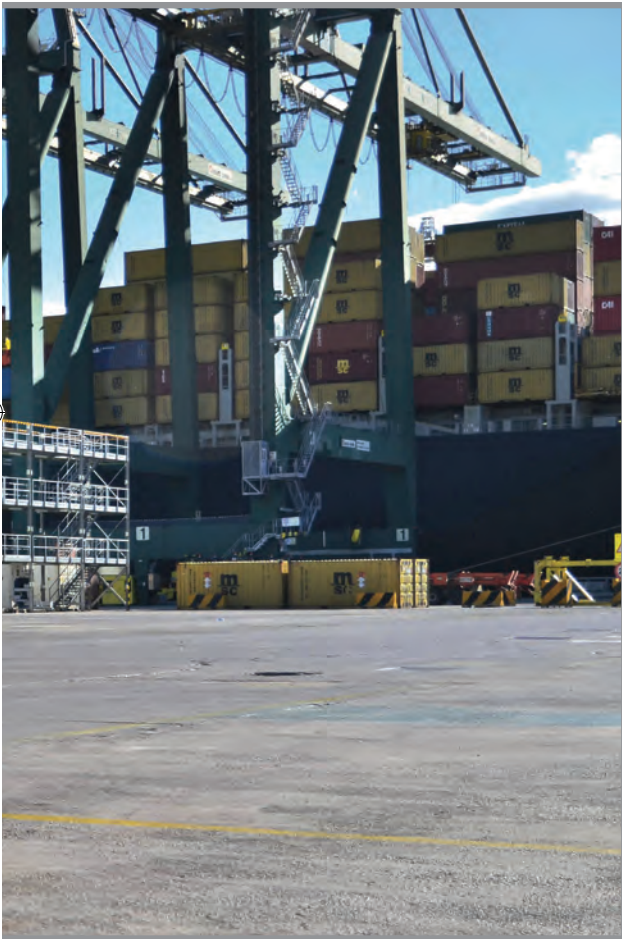
Continental also offers the special Tractor Master tire for port logistics. This product has been specially designed for tractor units deployed for handling operations in ports and forwarding agents' yards.

These tires enable large and heavy loads to be transported – and all that with uniform wear to prevent the tread from tearing. The tire is highly damage-resistant, has extremely low wear, and helps

to cut not only fuel consumption but also CO₂ emissions. And with Straddle Master, Container Master, Dock Master, and Continental Crane Master, the highly resistant V.ply tires for port fleets also help to ensure smooth operations in port environments.

Fuel-saving air springs

In the trucks that unload the heavy containers from the ships for onward transportation, air springs featuring lightweight plastic pistons help to reduce



ABOVE: Vehicles operating in ports must be capable of handling very heavy loads



ABOVE: Tires for port vehicles need to be highly resistant to extreme-strain situations

overall vehicle weight and save fuel – for example, in the Mercedes-Benz Actros.

Bunker hoses are used for conveying heavy fuel oil, carburetor fuels and hot asphalt, to and from the ships. Whether in Hamburg, Rotterdam, Antwerp, or Batumi, Georgia, these highly resistant hoses are essential for conveying these substances either onto dry land or onto the ships. When in operation, they have to be absolutely safe and reliable in order to avoid environmental damage. Decades of know-how in the production of hybrid hoses lead to ever-improving product quality. And what's more, when iron ore or coal in Rotterdam in the Netherlands, Hamburg in Germany, or Narvik in Norway needs to be extinguished, oil-resistant and fire-retardant, energy-optimized covers ensure problem-free unloading to the designated bays – highly efficient and energy-saving.

Port construction role player

ContiTech has a role to play in the construction of new ports, too. Floating hoses it developed were used during the construction of Jade Weser Port, Germany's only deepwater port. Special-purpose hoses were used for shifting 12 million cubic meters of sand from the dredgers. Continental offers

a range of high-quality, special-purpose hoses for transporting concrete to container terminals that are under construction.

Whether port deepening on the coast, river deepening for inland water transportation, or land reclamation for expanding terminals, dredging companies count on Continental – in Hamburg or Bremen, and any other port where waterways require regular clearing. For these tasks, companies need highly wear-resistant hoses that are not only durable and highly flexible, but also meet individual customer requirements.

Safety is the watchword here. The floating hoses are designed to withstand three times the pressure stipulated in the planning data. The floater dredges deployed to perform such tasks are also equipped with conical mounts from Continental to ensure the required stability.

These components continuously compensate for the movements and shifts in weight that occur as a result of the extreme stresses. Installed on the ring mount in the dredger, the mount ensures that the water engineering vehicle always stays on course during construction operations. **ivT**

The author, Antje Lewe, is spokeswoman for ContiTech



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LEFT: Solutions are customized to the vehicle's requirements

integrates heating systems with 'Engine-Off' technology into the engine-cooling circuit. On one hand, this implements a customized and very efficient preheating system, while on the other, it generates savings by reducing idling, engine hours, and consequently fuel consumption, by up to 90%.

Engine-Off technology saves costs

The patented Engine-Off technology avoids engine idling – without forgoing driver comfort and machine reliability. Manufacturers, owners and lessees profit from the benefits delivered by the Engine-Off heating technology – over both the short- and long-term. For example, the service life of the machine is extended. Furthermore, pleasant temperature represents a key safety factor, as the driver's ability to concentrate and react is affected by the climatic conditions. Webasto also recommends its online savings calculator, a useful tool that can quickly and easily calculate potential savings of non-idling technology for any vehicle.

Webasto's main focus at this year's Agritechnica will be air-conditioning. For several years now, Webasto has been working closely with OEMs to develop, design and produce best-in-class air-conditioning solutions. In addition to its cooperation with OEMs, Webasto is an active innovator in this market, pursuing an advanced engineering approach. The company sees a major opportunity to support OEMs with more powerful, slimmer and smaller cooling solutions, offering more design freedom for OEMs, and benefits such as increased visibility for operators. At Agritechnica, Webasto will showcase innovative concepts and ideas that will bring even more comfort and efficiency to the agricultural market. **ivT**

Josef Graubmann is head of business development at Webasto Thermo & Comfort SE

Whether it's for winter or summer, as a systems supplier for heating and cooling, Webasto develops climate solutions customized specifically to customers' requirements and developed in cooperation with their engineering, design and testing departments. Working with the customer, Webasto determines the specifications required for the individual vehicle, develops the mechanical and thermodynamic design, and produces a prototype that undergoes thorough testing. Webasto's mission is to advance and enhance the comfort of the customer. To this end, the company will present its customized solutions at Agritechnica 2017.

Manufactured to specific requirements

As the global market leader for parking heaters, Webasto has been developing, manufacturing and distributing heaters for agricultural machinery for many years. The parking heater product portfolio is based on two different types of parking heaters

that meet specific requirements for use: air and water heaters, each with different functions and heating ranges.

Water heaters operate independently of the engine. They ensure that the vehicle's windows are clear and the driver's cabin is warm, even before work begins. The heaters are integrated into the vehicle's coolant circuit, therefore avoiding cold starts. The engine is already pre-heated before the vehicle moves off. This makes the Webasto system optimally suited to the tough conditions in which agricultural machinery is often used, because it must operate under extreme loads and great fluctuations in temperature.

In recent years, the agricultural equipment sector has seen an increase in the importance of comfort as a factor in maximizing driver safety and performance, as well as in the requirements imposed by environmental regulations. This affects both the cooling and heating solutions provided by Webasto. For example, upon request, the climate specialist



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High flow range

HIGH-PERFORMING COUPLINGS ARE ESSENTIAL FOR SUPPORTING THE PERFORMANCE OF TRACTORS AND OTHER AGRICULTURAL VEHICLES

▶ Faster is a market leader in quick-release hydraulic couplings for the agricultural sector. HF is the new product range developed by Faster's R&D department. It was designed for use in applications that require a higher flow rate. This is the only 'push-pull' range available for agricultural applications reaching a maximum flow rate of 250 l/min.

The range comprises of: the male and female 3CFHF series, connectable with male halves under residual pressure; and a male and female 4SRHF series, connectable with male and female halves under residual pressure.

In addition to the standard-length version, Faster has also developed a compact 'K' version of the 3 (3CKHF) and 4 (4SKHF) series. The K series has all of the benefits and technical features of standard HF models, but with reduced dimensions of the female couplers, which are 15mm (0.6in) shorter than the standard ones, so they are the ideal solutions in case of space issues.

The HF design was specifically developed, based on actual market needs. Typically, when tractors have attached a tipper (or dumper), the tractor's hydraulics lines are connected to the pistons' hydraulic lines, in order to lift the frontal part of the open-box bed, enabling the material in the bed to be deposited (or 'dumped') on the ground behind the truck at the site of delivery.

When the bed returns back in place, there can be a high and uncontrolled backflow from the attachment towards the tractor. This can tear the seals off, pushing them into the hydraulic circuit, and causing unwanted oil leakages during the disconnection process.

Performance upgrade

Reaching a maximum flow rate of 250 l/min, the female and male HF couplings can improve the machines' performances, avoiding any kind of backflow issue. Moreover, tractors and their functions continue to evolve and become more and more powerful, thus requiring better performances in terms of flow rates.

The evolution of tractors and their functions can sometimes cause situations where reduced space has to host several components on the tractors where



THE PRODUCT IMAGES DO NOT REFLECT THEIR ACTUAL SIZE

ABOVE: Faster's new 3CFHF and 4SRHF couplings

female couplings are placed. Sometimes, in addition, tractor manufacturers place connections on the tractor's front for some specific front attachments. Generally, on the front of the tractor there is not much space available, so the compactness of Faster's 3CKHF and 4SKHF females is the feature that makes a difference in these situations.

Easily recognizable

The HF range, both the standard length and compact versions, can be easily recognized by the HF logo engraved in the rubber dust protection ring mounted on the female half – red for the 3 series and gray for the 4 series. On the male half, 'HF' is indented on the hexagon.

It is possible to upgrade a tractor by buying male and female couplings through Faster distributors, and replacing one or more female halves on the tractor, and a high-flow male half on the attachment. The high-flow feature only works if a high-flow female half is coupled with a high-flow male half.

Dust caps and modular oil-collecting caps do not need to be changed for the couplings, because the high-flow series has the exact same proportions of Faster's standard 3CFPV series. Therefore, an upgrade is easy and fast to perform. **ivT**

Annamaria Chierici is marketing manager at Faster SpA



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Temposonics®

Magnetostrictive Linear Positions Sensors



Easy in-field installation

The Temposonics® Flexible MH sensor is perfect for use in hydraulic cylinders in mobile applications. The externally threaded sensor is highly resistant to shocks and vibrations and features an innovative two-part design that allows users to separate the flexible sensing element and electronics from the housing without opening the hydraulic system. The FMH sensor has a measuring length up to 5000 mm, can resist high temperatures up to +105 °C, and is available with an analog or digital output.

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TOUGHER EMISSIONS GUIDELINES ARE DUE IN TWO YEARS' TIME AND WILL BE A CHALLENGE FOR ENGINE MANUFACTURERS. VOLVO PENTA HAS DEVELOPED A MARKET-READY DIESEL ENGINE IN ANTICIPATION

▶ Volvo Penta has launched its off-road diesel engine concept to meet forthcoming EU Stage V emissions regulations, ahead of the legislation coming into force in 2019. This gives OEMs time to prepare for the change. The range will include all models in Volvo Penta's existing range – D5, D8, D11, D13 and D16 engines – offering a power output of 105-565kW (141-758hp). They are ideal for industries such as mining, material handling, construction, forestry and agriculture.

Optimized platform benefits

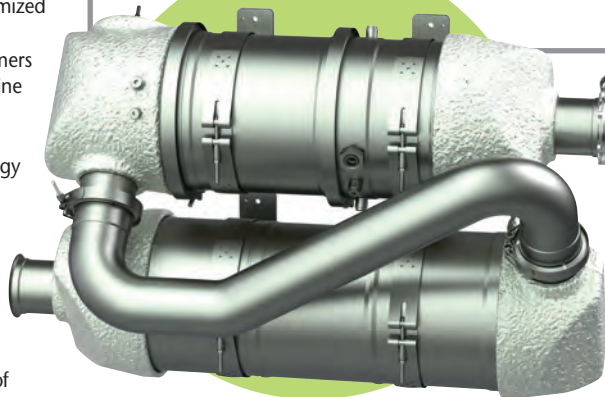
The new platform consists of an engine and perfectly matched exhaust aftertreatment system (EATS), and has been developed to provide world-class fuel efficiency, with maximized uptime via the optimized regeneration strategy.

"Our Stage V concept is designed for customers to reap the benefits of the combination of engine and exhaust aftertreatment system, which reduces fuel consumption and minimizes emissions," says Johan Carlsson, chief technology officer for Volvo Penta. "The solution is easy to install, operate and maintain. It is optimized for our customers' future needs."

Earlier this year Volvo Penta's 8-liter and 11-liter models were the first in the range to be revealed. The 8-liter TAD880-883VE has a power output of 160-235kW. The 11-liter TAD1180-1183VE has a power output of 235-315kW. The engines are compact, powerful and reliable, with a fixed geometry turbo that contributes to reduced complexity. They are designed to deliver maximum power and torque at low RPM, and the common rail fuel injection system contributes to excellent fuel economy as well as low engine noise levels. Together with the perfectly matched EATS, they provide a complete, flexible system.

The air inlet throttle, along with the uncooled exhaust gas recirculation (EGR) and the electrical exhaust pressure governor (EPG), delivers highly effective heat management of the engine. This enables the system to function without the need for additional fuel injectors to inject fuel into the exhaust stream to raise the temperature.

With this approach, the exhaust gas has the ideal temperature when it passes through the EATS.



ABOVE: The complete Stage V solution includes the engine and exhaust aftertreatment system
INSET: The aftertreatment solution does not require daily standstill regeneration

Low heat rejection from the complete system means that less cooling is required. The new engine models and EATS work in harmony to comply with Stage V emissions standards.

The EATS includes the following components: diesel oxidation catalyst (DOC), diesel particulate filter (DPF), selective catalytic reduction (SCR) and ammonia slip catalyst (ASC).

Carlsson says, "Our Stage V range has a common engine platform and complementary EATS to provide an easy and flexible solution for customers. The engine interfaces, the electrical architecture

and the range of options that can be chosen with our engines are compatible across various emissions levels, minimizing the need to redesign machines, regardless of where in the world manufacturers are shipping to. This helps OEMs and operators move forward to the new regulations as smoothly as possible."

Cooperation for regeneration

Volvo Penta's Stage V engine and EATS work together to maximize passive regeneration during normal operation. There is no high-temperature regeneration needed, as sulfur regeneration in the SCR catalyst is not required; only soot regeneration is needed to clean the DPF. No additional fuel injector (7th injector) for regeneration is needed. This leads to increased fuel efficiency and uptime for operators.

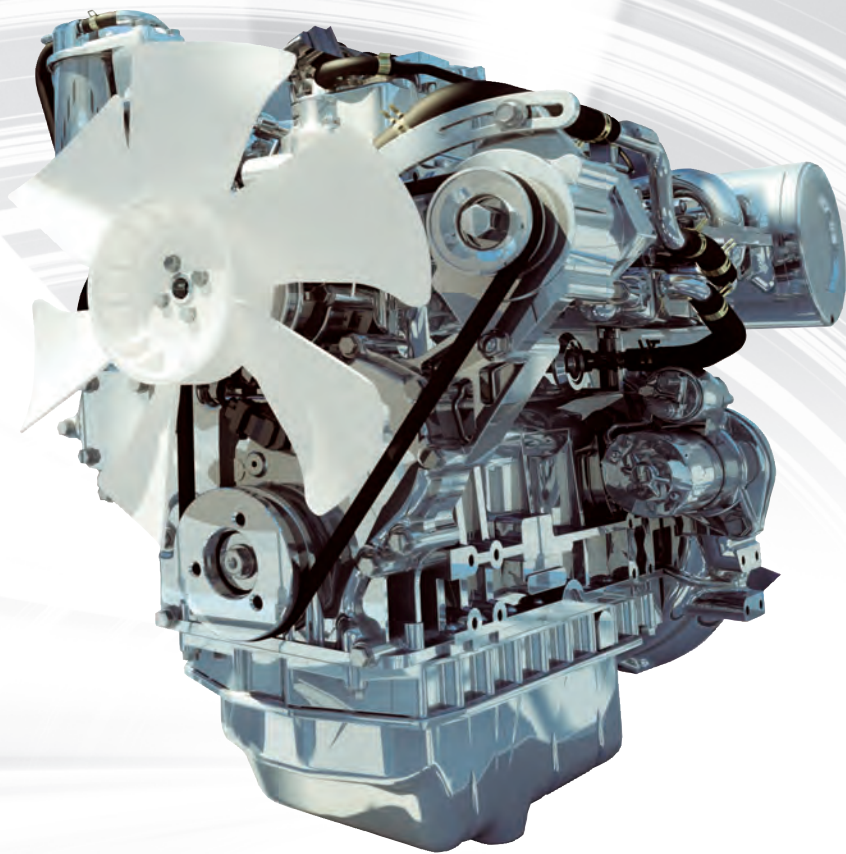
"With our EATS solution there is no need for daily standstill regeneration," says Carlsson. "Passive regeneration enables increased efficiency and maximizes uptime for customers. This has been a major driver in our product development, to provide a solution that helps maximize productivity across the different applications where end-users operate." **IVT**



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Customizable HMI display



HIGH PERFORMANCE, INTUITIVE MONITORS AVAILABLE FOR OFF-HIGHWAY INDUSTRY MACHINES ARE REACHING THE LEVEL ONCE THE PRESERVE OF CONSUMER ELECTRONIC DEVICES

In the off-highway industry, OEMs are increasingly focusing on high-performance displays with evolved and user-friendly graphical interfaces, similar to those typical of consumer electronics products.

Devices of this type are capable of displaying vehicle data in real time, as well as commanding different equipment in the vehicle itself.

During development, companies that design such electronic products must take into account several factors, such as driver safety; maximum visibility, even in the presence of direct light; start-up speed to ensure immediate operation of the vehicle; and hostile operating conditions in the presence of water, dust, mud and corrosion in which these vehicles are employed. On the other hand, development must also consider the cost-effectiveness of the display, as well as the possibility for OEMs to install it on multiple platforms.

Increasing importance

Off-the-shelf products are increasingly useful when already programmed with basic software that can be customized depending on the vehicle on which the product will be installed, with additional tools supplied to the manufacturers of the vehicles.

The result of a careful analysis of these market demands, the new Giotto 8in color TFT (Thin Film Transistor) display, designed and manufactured in-house by the MTA electronics division, can be used both as a standalone element or incorporated with other displays and/or instrument panels.

Giotto, offered in either a touchscreen or with a side keyboard (Giotto K) with a 12V or 24V power supply, is based on an Android platform or alternatively on a proprietary MTA Studio platform. It uses the Texas Instruments Jacinto 6 processor that can ensure power-up times of less than five seconds,



ABOVE: The Giotto and the Giotto K have an in-house designed 8in color Thin Film Transistor display

BELOW: Glass frame bonding minimizes light reflection on the display screen

and as far as hardware is concerned, it includes a host of sophisticated off-highway technical features. In particular, the display is optically bonded with an anti-reflective glass on the screen that uses a special technique and adhesive that completely eliminate the air in between, thus minimizing light reflection. Maximum visibility is also ensured by the use of anti-reflective and anti-fingerprint glass on the display.

Giotto is equipped with a side USB port that allows for convenient access to the device. The back of the display has a speaker, two video inputs for connecting to any video cameras, and four points for fastening.

Connecting to the network

The 34-pin sealing connector offers a connection to the CAN network, a variety of analog and digital inputs and two power outputs. There is also a second USB port on the back to enable fast data transfers.

In the K version, Giotto replaces the touchscreen on the front with six buttons on the side to satisfy customers who prefer a more traditional approach in interacting with the display. The materials and design solutions chosen for the display guarantee an IP66 degree of protection, as well as high resistance to vibrations and extreme temperatures.

Giotto is an off-the-shelf product, customizable by the customer using software tools, Android Studio or MTA Studio.

The Android platform on which it is based includes standard features like graphical elements and algorithms of reference that facilitate the development of applications (examples of applications and an object library that facilitates configuration are provided). This way, the customer can easily customize the device to meet the specific needs of the vehicle on which it will be installed.

In addition to the Android Studio environment, Giotto and Giotto K can be programmed with the proprietary MTA Studio tool, designed for less advanced users.

In-house developed technology

The software, developed entirely by the MTA electronics division, allows for the configuration of the display as well as its programming with C/C++, LADDER (Livelihoods and Diversification Directions Explored by Research) and FBD for the operating logic. The graphic human machine interface is WYSIWYG (What You See Is What You Get), allowing the user to see the graphics as they will appear at the end of the job even while building the application itself. **ivt**

Luca Baldini is project leader, electronic division for instruments and clusters at MTA



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Remote engine monitoring



PERKINS HAS DEVELOPED A SMARTPHONE APP THAT ENHANCES THE ABILITY OF MANAGERS TO KEEP TRACK OF THEIR FLEET'S PERFORMANCE

Digital innovation in farming is burgeoning, with more and more farmers recognizing the benefits of multi-media platforms to grow and manage their business.

To provide effective support to the agricultural sector, among others, Perkins has launched the world's first low-cost, engine-level telematics device – the SmartCap, a 'smart' oil cap, which can be used on new and existing Perkins mechanical and electronic engines.

Designed to replace the oil filler cap, the SmartCap is a low-cost connectivity solution that allows end users to connect their mobile device to their engine via the free My Engine App on their smartphone. The cap monitors the engine and sends data direct to the free app, which is available from both the Apple and Google stores.

This data helps owners of tractors, combine harvesters, sprayers and other farming machinery to better plan their service schedules. A distributor portal is also available to authorized Perkins service outlets to record services, so that a full log of all service activity is available to farmers on the app.

Administration made simple

In addition to personalized engine information, the app also provides parts book and consumer information, making it easier to manage the administration of engines without the need to keep track of a lot of paperwork and manuals.

The app can track many engines at once, enabling machinery owners to access information on all of their engines in one convenient place.

For the first time, the low-cost SmartCap in conjunction with the My Engine App enables Perkins customers to easily track use of their engine and servicing requirements, locate their local Perkins distributor, see parts information and receive service updates, all in one place.

The app allows end users to register their Perkins engine, and access their *Operating Maintenance Manual* and parts book. A service record can also be kept, while the user can easily make contact with their local Perkins distributor, through the Distributor Locator feature.

The low-cost cap and free app are simple to use. The cap can be fitted to any Perkins mechanical



ABOVE: The SmartCap can monitor the engine, sending data to the app

LEFT: The app displays information and data clearly and in a user-friendly manner

or electronic engine in a matter of minutes and instantly provides engine telematics.

Retrofitting possibilities

The My Engine App and SmartCap, which can be retrofitted to any Perkins engine, are ideally suited to the millions of owners and operators of Perkins-powered machines, providing easy access to engine-specific information such as: running hours,

stop/start data, build list, series, type, model, Perkins Platinum Protection indicator, parts book, *Operating Maintenance Manual*, a consumable list, up-and-coming services, and a completed service log.

As well as being the world's first engine-level telematics system, it is also the only way owners of mechanical engines, including older historical engines, can track their engines online.

Priced at an introductory offer of £39.99 (US\$53) or equivalent exchange rate, the SmartCap, which has no ongoing costs, will be available from the Perkins distribution network. Production release is September 2017. **IVT**

Ian Bradford is parts product manager at Perkins



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Orlaco focuses on developing camera-monitor technology for industrial mobile vehicles. The company produces more than 120,000 cameras, vision systems and monitors each year, 70% of them supplied direct to the world's largest OEMs.

The camera-monitor specialist will present the Emos two-wire Ethernet camera and wireless sender-receiver (WISR) connectivity box at Agritechnica 2017.

These new technologies will feature alongside the Emos four-wire Ethernet camera, which was released last year. The new high-speed camera and WISR form the basis of a cost-effective vision solution for drivers of agricultural vehicles, as well as those operating in other sectors.

Improved video connectivity

The WISR also enables improved video connectivity between vehicles, increasing safety and productivity and offering countless options for image processing.

Orlaco Ethernet cameras can be used in demanding environments such as those found in the agricultural, mining and construction sectors. The company has achieved this by taking advantage of the wide range of options provided by flexible Ethernet networks.

The high-speed Orlaco Emos four-wire Ethernet camera was unveiled in April 2016 at the Bauma trade fair in Munich, Germany. The product received an enthusiastic reaction on the market, and specialists are particularly excited about its speed, size and automotive specifications.

The camera can operate at temperatures ranging from -40°C/F to 85°C (185°F), is shock and vibration resistant and meets IP68/IP69k standards for protection against dust and water.

With a maximum delay of 48ms at 30fps, the camera boasts a system latency of under 100ms thanks to the use of the RTP (real-time transport) protocol over UDP (user datagram protocol). This means that the system is not slowed down by an internal browser, unlike conventional IP cameras.

Universal installation

Measuring 55 x 60 x 24mm, the compact camera can be installed discreetly in an existing Ethernet network on any vehicle. The Emos two-wire Ethernet



TOP: Side and rear vehicle views can be displayed on HMI's, tablets and smartphones

BELOW: EMOS cameras are shock, vibration and water resistant



discussion with vehicle manufacturers and HMI suppliers.

Additional appearances

At Agritechnica 2017, Orlaco will also present a connectivity box that will allow users to transfer Ethernet camera images wirelessly over short (up to 140m) or long (over 250m) distances.

This Ethernet WISR is designed to make it easier to establish a video connection between tractors and implements and will also improve functionality.

Drivers can avoid accidents and incidents thanks to the enhanced visibility the system provides. Since video images from the cameras can also be viewed from long distances, vehicles can be monitored remotely, allowing users to increase efficiency and productivity. **ivT**

camera is a direct result of Orlaco's collaboration with HMI manufacturers, combined with demand from the agricultural sector.

This camera has the same characteristics as the four-wire Ethernet camera, including a wide selection of aperture angles ranging from 30° to 180°, and is suitable for use in BroadR-Reach Ethernet networks. One improvement over the four-wire Ethernet camera is the device's startup time (0.8s compared with 1.8s).

Orlaco has not yet chosen a standard connector for the BroadR-Reach camera and is open for

Linda van Dijk is project manager communications at Orlaco



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Demanding motors

POCLAIN HYDRAULICS HAS DEVELOPED MOTOR TECHNOLOGY THAT DELIVERS HIGH PERFORMANCE IN THE TOUGHEST OF WORKING ENVIRONMENTS

▶ Agriculture, construction, material handling, mining, manufacturing and maritime industry players seek gains in productivity and quality, as well as lower design and operating costs, in order to increase the ownership value of their applications. The MHP motor range, from Poclain Hydraulics, and available in five sizes, meets their requirements, with displacements ranging from 61-213in³ per revolution.

The motor design allows MHP to reach the highest rotating speeds and horsepower levels on the market, leading to increases in productivity and performance. In addition, the MHP motors can withstand the extreme working conditions that are typical in these applications and are easy to integrate due to their compact size and modularity.

Structure and materials

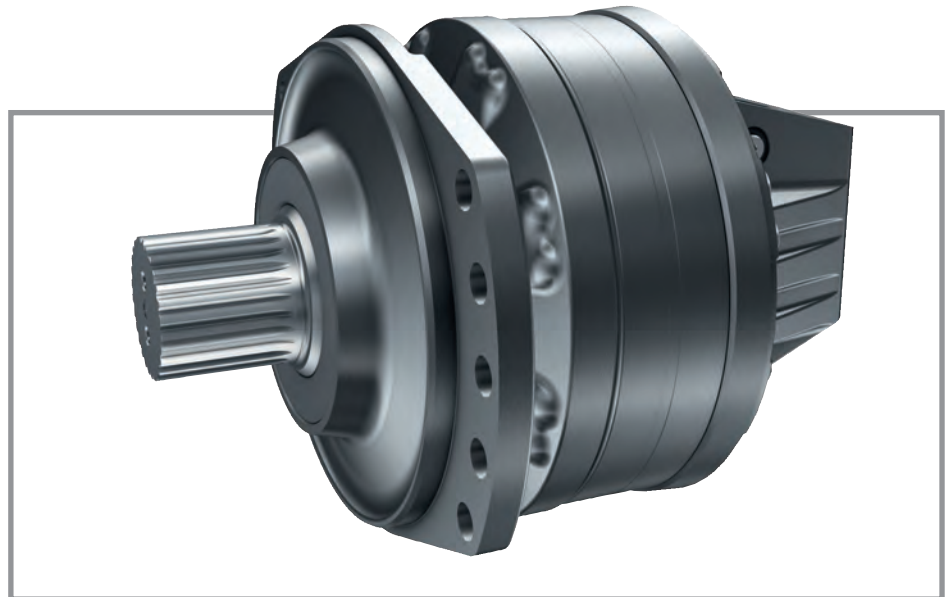
The structure and the state-of-the-art materials used in the main motor parts contribute to the outstanding performance levels.

The motor consists of three sub-assemblies: the torque module, which generates the power; the valving, which provides connections for the hosing, speed shifting and mounting; and the bearing support, which carries the load, transfers the torque generated by the torque module, and interfaces with the brakes.

The MHP motors integrate torque modules designed on the latest CAD software. These power generators use revolutionary materials that increase the lifetime of the torque module and the motor overall.

The structure and the layout of the pistons push back the limits of maximum power and

BELOW: **The C27 wet disc technology leads to high braking performance with reduced emissions**



ABOVE: **The MHP offers higher working pressure (500 bar) compared with conventional cam-lobe motors**

rotating speed, as well as lowering the pressure drop. These benefits contribute to optimizing the overall transmission and are in tune with the downsizing requirements of customers.

All applications under one roof

The valving provides all the functionalities required by the target applications. First, the motor displacement ratio gap between the lowest and the highest displacement can be as much as four. Second, the valving provides four gears by selecting the full motor displacement or one of the three built-in sub-displacements.

To simplify and optimize hosing, the reinforced closed covers can interface with the hydraulic assemblies that manage speed shifts. The design engineers applied the latest machining breakthroughs to create the cover's profile. These innovations also lead to a reduction of pressure drop.

Last but not least, users can choose the Boosted Brake function: when the motor hydrostatically brakes, it generates the braking torque coming from the full displacement, regardless of selected sub-displacement.

The MHP motors have been designed and validated to work in the extreme conditions encountered on the field. They can withstand contact with chemicals, dust, mud and water, as well as impacts.

The bearing supports and their flanges can bear heavy loads, which gives the vehicle extra latitude to increase the machine capacity or integrate heavier components, such as the engine. The bearing supports of the MHP are 100% compatible with those of the existing MS motors, which allows for a wide array of integration solutions in machines.

As far as braking is concerned, the customer can choose between a range of solutions: a parking brake, a dynamic brake, or a combined brake associating both.

The wide displacement ratio, the high rotation speeds, the high maximum horsepower and the four available speeds contribute to increasing productivity. The quality increase is provided by the new, more robust, cover and bearing support architecture. The cost of machine design and operation is considerably reduced by the integration of the brakes in the bearing support, the compact size, and the lifetime of the MHP motors. **ivT**

Adrien Esposito is radial product marketing manager at Poclain Hydraulics



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An extra dimension

ACCESSING 3D MODELS FOR A RANGE OF HVAC COMPONENTS AND ACCESSORIES ONLINE IS NOW POSSIBLE, THANKS TO KALORI

▷ Kalori is now offering 3D plans for its range of heating and air-conditioning components and accessories.

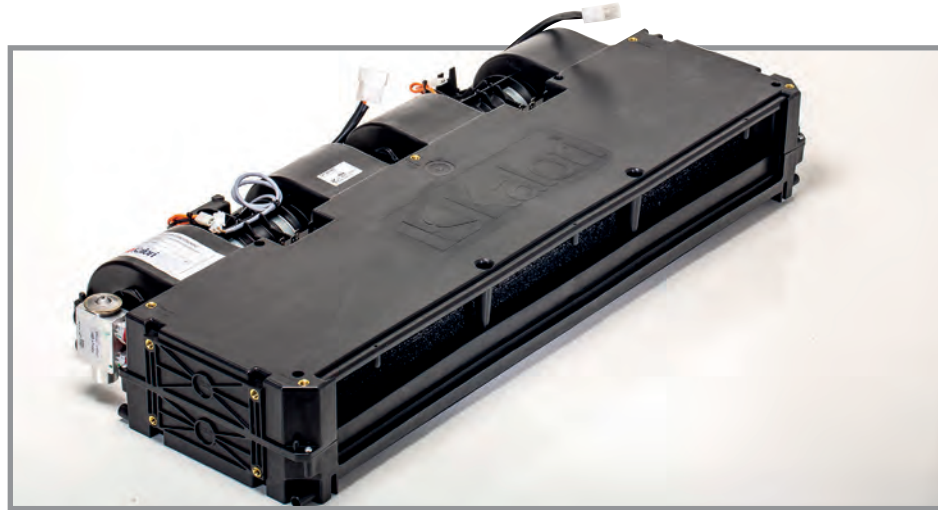
Kalori's development has been boosted by design studies for specific manufacturers' systems, but it is also equally true that Kalori's off-the-shelf range of products provides a rapid response to the needs of a wider range of manufacturers using its services. The company's design engineering office has been able to offer this service by remaining in close contact with manufacturers' design departments.

The necessity of speed

The whole range of these off-the-shelf products is to be made available to manufacturers, in order to permit them to carry out installation setup tests faster, in complete autonomy. This rapidity is of critical importance when working on the development of a new vehicle cab.

Any draftsman, project worker or project leader can therefore pick up, from Kalori's on-line catalog, a 3D drawing of one of the grilles, aeration nozzles or HVAC components, to verify its positioning. All this without having to make requests... free of charge and just a single click away on the Kalori website. Just open the technical sheet for the product in question and click on the 3D logo to download the .stp file. Users can then check that the component fits their planned construction.

BELOW: The Twist base can be installed on inclined surfaces and can rotate 360°



ABOVE: The HK EVO4 can provide suitable air-conditioning even for the largest cab

The engineers in Kalori's design office are available to provide guidance for manufacturers in their design work, providing calculation sheets if needed.

For Kalori, the aim of this service is to save time, as a subject dealt with rapidly can aid retro-planning.

It also helps in updating vehicles with an older appearance, which often use the same accessories, as they are taken from the list of products validated and available via the manufacturer's own product library. The improved availability of 3D drawings provides access to a vast catalog of parts, thus making it easier to update the interior design of a cab and to discover new and innovative ideas. In a rapidly changing world, it is important to show, using these highly visible elements, that there is a willingness to change.

This online catalog also contains HVAC systems, in particular the all-new HK EVO4.

Powerful and comfortable

The HK EVO4 is powerful enough to handle the air-conditioning for the largest cab, while providing optimal comfort levels with a very slow (therefore very quiet) ventilation system. Its ultra-flat design (120mm) makes it easier to integrate into the thinnest of under ceiling spaces.

This HVAC system is fitted with two separate motorized fan units, with these two systems together

providing an airflow rate of 1300m³/hr. With a correctly designed and fitted air-distribution system, the HK EVO4 can guarantee total comfort and high-performance de-misting.

Tested under harsh conditions

The HVAC system has been tested at angles of 30° laterally and 30° angled forward and backward, under the harshest of test conditions: 28° and 90% relative humidity. The condensates are collected and evacuated perfectly.

Also available are accessories from the Kalori TrimLine range, including the new Twist base.

This mounting is a universal air diffusion component, capable of rotating through 360° and being installed on an inclined surface with an embedded aeration diffuser.

It allows air to be sent in any direction. Fitted to the dashboard or into the cab ceiling, it can be pointed forward to help de-mist the windshield, or backward toward the center of the cab for air-conditioning, depending on seasonal requirements.

The unit can be fitted either to an existing air-distribution channel or to its own dedicated duct, using the Kaledonia range of connectors, which go from Ø 40mm to Ø 60mm and even include a Ø 55mm with a 90° bend. The finish guarantees that the results are of the highest quality. **ivT**

Olivier Bontemps is general manager at Kalori



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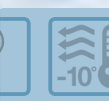
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Based on a multifunctional cab for self-propelled machines such as harvesters and field sprayers, the CCC shows the possibilities from today and of the future.

The great presentation will take place at the Agritechnica 2017, from 12th to 18th November in Hannover, Germany.

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A NEW PRODUCT FROM COMER INDUSTRIES USES CLEVER ECU TECHNOLOGY TO IMPROVE SAFETY AND PRODUCTIVITY FOR THE OPERATOR

▶ At Agritechnica 2017, Comer Industries, a global provider of advanced engineering systems and mechatronics solutions for power transmission in agricultural and industrial machinery worldwide, will exhibit new Powershift solutions that allow gears to shift under load and while the machine is running.

The brains of the technology

The Powershift integrates an innovative ECU (electronic control unit – the real brain of the product), capable of managing work parameters while at the same time ensuring the machine's safety under all conditions through a failure-management process of the installed software. The electronic system communicates with a functional display, which allows the operator to command and supervise the entire transmission.

The Powershift is a complete mechatronic system that includes mechanical transmission, a hydraulic system for clutch engagement, and an ECU for managing both gear shifting without torque interruption and system functionality.

Comer Industries has developed this mechatronic transmission and made it available to the market to contribute to the technological evolution of the agricultural world, thus increasing easier use of machines and improving operator efficiency and safety.

Powershifts are applied on a wide range of machines, including high-capacity feed mixers. Specifically for this latest application, the Powershift A-614 transmission allows for changing the auger speeds while the machine is running, without interrupting the mixing activity: the end user of the mixer can change the final speed of the augers without stopping the tractor's power take-off, thus avoiding waste of time and achieving significant fuel economy.

The use of the new Comer Industries display allows the gears to shift without the operator being on board of the vehicle and ensures continuous monitoring of main working parameters (auger speed, operating temperature of the lubricant in the gearbox and disk clutch pressures).

The Powershift transmissions are available in two versions: model A-614A, with 2-speed (ratios



ABOVE: The climatic cell can carry out tests ranging from -40° C to +85° C

ABOVE LEFT: The A-614 transmission allows for auger speeds to be modified while the machine is running

LEFT: The powershift is able to communicate with a functional display

1:1 and 1.8:1) and model A-614B, a 3-speed version (ratios 1:1, 1.8:1 and 3.2:1) for high power and machines up to 46m³.

Ease of operation taken into account

The ECU can easily be connected to the remote control device, which includes a display in which the gear position is highlighted and the operating system parameters are visible. To ensure maximum reliability and durability of the transmission, the display provides various diagnostic signals. The device features the neutral position, the gear shifting from slow to fast shift and vice versa.

A dedicated software also guarantees transmission protection from incorrect use by the operator. Diagnostics is performed through the temperature sensors installed on the gearbox, as well as through the latest generation inductive sensors for reading inbound and outbound speeds.

"The integrated display allows the operator to read measured values in real time. Thanks to the sensors we have applied to the gearbox, the use of the machine is easier and more

efficient," says Morgan Motta, Comer Industries Business Development Agri.

At the Comer Industries Mechatronics Research Center, a complete set of functional tests has been performed to optimize Powershift operation. In the same laboratory, the company's engineering team carried out specific tests in a low temperature climatic cell (test capacity from -40° C to +85° C) to calibrate clutch operation under extreme climatic conditions.

The first installations on the machines were followed by the Comer Industries technical staff along with the customer: field experience has made it possible to optimize the final design, which further improved the performance of the entire application. The synergy created between Comer Industries engineering teams and the customer has allowed accelerated development of the machine.

The Powershift, combined with Comer Industries' VP professional series of driveshafts, high-range torque planetary drives for final augers, and new-generation axles, represents the complete package for high-capacity feed mixers. **IVT**

The author is Sara Bernardelli, press office and product communication manager at Comer Industries.



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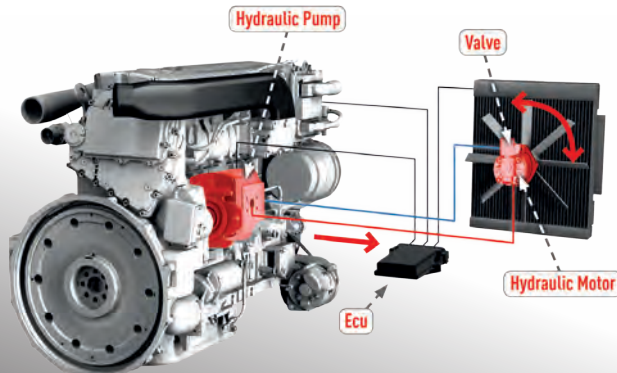
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Agricultural power

MULTIPLE OEMs RELY ON JOHN DEERE-BUILT ENGINES TO BOOST THEIR HEAVY-DUTY FARMING MACHINES WITH FUEL-EFFICIENT POWER

John Deere has been integrating diesel engines and drivetrain components into its own farming equipment since 1949. In the 1970s, other OEMs realized they could benefit from this knowledge and power in their equipment too. John Deere engines have since been powering an array of proven OEM farming applications across the globe.

Today, the company's power division, John Deere Power Systems (JDPS), has solid relationships with farm equipment OEMs around the world. Working closely with these OEMs has enabled JDPS to develop an extensive line-up of diesel engines that combine outstanding fuel efficiency and reliability, while meeting ever-stricter emissions standards.

What does this mean for the world of farming equipment, from tractors and harvesters to telescopic handlers, irrigation pumps, mixer feeders and loaders? In short, JDPS engines enable the design and build ever more compact, productive, reliable and economical machines. Moreover, OEMs that manufacture JDPS-powered equipment benefit from the support of 4,000 expert service points worldwide.

As an example, for French company Kuhn Audureau, working with JDPS engines enable the design and build ever more compact, productive, reliable and economical machines. Moreover, OEMs that manufacture JDPS-powered equipment benefit from the support of 4,000 expert service points worldwide. Its self-propelled mixer wagon with a 126kW (170hp) PowerTech E 4.5-liter engine won 'most innovative concept' at SIMA 2017.

Maximizing all-around performance

Meeting farmers' needs means maximizing productivity, reliability and fuel efficiency. For its RM 8100 bagger – capable of processing 10,000 tons of crop per year – BAG Budissa in Germany uses the PowerTech PVX 6.8-liter Interim Tier 4/Stage III B

BELOW: The Italmix mixer feeders are equipped with PowerTech engines



LEFT: The characteristics of John Deere engines mean many OEMs rely on them in their own machines

engine. "It gives just the right power while keeping noise levels down," says the company's technical director, Stefan Bresan.

The agricultural machine manufacturer, Strautmann, describes its range of Verti-Mix SF mixer feeder wagons as 'intelligent solutions'. Designed alongside actual users, they increase dairy farm productivity, combining great performance with cost-efficiency and reliability in a compact design. At the heart of the heavy-duty six-cylinder Verti-Mix SF fodder mixing wagon is a heavy-duty PowerTech PVX 6.8-liter Interim Tier 4/Stage III B engine.

Italmix's Formula and Formula Jumbo self-propelled mixer feeders are powered by PowerTech 4.5-liter and 6.8-liter engines. Sales manager Sergio Lanzanova says, "We chose them for their fuel efficiency, clean emissions and thermal stability."

JDPS integration support is another decisive factor for OEMs. "Working closely with OEM engineers, our teams ensure the best possible integration – and performance – of the engine and drivetrain components," says Martin Ryley, manager, JDPS Marketing Services and Sales Engineering, Europe, Africa and the Middle East. "Plus, preconfigured plug-and-play solutions save hours of engineering and help get machines to market faster."

Seamless integration support

Italmix experienced seamless integration support when it switched to an Interim Tier 4/Stage III B engine in its Formula 18 mixer feeder. "We had to

redraw the back end of the machine to create more space for the new block design. John Deere engine distributor Rama Motori's support in configuring the engine and attending field trials helped save us valuable time and money," Lanzanova adds.

Solutions for the future

Looking ahead, new JDPS after-treatment solutions are expected to deliver greater package flexibility and easier installation, with reductions of 20% in size and 40% in weight. This will also help OEMs meet increasingly challenging machine design goals.

In terms of emissions, JDPS engines is already prepared for the Stage V standards arriving in 2019 and 2020, including the essential diesel particulate filter (DPF) for 19kW to 560kW power band engines.

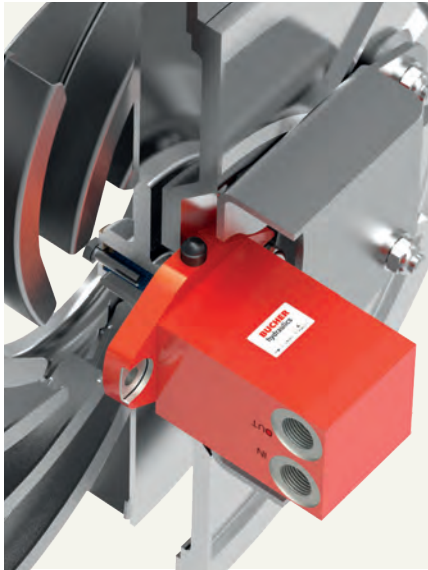
"John Deere takes a modular building block approach to emission control, which is proven and has led to DPF solutions capable of complying with the Stage V emissions standards," says Ryley. "We have been employing DPF technology since Interim Tier 4/Stage III B, resulting in more than 425 million hours of field experience. By transferring this experience directly to our customers, we give them a distinct advantage as they transition to Stage V."

Yet again, in the constantly changing farming sector, JDPS's experience will benefit OEMs as regulations evolve and customer needs grow. **ivT**

Sandrine Couason is regional product and market development manager for John Deere Power Systems



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Controls of the future

AS TECHNOLOGICAL CHANGES OCCUR, CURTISS-WRIGHT IS ADAPTING TO THE EVOLVING REQUIREMENTS OF ITS CUSTOMERS

▶ Global population increases have transformed agriculture from labor-intensive manual work to a highly automated process that, increasingly, uses self-propelled and autonomous vehicles, machinery and equipment fitted with GPS auto-steer technology to increase productivity in the planting, fertilization, irrigation and harvesting of crops.

Curtiss-Wright's Industrial division – including its legacy brands Arens Controls, Penny & Giles and Williams Controls – has relationships with many industry-leading OEMs and is highly experienced in working with agricultural machinery designers to provide safety-critical components and subsystems that can withstand environmental challenges (e.g. water, dust, shock, vibration and temperature extremes) and are ergonomically optimized for efficient operator control, to reduce fatigue and increase productivity.

For example, new vehicle cab designs are now adopting electronic human-machine interfaces (HMI) that replace multiple hydraulic levers and discrete components with fully integrated armrest assemblies, providing operators with numerous new and existing capabilities. And for many agricultural applications, Curtiss-Wright is developing vehicle controls designed to incorporate multiple functions that can be operated with just one hand, finger or thumb. These controls typically incorporate push-button switches, rotary thumbwheels and joystick paddles and levers, which variously offer switched and proportional control of the vehicle's numerous features.

So whether Curtiss-Wright is customizing an existing product to better suit an application, or creating completely new concepts to address an OEM specification, its global team of engineers is ready for the challenge and will partner with design teams to ensure that the most reliable and cost-effective equipment is developed.

Multiple configurations

Penny & Giles branded joystick controllers – including JC1200, JC1500, JC6000 and JC8000 and all-new, hall-effect sensor technology-based JC040 and JC050 models – are available in single- and multi-axis configurations and can be specified with multiple handle options to provide proportional control within the HMI for numerous applications. The



ABOVE: Curtiss-Wright Industrial provides a variety of joysticks, HMI systems and shifters

company's linear, rotary and tilt sensors are also suitable for numerous agricultural vehicle applications.

Durable, high performance

Complementary systems from the Williams Controls brand include lever-operated and rotary electronic hand controls, standard and customizable heavy-duty industrial joysticks and contact and non-contact rotary position sensors. Robust, suspended pedals such as the WM-540HD are also extremely durable and provide outstanding performance for agricultural-based applications.

For vehicle control applications, Curtiss-Wright brand Arens Controls is rapidly emerging as a global leader in the engineering and manufacturing of precision operator interface control systems and power management systems for commercial on- and off-highway vehicles. Products including its T10, T20, T50 and T60 cable-operated shifters for controlling automatic and hydrostatic transmissions are available in single- and dual-lever configurations and are especially suitable for agricultural applications. Its C60 dual-axis, C72 friction and C80 single-action range of lever controls is also suitable for agricultural applications and fully customizable

with options including shaft orientation, sensor positions and knob color.

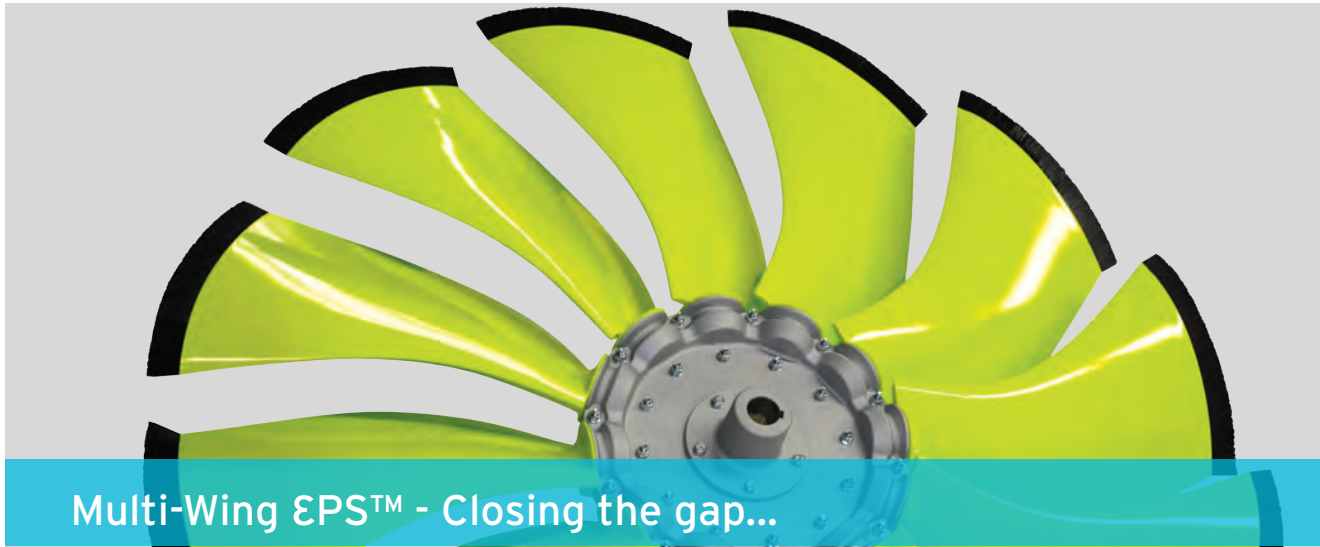
From the latest on- and off-highway commercial vehicles, to the rapidly developing hybrid vehicle market, Curtiss-Wright engineers are focused on developing bespoke, innovative solutions and next-generation technology. This intelligent engineering, from initial concept to finished product, demonstrates the Industrial division's commitment to providing the advanced control and power management systems demanded by today's agricultural vehicle manufacturers.

With design and manufacturing capabilities in the USA, the UK, China and India, Curtiss-Wright Industrial is well placed as a global provider. Its many facilities make it possible to manufacture products more efficiently and assemble completed units for whenever and wherever they are needed throughout the world. And its manufacturing capability is backed by sales and technical support teams in over 45 other countries, ensuring exceptional levels of efficiency, quality and on-time delivery. **ivT**

Mike Iles is a marketing manager at Curtiss-Wright Industrial, which includes the Penny & Giles legacy brand



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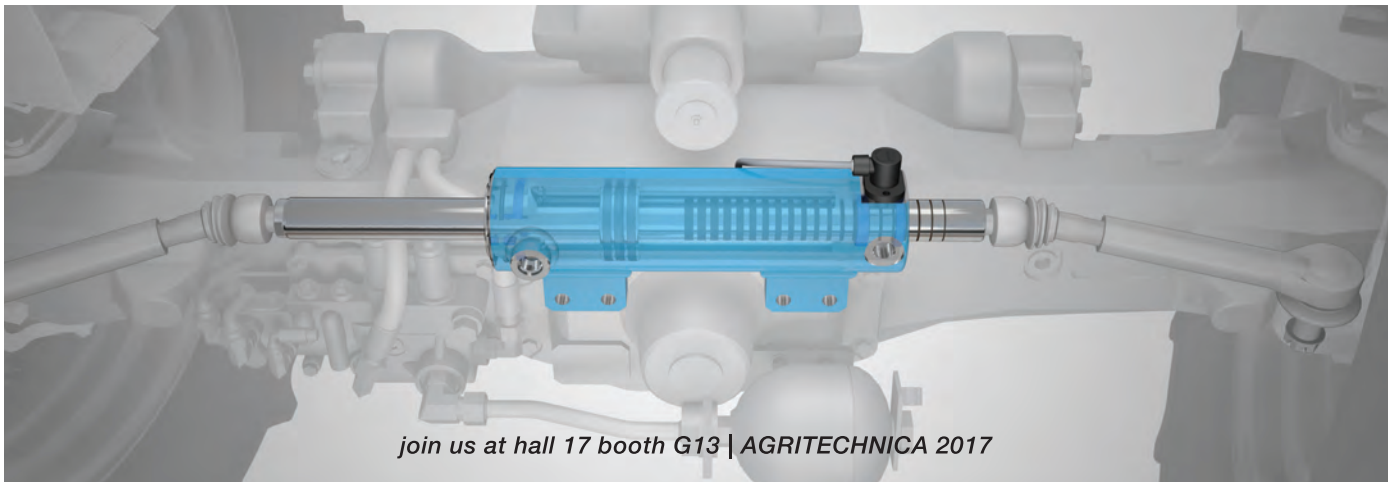
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ISOBUS HARDWARE IS INCREASINGLY ESSENTIAL TO THE PROPER FUNCTIONING OF FARM MACHINERY, WHICH IS WHY IMPROVEMENTS IN USABILITY AND DURABILITY ARE ALWAYS WELCOMED BY THE INDUSTRY

Powell, one of the market leaders in ISOBus hardware, is bringing to market several new innovations, that it will showcase at the Agritechnica 2017 expo in Hannover, Germany.

At the core of these new innovations is its upgraded ISOBus Breakaway Connector (IBBC). The IBBC is the standardized connector receptacle for ISO 11783-2. It incorporates integrated electronics along with a patented breakaway latching system, keeping the implement cable firmly in place.

The now upgraded IBBC includes improved PCB sealing where the connector interfaces reach IP 6K9K level of protection. The new closing mechanism achieves a better closing of the lid after 'unmating'. This system is fully intermatable and interchangeable with the previous products on the market. The new IBBC is also high-speed ISOBus ready. All the improvements don't change the fit, form or functionality of the IBBC, so requalification is not needed.

Latch innovation

In coordination with the improved latching on the IBBC, the new IBRC-3L (ISOBus Rear Connector, 3 Latch) has three latches to maximize the alignment. The interfacial seal is upgraded to a two-dimensional sealing with a bright-colored position indicator showing the proper mating of the connector for optimized contact alignment.

This new design will reduce stress on the contacts, while the maximum contact mating length has been achieved, reducing loss of power or heat build-up under full load. This connector comes as a pre-assembled poke-and-pull solution that greatly reduces assembly time and costs compared with previous designs.

Smarter implement connections

The IBIC (ISOBus Implement Connector) is the perfect solution for connecting implements to tractors in the ISO 11783-2 protocol for the electrical connection of agricultural vehicles. Made from several different non-corrosive materials, the IBIC's unique design ensures survival in the harshest environments. Where necessary, this connector is field repairable. If there is any damage caused



TOP RIGHT: The upgraded IBBC has improved sealing characteristics

ABOVE LEFT: The IBRC-3L has three latches to ensure correct alignment

ABOVE RIGHT: The IBIC is made from several different non-corrosive materials

LEFT: The IBRC-3L's bright colored position indicator helps alignment

free-hanging on the implement cable. Both the IBIC and the cap will not brake when dropped and have an improved grip/position marker.

Interface for low-power tractors

The cost-optimized physical layer has been developed at the request of the AEF (Agricultural Industry Electronics Foundation) as a cost-effective ISO 11783 interface receptacle for applications on low-power tractors. This is an IP 6K9K sealed connector.

Supplied in an innovative modular design, it comes in three versions: to mount in a bracket, mount in a box, or free-hanging on the cable. Each version can be selected with a back shell and/or a self-closing lid IP 6K9K. It is ISO 11783-2 compatible and mates to the Powell IBIC. This connector solution enables the use of an implement cable as a standalone cable, making replacement easy and fast, reducing downtime in the field. **ivT**

by driving over the connector, spares will be available. This part is extremely easy to replace; this can even be done in the field by the tractor operator, reducing downtime to a minimum. It is equipped with two built-in water and moisture barriers, achieving almost IP 6K9K in mated position. The outstanding and integrated strain relief makes this connector very user-friendly.

Simultaneously the IBIC prevents stress at the contacts in case of a breakaway mishap. Mated with the IBBC, it guarantees many benefits. The IBIC breakaway connector is extremely easy to populate with standard crimp tooling and saves substantial labor time compared with the old design. It can be used in combination with a protective cap that can be placed on a bracket as a storage cap or

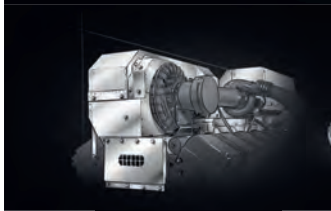
Ryan Milligan & Sjaak Bontje are respectively business development manager and sales manager at Powell



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The challenges of measuring sound levels

TO BE CERTAIN THAT VEHICLE COMPONENTS ARE GOING TO BE QUIETER, IT IS ESSENTIAL TO BE AWARE OF THE CHALLENGES OF MEASURING SOUND LEVELS ACCURATELY, AND THEREFORE BEING ABLE TO PLAN TO OVERCOME THESE CHALLENGES

As industrial vehicles become more advanced, one key aim of manufacturers is to make them quieter. In this way machine operators can have more comfortable, safer working environments, and vehicles can be used in urban or populated areas for longer periods of time without disturbing local residents or visitors in the area.

Multi-Wing is a manufacturer of axial fans, a vehicle component which, like many others, produces noise. To ensure these fans are running as quietly as possible, it is necessary to measure how much noise they are making. But, as a recent study by Multi-Wing proved, measuring sound levels accurately is not always easy.

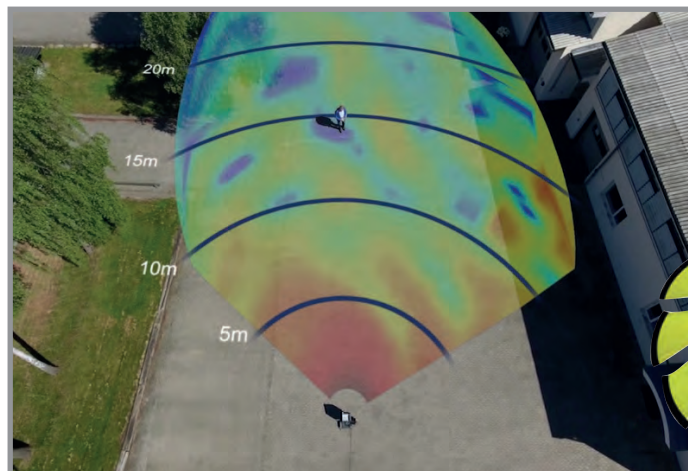
The fundamental problem is that it is almost impossible to create ideal conditions for measuring sound. ISO standard 3744, which deals with sound measurements over a flat plane, states in Paragraph 1.3: "The ideal environment is a completely open space with no bounding or reflecting surfaces other than the reflecting plane(s) (such as that provided by a qualified hemi-anechoic chamber)." This is defined as an 'essentially free field'. But what qualifies as one?

Typical locations in modern world industrial regions offer rather limited space. Areas that would generally be used for free field measurements would be parking areas. The challenge then arises: Is the space an essentially free field? There will be buildings, trees, cars and other things that will reflect or absorb the sound. Even the ground could act differently.

To demonstrate the actual influence of reflecting walls, trees and different absorptions in the test site, the examples above were measured in the real world at the Multi-Wing development center in Denmark. The yard at the development center offers some 30 x 30m (98 x 98ft) of open space.

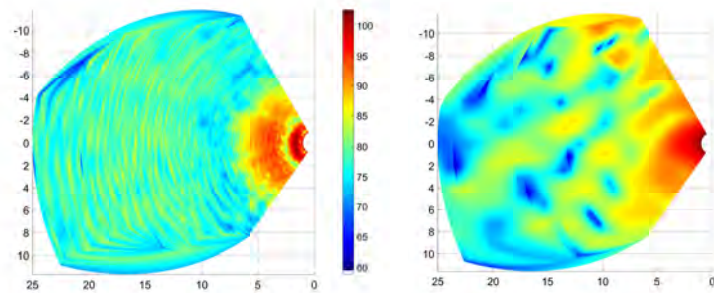
The illustration shows the parking area between buildings on three sides. Projected onto this are sound measurements made with a microphone connected to a datalogger and a position indicator. A loudspeaker is placed in the center of the radiation pattern and the distances are shown with marked circles.

The 63Hz example shows a complicated sound propagation with a lot of nodes with high as well as low SPL, ranging from some 75dB to well above



LEFT: The test area with results superimposed on the image

INSET: The Multi-Wing EPS is a noise-reducing solution



LEFT: Sound wave propagation over a plane hard surface at 1kHz and at 63Hz in the presence of buildings etc.

105dB close to the 1m circle. Judging from this, the measurement will be close to useless – if it was not for the fact that as much as -26.1dB reduction is allowed when measuring the lowest band.

The 1kHz example shows ripples that were identified in the real world case. There is a kind of intermediate region, 6-8m (20-26ft), where the level is remarkably lower than the rest of the area, where the alternations in SPL are between 80dB and close to 90dB. In fact, this would also deem the test field useless for such tests. The situation is remedied to some extent by the effect that was mentioned earlier, namely the incoherent radiation from the blades at different positions on the circumference, blurring the picture. Actually, most of the sound

is produced in the clearance between the blade tip and the shroud, creating some separation between the noise sources.

Hence the effect is not as pronounced as the 1kHz example shows. At higher frequencies, the aerodynamic noise generally contributes more to the sound spectrum than the tonal noise and the associated harmonics. This type of noise is far more evenly distributed in the spectrum and consequently the large variations in SPL in this region tend to vanish. **ivT**

Taken from the June 2017 Multi-Wing White Paper, Challenges in sound measurement – Field testing. To read the full paper and for a video showing the tests in progress visit www.multi-wing.com



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Agricultural drivetrains

ADVANCED DRIVE AND MOTION SYSTEMS ARE PUSHING THE BOUNDARIES OF WHAT IS POSSIBLE IN AGRICULTURAL VEHICLES

▶ As a solutions provider that can manage power conveyance to move machines and perform the work functions of the machine, Dana offers a full line of technologies for the agriculture market including Spicer drivetrain solutions and Brevini hydraulic components.

Hydraulic systems play an important role in the mechanization of agriculture, especially for tasks such as hoisting, pulling, slewing and material handling. Brevini hydraulic pumps, motors, and power packs, distributors, electro valves, proportional valves, wheel drives, coupling gears, and other innovative fluid power solutions have been designed to efficiently and reliably maximize the performance of machines for the agriculture industry.

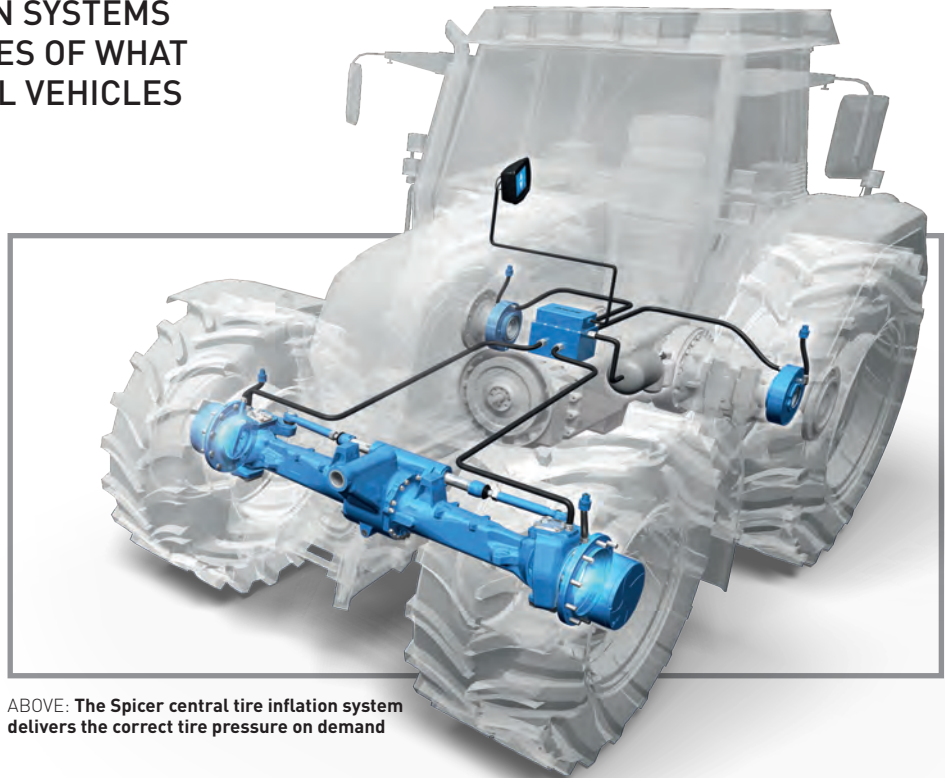
The Spicer Model 970 axle is designed for large high-speed tractors up to 268kW (360hp). Engineered with an independent front suspension to offer isolation from body vibration, the Model 970 axle provides enhanced operator comfort, more precise vehicle control, better traction, and improved handling characteristics for safer operation, especially at on-road speeds.

Tried-and-tested technology

Built on the success of the Model 970 axle, the Model 990 suspension steer axle is for open-field tractors from 285-370kW (380-500 horsepower) in continuous use. Engineered for integration into the vehicle's frame, the Model 990 axle reduces complexity and simplifies final assembly on the OEM production line.

Dana offers a broad selection of Spicer modular steer axles for tractors with engines from 33-301kW (45-410hp) and continuous output torques from 2,000-40,000Nm. This unique global platform

BELOW LEFT: The Model 990 suspension steer axle offers better traction with improved comfort



ABOVE: The Spicer central tire inflation system delivers the correct tire pressure on demand

enables engineers to reduce the time from design to production while still supporting a wide range of customization options.

The components used in this line of modular agricultural axles provide customers' engineers with a flexible product design that can be manufactured at numerous Dana facilities around the globe. The advanced modular design features a common center section and wheel ends, while accommodating multiple traction devices on a single carrier.

Innovations to enhance productivity

The Spicer central tire inflation system is now commercially available for OEM tractors, combines, forage harvesters and other agricultural equipment. When working either on- or off-road, it enables farmers to adjust tire pressure to match conditions, allowing for an optimized tire pressure setting customized to terrain type. This technology lessens soil compaction and improves crop yield.

To minimize downtime and get machines back to work faster, the system features rapid inflate/deflate functionality, as well as the ability to perform adjustments from within the cab or remotely while the machine is moving. The pressure in each tire can be set independently to a different level. Additionally,

the system's highly integrated design eliminates the need for vulnerable external piping around mud guards, and it packages within existing overall axle dimensions without adding external components.

Now available for pre-production testing by vehicle manufacturers, the Spicer Smart Suite Intelligent Load Monitoring System (ILMS) for telehandlers uses patented and proprietary data-collecting technologies across the vehicle to prevent tip-over incidents, estimate static loads, and supply intelligent calibration management.

ILMS is designed to alert the operator of potential tipping, reduce the risk of vehicle breakdowns, improve productivity and precision, and enhance the long-term durability of powertrain systems.

The system is part of a series of Spicer Smart Suite technology packages under development by Dana. This platform of fully integrated, connected-vehicle features converts operating data from the drivetrain into actionable insights for enhancing productivity, improving operator and machine safety, reducing maintenance costs, and reducing total operating costs. **IVT**

Marco Grappoli is agricultural segment leader for off-highway drive and motion technologies at Dana



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Multi-coupling matters

HYDRAULIC SYSTEMS FOR INDUSTRIAL VEHICLE APPLICATIONS POSE A NUMBER OF CHALLENGES THAT A NEW SOLUTION FROM STUCCHI IS OVERCOMING

▶ The market already has a wealth of systems that are suitable for connection and disconnection of hydraulic lines, but the multi-coupling system has attracted the attention of industrial vehicles manufacturers.

The main function of the multi-coupling is to connect and disconnect multiple hydraulic lines simultaneously with a single, rapid and univocal movement, without any possibility of mixing up the lines. Therefore, it is not difficult to understand how the multi-coupling's characteristics offer significant time saving benefits in connection and disconnection of the hydraulic lines compared with traditional single quick-couplings.

Costly and time-consuming

Mismatching hydraulic lines, or failure to connect a line (a drain line, for instance), can cause a malfunction of the system, resulting in a possible downtime of the machine or even a failure of the plant with a prolonged stoppage of the machine and considerable repair costs.

First of all, one or both of the hydraulic lines to be connected can have an internal residual pressure, which is a typical condition for industrial vehicles because disconnected hoses full of oil can be heated by sunlight exposure or other external factors, causing the internal pressure to increase and thus making the connection impossible.

Stucchi multi-couplings are equipped with female couplings with specific extrusion-resisting seals and

RIGHT: The Stucchi multi-coupling is configurable to a variety of applications



LEFT: A flat face design means there is no fluid spillage when a compact valve is disconnected

male couplings with triple internal pressure-relief valves. This, added to the specially designed lever mechanism, allows for the connection of the hydraulic lines with residual pressure with minimal effort and high safety.

The couplings used are flat face valves, so there is no fluid spillage during disconnection, and during connection the risk of contamination into the circuit is minimized, to ensure optimum conditions for good operation.

They are compact, easy to assemble in small spaces on both new and existing machines, and are configurable in a flexible way according to the different application requirements. They can be configured with couplings of the same or

different sizes, but also for various systems such as hydraulic oil, air, water, or water and glycol, and it is also possible to integrate electrical connectors, electrical resistances, sensors and an anti-exchange system that permits the use of a fixed multi-system with a mobile multi-system or other types of devices.

The Stucchi multi-coupling is also simple to use. After the connection, a locking device is activated to ensure the system is properly connected and cannot be disconnected accidentally.

Ease of assembly and maintenance

The special fixing system, consisting of a locking nut and an anti-unscrew ring, makes the multi-coupling suitable for pressure impulse conditions and allows for simple assembly and maintenance in the case of replacement of a coupling.

When the multi-coupling is not connected, a cap for the fixed multi-plate and a parking station for the mobile multi-plate are available – these two accessories are important for protection from both dirt and damage caused by shocks.

All the multi-coupling components and accessories are treated with latest-generation treatments to ensure maximum corrosion resistance in corrosive environments such as salt on snowy roads.

These features make the Stucchi multi-coupling a versatile product, well suited to the most varied of applications. **IVT**

Gianmarco Gatti, product specialist at Stucchi



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Auxiliary uphill steering

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM MOBIL ELEKTRONIK ARE PROVIDING THE TRACTION REQUIRED FOR AGRICULTURAL VEHICLES WORKING IN MOUNTAINOUS LOCATIONS

Small, but steep, slopes; obstacles such as trees and rocks; narrow roads through villages and towns – these are the conditions tractors face daily in mountainous regions.

Tractor company Lindner specializes in exactly this. For 70 years the medium-sized family business from Kundl, Austria has developed tractors for mountain and meadowland farming, as well as the municipal sector. In the past few years its expenditure on research and development has increased from 2% to 4%.

One of a kind standard tractor

One of the recent models is the Lintrac 90, the first standard tractor with continuously variable transmission and steered rear axle.

“We expected that half of all Lintracs sold would be equipped with a steered rear axle. In practice we deliver 90% of all vehicles with this feature,” says David Lindner, marketing and export manager of Traktorenwerk Lindner. The rear axle can be steered up to 20°, giving this already compact vehicle excellent maneuverability.

The introduction of the first standard tractor with a steered rear axle is a prime example of product development by the ‘leading user’ approach. The aim of the method is to involve leading users in the development process, to produce ideas and concepts for new products. In this way, Lindner analyzed the requirements of customers as a first step. For small farms, it is important that multiple vehicle types are combined into one, namely a standard tractor, a hillside mower and a farm loader. Ahead of series production, selected users of Lindner’s key markets tested the vehicle thoroughly. The results



ABOVE: Maneuverability is at a high level thanks to the rear axle steering capabilities



Mobil Elektronik specializes in auxiliary steering systems for special-purpose vehicles

contributed to further development. To prevent slipping at the rear of the tractor, the rear axle can be steered manually in the same direction as the front axle, via the on-board display of the auxiliary steering system. Using this diagonal drive, the vehicle can be stabilized on a slope.

Also a family business, Mobil Elektronik has more than 50,000 of its auxiliary steering systems in operation worldwide and is a key Lindner supplier.

With its EHLA (electronic hydraulic steering) systems, not just one axle can be steered, but as many as the vehicle needs. For instance, up to six axles can be steered individually on mobile cranes. Multiple computers can communicate with each other and give support in the event of an error.

An EHLA Plus system was used for the Lintrac, which has its hydraulic unit, steering cylinder and angle transducer forming a closed control loop.

The set point of the axle to be steered is calculated based on variables such as the geometry of the tractor, the steering angle of the front axle and so on. If there are any errors they are automatically adjusted. The steering angle of the front axle is recorded by an angle transducer and the vehicle speed is read redundantly by a CANbus or magnetic encoder. For the hydraulic supply, a motor-powered fixed displacement pump is used.

“It was important for us to get an individual system customized for us,” says Lindner. Accordingly, Mobil Elektronik has integrated Lindner’s own

hydraulic components into the system for the rear axle steering.

EHLA Plus meets the requirements of ECE-R79 Annex 6, so it can be approved for use on public roads – an important prerequisite for the Lintrac.

The rear axle steering is only active in field operation, which means it is hydraulically centered and locked by block valves when driving on roads. In the event of a safety-relevant system error during field operation, the axle is hydraulically locked in position by the EHLA Plus.

In field mode, several useful steering programs can be activated. One of these is the snow chain mode, which has been created specially for Lindner and limits the steering angle of the rear axle electronically to avoid collision with the snow-chain covered tires and other parts of the tractor. Another helpful feature is the mowing-mode that only activates rear steering if the front axle is steered at more than 20°. Other standard EHLA Plus steering programs include all-wheel-steering and soil protection.

“Once you have tried the rear axle steering, you will always want it,” says Lindner.

Due to the strong demand there are plans to extend the Lintrac product portfolio. This is good news for Mobil Elektronik, as agricultural machines are one of the company’s core markets. **IVT**

Wolfgang Stadie is head of sales and marketing at ME Mobil Elektronik GmbH



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Absolute position sensors

NEW ABSOLUTE POSITION SENSOR TECHNOLOGY IS PUSHING THE BOUNDARIES OF HYDRAULIC CYLINDER PERFORMANCE

▶ Optoi Microelectronics and Giuliani are showing a new absolute position sensor for hydraulic cylinders at the next Agritechnica in Hannover. Based on the previous model OIS22, the new optical sensor will exhibit improved performance and ease of integration, and will be highly accurate and easy to replace on the field.

But 'new' does not mean untried or untested, as since the first launch two years ago at Agritechnica 2015, the optical absolute position system has undergone a long evaluation and qualification process by the company's customers.

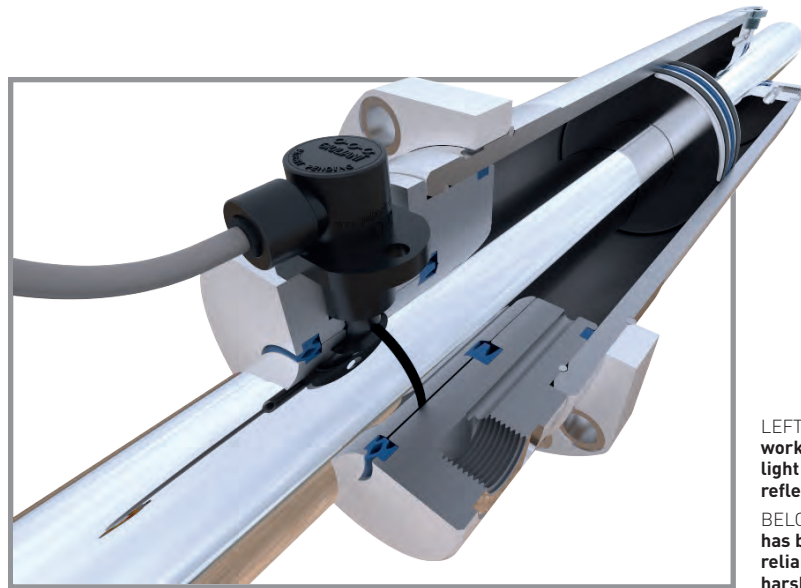
To date, 200 different systems have been sampled by 15 different beta-customers that have tested them in the field for several months and on different machines: agricultural trailers, harvesters, telehandlers, trenchers, and multifunctional tool carriers for forestry and municipal work. These smart systems have also been employed for several final applications, from steering control to machine stabilization, from cabin leveling to suspensions. The tests on the field, performed along with several internal tests, have provided precious feedback for the optimization of production.

Additional characteristics

Starting from 2018, the optical sensor will be launched for series production and will feature additional characteristics, compared with the previous models, including having plug-and-play functionality – meaning that it will be user-friendly regardless of the vehicles used by customers. Such a feature is a rarity for an absolute position sensor integrated into hydraulic cylinders.

In addition, the barcode imprinted on the rod surface has been optimized to reduce production costs. It was also redesigned to allow longer strokes: the first absolute systems worked up to 300mm, but now sensors can read strokes as long as 1,000mm, making them suitable for many other applications.

Other advantages of this optical technology include the very high reading accuracy (0.05mm), which gives the user a fine control over the cylinder; and the high resistance to electromagnetic interference thanks to the optical core of the system. Apart from absolute systems, single position sensors



LEFT: The sensor works by emitting light that is then reflected by the rod
BELOW: The sensor has been proven reliable in even the harshest conditions

are still the most successful products and their volume has significantly increased in 2017.

Volume increases

Developed in 2001 and offered for the first time to the hydraulic market, this technology is also patented by Optoi Microelectronics and Giuliani. The core technology is the same as it is based on the light emitted by a sensor and reflected by the rod, which is specifically imprinted using a laser-marking process.

OIS21 is the first model for steering applications, designed to let the operator know when the wheels are aligned for road driving. Since 2001, more than 300,000 devices have been produced, proving that the optical technology is reliable in tough conditions and challenging environments.



The continuous evolution of the product over 16 years has been driven by the increasing demands of safety regulations.

Improved steering performance

A special version (OIS25) developed for Komatsu in 2014 allowed the Japanese group to increase the performance of their steering system on a wheeled machine. Now a fully redundant sensor (OIS27) is also available to allow customers to get higher performance levels, not only for steering applications, but also on stabilizers and lifting and telescopic cylinders.

In many cases, the most important advantage of this technology is that, with one or two OIS27 sensors, it is possible to supersede expensive solutions such as magnetostrictive sensors or wired encoders over long strokes. For example, two OIS27 sensors can be used to detect the open or shut position of a lifting cylinder and also to provide information about the rod direction.

Optoi Microelectronics and Giuliani are helping customers find the best solution for their needs in terms of costs as well as technological innovation. **ivt**

Jacopo Brunelli is sales manager at Optoi Microelectronics



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Remote solutions

AS INCREASING LEVELS OF MACHINE AUTOMATION AND ELECTRIFICATION BECOME MORE COMMONPLACE, THE KEY TO MAXIMIZING THE BENEFITS OF THESE TECHNOLOGIES IS A LEVEL OF DIGITIZATION THAT WILL CREATE DIFFERENT TYPES OF ACCESS, COMMUNICATION AND BUSINESS MODELS

When it comes to managing mobile machines, one will find different stakeholders with multiple interests over the lifecycle of the machine. Sensor-Technik Wiedemann (STW) is a specialist in automation, electrification and digitization, and has long experience in providing electrical and electronic solutions for mobile machines. The company has launched a new suite of software tools for the field-proven onboard connectivity and data management modules: TC3G and TC1.

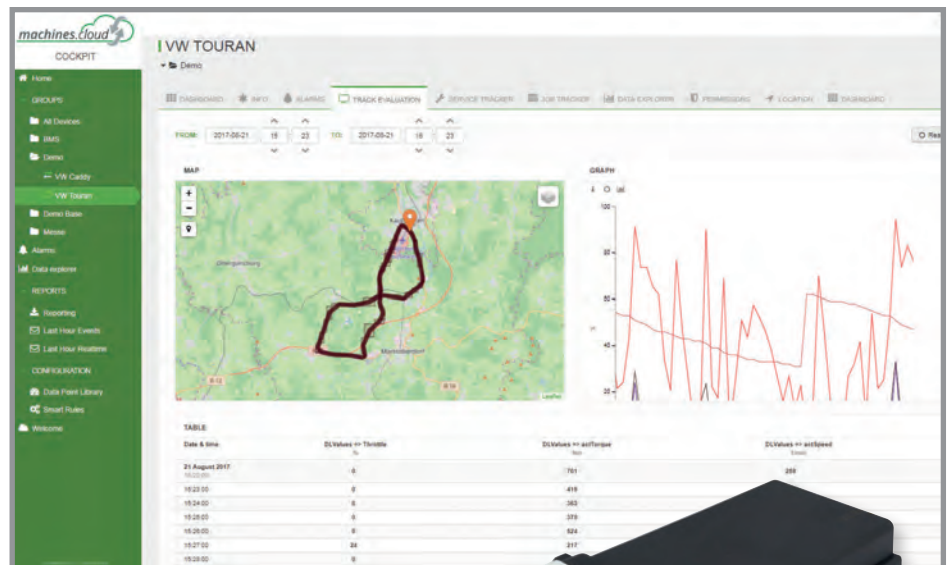
Typically, the company's R&D team will program and test the application for a machine's control unit in a lab setting. When it comes to deploying the application on the machine itself, it's useful for the team to maintain access to the control units to debug the code. For this, one would need a remote wireless connection.

Remote control

With 'machines.access', STW offers a solution that enables work from a PC through a wireless VPN connection – via wi-fi or mobile network – to the TC3G or TC1. From there, using software gateways to the control units, the R&D team or a support team can gain remote access of the application as if the machine is next door. In a similar way, display screens can be mirrored on an office PC, using a virtual network computing (VNC) server in the virtual storage exchange (VSX) display and a VNC client on the PC.

The production team will be interested in ordering parts, and the service team in maintaining and supporting the machines. With 'machine.insight', STW offers a tool with unmatched configuration, display and updating possibilities.

The software runs on a web server and allows access via any web browser on any end-user device. As service teams are usually close to the machine, connections can be made with an Ethernet cable or via wi-fi, using the onboard module to create a hotspot. Technicians can send new configuration files or retrieve log data. Freely designable dashboards display current parameters for instant analysis of the machine's condition to the service team. Using machines.access, service and R&D teams can utilize the benefits of machine.insight from a remote office.



ABOVE: STW's digitization solution suite creates visuals of machine parameters and data

INSET: A data management module



While machines.access and machine.insight clearly focus on single mobile machines, STW's IoT platform, 'machines.cloud', extends it to a fleet and includes stakeholders who many be looking at machines from a business perspective. Machines.cloud also addresses what has already become indispensable in private spheres: access to information at anytime and from anywhere. The same onboard modules collect data and preprocess it if required. The information is then sent to the machines.cloud platform or to other cloud services via the internet.

Matching infrastructure to workflow

While most telematics systems today create visuals of machine data, STW takes this a step further by providing a matching infrastructure for the integration and automation of workflows. The connection to machines.cloud from third-party systems is enabled via a representational state transfer (REST) interface. ERP/CRM systems

or logistics software can be supplied with useful data almost in real time. With machines.cloud, existing processes can be monitored and optimized, and the implementation of completely new services is possible, too.

The beauty of STW's digitization solution suite is the fact that it all works on the same, freely programmable onboard modules. The openness spans from modules to the cloud and beyond. Numerous standard tools and a flexible and open ecosystem of third-party systems and services form the basis for the implementation of various projects.

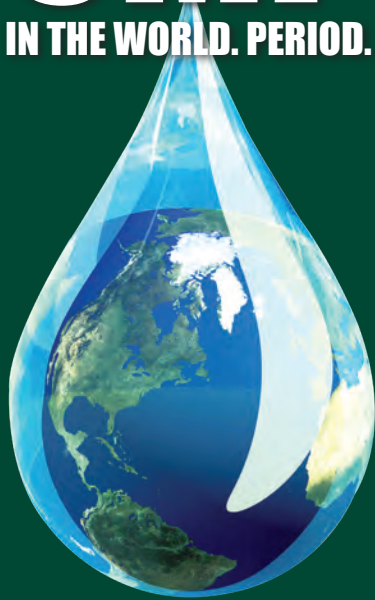
This open approach of 'No Vendor Lock-In' provides necessary investment security. STW and its strong partner network advises and supports customers with the implementation of their projects, services and business models. **ivT**

Hans Wiedemann is sales manager at Sensor-Technik Wiedemann GmbH



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Pumps that control flow

ADVANCES IN PUMP TECHNOLOGY MEAN ACE PUMP CAN INCREASE OR REDUCE THE RATE OF OIL FLOWING TO THE MOTOR

▶ Agricultural sprayers were developed to apply liquid fertilizers, herbicides, pesticides and other crop inputs. Over the years, improvements to these machines have focused on application efficiency.

Years ago, self-propelled sprayers were improved with the addition of a pulse width modulation (PWM) control valve that regulates oil flow of the spray pump, precisely controlling the application rate. PWM is a common type of control signal that modern rate controllers use to regulate the application rate. PWM signals have several defining characteristics including voltage, frequency and duty cycle.

Voltage and frequency are constant

The voltage of a PWM signal and the frequency, which can be set by the operator, are constant. Frequency sets the length of time each cycle lasts. Duty cycle is a variable calculated by the rate controller and defines the length of time the constant voltage is on during each cycle.

In Ace Pump's application, the PWM signal is used to open and close a 12V proportional valve. The proportional valve acts as a variable barrier that increases or decreases the amount of oil flow through the motor. This variable oil flow modifies the revs per minute of the pump/motor assembly, adjusting the overall application rate. The result is an instantaneous response to a change in the rate controller's required flow demand.

Precision control and application is becoming a greater focus these days. The fast response time of PWM valves offers a solution when used in combination with a rate controller.

Some of the latest-generation rate controllers require a PWM pump. These pump/valve combinations provide quick rate changes for constant and variable rate applications.

Pumps only run as fast as is necessary, minimizing horsepower requirements as well as wear and tear on the pump and other system components. This prevents excessive heat or foaming caused by large bypass flows.

All of Ace Pump's PWM-controlled products are designed for use on any closed-center hydraulic system. The valves have internal compensation to provide linear control curves, helping a broad range of rate controllers find the correct rate almost



LEFT: The new pumps include integrated pulse width modulated (PWM) control valves

BELOW: The Gemini dual-pump enables operation of two pumps independently

instantaneously. The 12V valve has an industry standard connector and includes a manual override for emergency situations where the control signal is lost, or to aid in troubleshooting hydraulic issues. Each PWM product is thoroughly tested to ensure rapid response out of the box.

Multiple application possibilities

Until recently, use of the PWM control valve was limited to self-propelled sprayers. But now the same PWM control technology used on self-propelled equipment can be implemented easily on pull-type sprayers and fertilizer applicators, thanks to Ace Pump's four new pump models with integrated PWM control valves.

The new pumps feature a two-valve design with a compensator spool to eliminate excessive hydraulic flow failures of the fixed clearance gear motor and further improve the stability of pump flow over the entire range of the PWM signal. Testing shows the application rate can be found in less than two seconds, even with a large change in the flow rate demand. These products also feature an anodized valve block for increased corrosion prevention.

Additional motors with integrated PWM valves are currently in the testing phase and will be available soon. In many applications today, especially planters, farmers run out of available hydraulic ports.

Attempts to run two pumps from one hydraulic source usually result in the flow going to one pump and the second one locking up. Farmers are forced



instead to use a smaller-capacity 12V pump, which offers only limited flow rates, with limited reliability.

The Gemini dual-pump kit enables users to operate two Ace Pumps independently from a single hydraulic supply and control them manually or automatically with a PWM control signal. The kit was designed for maximum flexibility out of the box and can control any combination of Ace's popular FMC-HYD series pumps powered by its 204 or 206 motors.

Once installed on a planter or sprayer, it enables operators to quickly and easily dial-in two separate application rates. Oil may be supplied from one selective control valve or directly from the powered hydraulic supply. In addition to greater application accuracy, the kit gives applicators and farmers more flexibility in setting up their spray systems. **IVT**

The author is Bobby M Robinson Jnr, senior production engineer at Ace Pump Corporation



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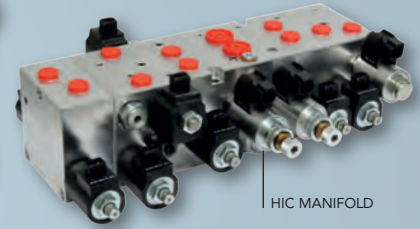
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Power to perform

IN ADVERSE WEATHER CONDITIONS, HIGH-POWERED, DURABLE AND ROBUST MACHINES ARE REQUIRED TO KEEP OPERATION RUNNING SMOOTHLY AND DISRUPTION TO A MINIMUM

▶ During winter months, airports often find themselves battling against bad weather which causes canceled flights and costly delays. Similarly to state highway departments, airport staff prepare for bad weather with well-choreographed plans to deal with disruptive weather. While each airport has its own snow removal plan during the winter season, it's critical they also have the right equipment to safely and quickly clear the runway, in order to keep operations moving.

One of the world's leading providers of snow removal equipment for airports is M-B Companies, a company that has enjoyed steady growth by focusing on niche markets and meeting the needs of independent contractors, governmental agencies, and other road and airport maintenance organizations.

M-B operates in five divisional locations, including its airport snow removal products division, based in Racine, Wisconsin, USA. This division designs and manufactures a family of snow removal equipment, such as: chassis, underbody, rollover and front mount plows, front mount and tow brooms, and loader mount and chassis mount snow blowers. Its product portfolio includes front- and mid-mount broom trucks and multitasking tractors. Broom products include front mount, tow, tracking tow brooms, cradling brooms, and tractor-mounted and loader-mounted brooms. M-B's plow line includes reversible, sectional, folding, and cupping ramp and rollover plows.

Cool performance

M-B Companies' airport snow removal equipment must perform in harsh conditions under intense time pressure to keep transportation systems running. Time is always of the essence because equipment breakdowns or slow operation can lead to canceled flights and potentially unhappy travelers stranded at the airport.

One of M-B Companies' clients is the Minneapolis-St Paul (MSP) Airport – one of the top four weather-affected airports in the USA. With average snow accumulations of 4.5ft (1.3m) per winter, snow removal at MSP is serious business as crews plow, blow, broom and de-ice more than 28 million square feet (8.5 million square meters) on airfield pavements alone.



ABOVE: M-B Companies' MTS vehicle can be fitted with various front add-ons, in order to tackle and minimize disruption caused by adverse cold weather

LEFT: The compact AM110 pump drive has a power output rating of 180kW



One star model of the snow removal fleet is M-B Companies' tractor-mounted, multitasking snow (MTS) vehicle that can be equipped with various front plows, tow brooms and de-icing equipment. Its bidirectional tractor-mounted runway broom runs at 347rpm and has five times more power than a typical hydraulics-powered broom. All operations are controlled from within the tractor cab, keeping the operator safe and comfortable, while isolating them from the outdoor elements.

The unit includes a compact Twin Disc AM110 pump drive that utilizes the full horsepower of the tractor to drive the hydraulic machinery. The advanced Twin Disc AM110 Pump Drive has a maximum input power rating of 180kW (242hp) with a 1:1 ratio at 3,200rpm. It features a cast-iron housing, case-hardened shafts and spur gears, and Viton seals for added durability.

The Twin Disc AM110 was appealing to M-B Companies because it offered the right ratio required to operate the large tow brooms and front plows needed for the massive amounts of snow that frequently disrupted MSP Airport. It replaced a previous pump drive on the unit that couldn't generate enough power to operate a 12ft (3.6m) broom in heavy snow storms.

"Ultimately you need a pump that's going to perform," says Gary Riha, an engineering manager at M-B Companies. "The Twin Disc pump is put together very well. Its compact design lets us do more with less, which is critical in mobile equipment applications."

Riha adds, "I really appreciate the application engineering knowledge that Twin Disc offers. They are very collaborative in helping us come up with a solution." **ivt**


Andy Conaty is product manager, industrial products at Twin Disc Incorporated



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Controlling valves electrohydraulically

 The MLT-FD5/D electrohydraulic proportional actuator from **Tecnord** has been designed to shift a directional control valve spool either directly (FL version) or by means of a servo piston that is mechanically connected to it (SP version). The internal closed-loop position control of the MLT-FD5/D makes the valve spool achieve the desired position with accuracy levels approaching the performance of a servo valve, by continuously comparing the setpoint of a remote control device (e.g. potentiometer, joystick, machine management system) with the feedback signal generated by a high-precision Hall effect position transducer.

Applications include the high-performance proportional control of stackable or monobloc

directional control valves, as well as proportional control of variable displacement pumps and motors.

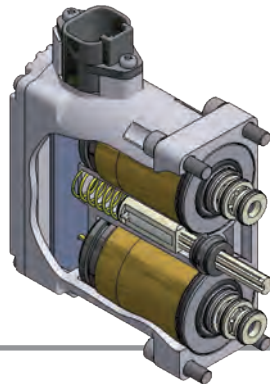
Two independent proportional valves provide a flow rate of 0.3 l/min, work pressure of 12-35 bar, and failsafe return to neutral in case of power loss. The Hall effect contactless spool position sensor ensures excellent linear control on 100% of spool travel; 8mm standard control stroke from each side of Neutral/13mm for Float position in one direction only; and prevents 'cross-talking' between adjacent work sections.

The built-in electronics feature an analog operating mode with +5V supply to external potentiometers or joystick controllers – with position feedback through analog voltage. In the other operating mode, the remote control setpoint is

provided via CANbus according to ISO 11898 at 250Kb/s or 500Kb/s by means of standard SAE J1939 messages. Diagnostic messages are also available from the MLT-FD5 actuator.

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Connecting the operator to the machine



Ametek Vehicular Instrumentation Systems – an industry leader

in custom dashboard instrument displays for heavy trucks as well as construction, military and other specialty vehicles – has added the CAN I/O X Expander Module to its family of CAN interface modules used to enhance vehicle instrumentation systems.


The versatile CAN I/O X is able to convert switched, analog or pulsed input into a standard or proprietary J1939 CAN databus message for any device on a vehicle instrumentation system. It provides manual transmissions and mechanical engines with a means to connect with electronic instrumentation by converting pulsed inputs to digital information. It also allows switched and analog inputs to be converted to digital data and converts pulsed input into a J1939 CAN databus message. The module features 10 switched and analog inputs and a minimal footprint of 18.7in².

The CAN I/O X module is environmentally sealed against dust and moisture penetration to IP67 specifications and can be mounted onto a vehicle chassis. The module is designed to withstand harsh conditions and rugged off-highway environments. It meets all SAE J1455 and J1113 requirements for vehicular instrumentation.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm Quote Ref: **564**

Stage V to be featured at Agritechnica

 At Agritechnica **Cummins** will feature the latest Stage V products. From 100 to 675hp (75 - 504 kW). These engines do more with less. For operators they deliver higher performance for more machine capability. Power and torque are increased by simpler architecture, which also means more reliability, and more productivity. The engines also boast improved fuel efficiency with extended service intervals reducing running costs.

While most manufacturers are adding technologies for Stage V, Cummins is changing the rules and reducing complexity. The latest Single Module™ aftertreatment technology is smaller and lighter than the equivalent Tier 4 final. There are savings of 50% in envelope size and up to 30% in weight compared to current systems. The higher efficiency NOx conversion allows EGR (Exhaust Gas Recirculation) to be removed from the engine. The system also removes 99.9% of all PM (Particulate Matter) by weight and count. It is used with the new F3.8, B4.5, B6.7 and L9 engines

The EGR-free engine design is more compact with less weight, meaning less installation complexity and lower installation cost. The single

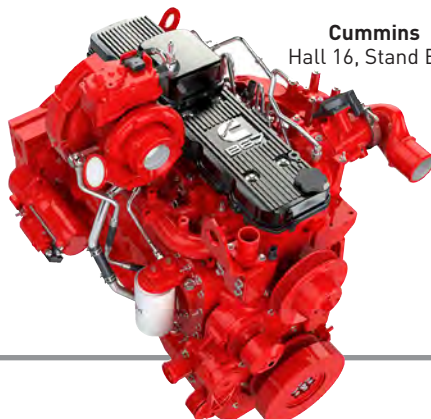
module aftertreatment technology also requires less space. The global engine platform has a common installation for domestic and export business, giving more flexibility to manufacturers. This is backed by high sulphur fuel tolerance.

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Cummins
Hall 16, Stand B11



Hardware to control hydraulic flow

 In the hydraulic circuit, a rotary and linear movement can be controlled particularly effectively by applying low medium compression and high energy density. One of the challenges in hydraulics is the use of a broad speed range with the possibility of bringing the movement to a standstill.

Swiss company **Wandfluh** offers an extremely interesting range of products, which have been specifically developed to support the machine in various situations it encounters.

For their use, two solution concepts (QN/QD) with three design variants, five different product sizes and 12 power levels are available. All Wandfluh components control

the entire volume flow range, from a standstill to the selected nominal volume flow level QN from a minimum of 0.1 l/min to 160 l/min.

The range of proportional throttles and flow regulators are also used in explosion-protected areas through the use of the multi-certified MKY45 solenoid coil.

The concepts are therefore available with IECEx, ATEX, EAC, Inmetro, UL, CSA, Nepsi, MA and Australia certificates. On request, the amplifier electronics can also be installed directly in the solenoid coil.

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New vehicle seat to be launched at Agritechnica 2017



 The new **Sears** Nexus seat will be launched in Europe at Agritechnica 2017.

The multi award-winning driver's seat company and the market leader in North America has grown into a global leader, significantly growing its business since the 'Active' seat was launched by John Deere in 2000 (the seat and suspension were supplied and co-designed by Sears). The steady flow of innovative products such as Active VRS suspension and active magnetic

suspensions (also now used in many high-performance sports car suspensions) has continued apace.

The Nexus seat top is combined with a new TLS suspension, and is the world's first 'swing toggle' and roller suspension design, providing the most effective combination of super low frequency ride and durability from the proven Toggle Link design. The TLS is a truly unique product and yet another first for Sears.


The stunning Nexus seat top has had rave reviews to date, setting new standards in cushion comfort, while its modern, innovative design places Sears at the forefront of seat-top styling and function.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm Quote Ref: **566**

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Sears
Hall 17, Stand D45

High-quality valves for any circumstance

 To satisfy demands from the agricultural and construction market industry, **Marzocchi Pompe** has developed a number of specific products that integrate relief valves, anti-cavitation, electro-proportional,

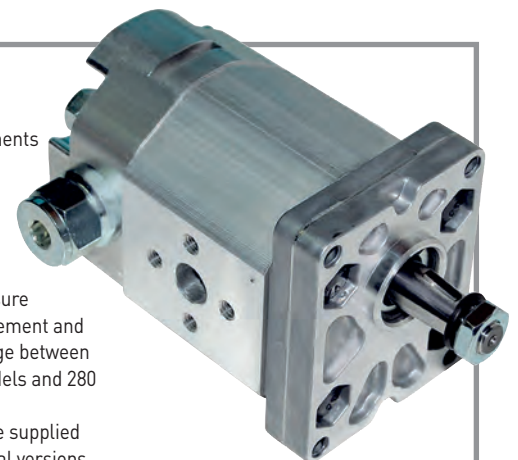
priority valves, and hi-low systems. The current Marzocchi production range varies between 0.19cm³/rev and 200.3cm³/rev and it is divided into eight groups according to gear size. A wide range of flange, shaft and coupling configurations

is available; these components can also be designed according to customers' specific requirements.

The cast-iron versions exist in groups 1, 2 and 3. Maximum operating pressure depends on pump displacement and type; it varies on an average between 230 bar on aluminum models and 280 bar for cast-iron versions.

All products can also be supplied with Viton seals and special versions are available for temperatures between -40°C and +120°C. Mono-directional and bidirectional motors are divided into three families (1,2,3) covering a range of displacements between 2.8cm³/rev and 87cm³/rev.

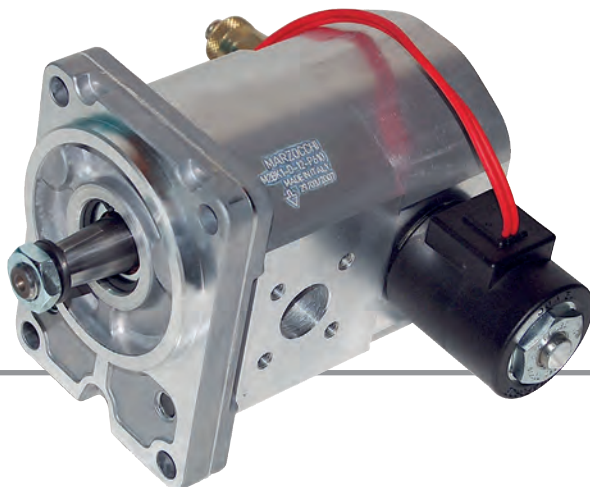
The maximum working pressures for the motors are similar to those




established for the pumps and they can deliver torque up to 250Nm and power up to 60 kW.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm Quote Ref: **567**



Angle sensor prevents corrosion

 Traditional angle sensors can often fail under outdoor conditions, even with high IP protection rates. This is due to moisture ingress that corrodes the sensor electronics. Conventional coating and sealing technologies have not been successful in preventing corrosion in the long term.

ASM Sensors has unveiled the magnetic angle sensor Posirot PRAS2, which includes a new sealing technology. The sensor housing is completely potted with a special sealing compound. The potting also includes the cable area, to avoid capillary water ingress along the cable.

The sensor is programmable in its finished state. The sensor housing is also shielded against magnetic fields. This enables its use even in the presence of strong electromagnetic fields, such as at the shaft end of an electric motor. A compact aluminum housing only 20mm

thick means the sensor is also suitable for installation in tight locations.

The Posirot PRAS2 measures the rotary position from 0° to 360° utilizing a multiple Hall effect sensor array and a position magnet. The protection class is IP67 as standard and IP69 optional. Analog outputs are available in either voltage of 0.5-10V, 0.5-4.5V or current 4-20mA. Digital outputs are available either absolute (CANbus, SSI) or incremental. The sensor has a linearity of ±0.3%.


Its special sealing and resistance to shock, vibration and dirt ingress, makes the Posirot PRAS2 especially suited to harsh environments such as industrial vehicles and mobile machines.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **568**



Rugged machine display

 **Enovation Controls** adds to its line of rugged Murphy displays with the compact PowerView 485 multifunctional display. With a 4.3in (109.2mm) WQVGA high-brightness (1,000 nits) color LCD, the PV485 provides an easy-to-read interface, even in direct sunlight. The PV485 is a fully customizable display built and tested to meet the demands of industrial and off-highway applications. Five tactile pushbuttons allow for user input to the interface. Boasting a wide array of I/O and the inclusion of RS-485, the PV485 supports mechanical and Tier 4/Stage IV electronic engines.

Customizing the PV485 is simple with PowerVision Configuration Studio software. With this powerful


software tool, users can customize their interface, sequence control and function of events for their application. PowerVision users can also quickly define custom parameters with the built-in library and import custom splash screens, logos and other graphics with their own branding.

Enovation Controls is a leading global provider of electronic control, display and instrumentation solutions for both recreational and off-highway vehicles, as well as industrial mobile and stationary equipment.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **569**

Easy-to-use wearable joystick

 The Dynamic Series from **Autec** is best known for its suitability with hydraulic machinery and other continuous-current applications. Thanks to proprietary FSA technology, complex machine control is made easy through bidirectional radio communication, visual displays of machine parameters, optional boards that serve to expand an already large number of commands, along with a tremendous number of options to best serve the needs of customers.

In addition to the quality and reliability expected from Autec, the new FJB offers safety functions – up to PLe EN ISO13849-1/SIL 3 IEC 62061 for stop and up to PLd/SIL2 for unintended movements from standstill, depending on output

configuration. FJB is big, without an inch of misappropriated space and can be interfaced with any Dynamic Series receiving unit.


The deluxe support belt is a feature that adds value in ways that standard joystick transmitting units don't: it mitigates the weight of the unit on the user and is easily detachable. Users will appreciate the added back support, making it possible to operate for hours on end because the FJB is comfortable to wear. A comprehensive list of options and actuators (e.g. 4.3in color display, cable control, levers, switches, sensors) are available.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **570**



Electric heaters without the hassle

 Since 1999 **Kalori** has been developing specific electric HVAC heaters, adapting them to the needs of OEMs.

E.HVAC is an electric version of standard HVACs and the same size, meaning the same air diffusion system can be used.

In terms of the heating elements, Kalori sources the best-quality PTC elements, which guarantees a high level of performance. The safety of these elements is guaranteed by their operating principles.

On every Kalori E.HVAC unit, security is reinforced by an additional sensor, primarily designed to protect the casing, which in turn is manufactured using high-quality injected polyamide

or polypropylene, with glass fiber.

In terms of air-conditioning, years of experience in the design of air duct parts and air diffusion systems, simulation software and test benches enable Kalori to offer the right solution – to preserve both autonomy and comfort levels.

While users may agree to pay for air-conditioning, they do not want to pay for ‘a little bit of fresh air’; comfort must be total without compromise and must be achievable using just electrical power.

The circuits are closed, using one of the best electric compressor ranges on the market: 12V, 24V, 48V, 80V and 600V versions are available as standard.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **571**



Kalori
Hall 17, Stand C43



Adaptable vehicular displays

 German manufacturer of rugged vehicular display systems

Bauser will not exhibit at the Agritechnica exhibition in November because it will be concentrating on upgrading its products developed for the off-highway, construction and materials handling markets. “This is a very busy and interesting time for the company as it is involved in product development projects with a number of leading OEMs that are coming to completion,” says Lucrezia Hellstern, owner and MD of Bauser.

Extensive data connectivity can now be enabled via CAN 2.0B, USB, Ethernet or PAL/NTSC video (open to custom requests), while J1939, ISOBUS, CANopen, TCP/IP, and OEM proprietary protocols are all available. To enhance Stage IIIB/IV and Tier 4 emission standards compliance, compatible DPF and SCR functions can be incorporated.

Installation can be achieved with a jointed arm (surface mounted) or integrated, while up to 12 tactile buttons and an optional rotary encoder can be incorporated.

Bauser offers a wide range of display sizes, i.e. 3.5in (320 x 240) to 7in (1,024 x 600) color transmissive TFT displays with

LED backlight of 350-1,000cd/m² over a lifetime of up to 50,000 hours.

The displays can be incorporated in a panel/cockpit, or even mounted on a surface by using the jointed arm. The displays are compatible with CAN J1939 engine data and can even be used as virtual terminals in an ISOBUS application to control the accessory equipment of machines. The optional rotary encoder enables the easy setting of a wide variety of machine and accessory equipment parameters.

Standard displays include up to 21 warning lamps (LED) and up to 26 pins for several I/Os, such as analog, digital or frequency inputs, as well as FET outputs (switching capacity 24V, 500mA).

Finally, a rugged design means applications can withstand rough environments with high levels of shock and vibration over a wide ambient range.

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To learn more about this advertiser, visit ukimediaevents.com/info/ivm
Quote Ref: **572**

Competition to encourage UK engineering

 Leading drive and control specialist **Bosch Rexroth** is launching an Innovation Award to nurture innovation within the UK engineering sector.

Specifically focused on mobile applications, the competition will offer entrants the chance to bring their new mobile machine concepts to life. All innovations must incorporate Bosch Rexroth’s Bodas control system and competition entries will be marked on creativity, practicality and complexity.

The Bodas system consists of a hardware and a software kit, ideally suited to the diverse requirements

of mobile working machines. The modular control system is designed to be simple to install and commission, thus reducing costs.

The individual crowned the ‘Innovation Champion’ will receive a complete Bodas control system, together with 100 hours of design support to help turn their leading innovation into reality. The top prize also includes hardware, software and product training for up to five people, while additional prizes are on offer for second and third places.

The Innovation Award is open to engineers aged 18 and over,

and resident in the UK or the Republic of Ireland, who are working for manufacturers of, or suppliers to, the construction, agricultural, materials handling or on-/off-highway vehicles industry.

All entries must be submitted before the closing date of December 22, 2017, and the winners will be announced in January 2018.

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Quote Ref: **573**





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LOOKING BACK



FROM HORSE-DRAWN TO HORSEPOWER

175 Years of Case IH

An early horse-drawn thresher from Case



This year, Case IH is celebrating its 175th anniversary. Its roots can be traced to Jerome Increase Case, who founded his eponymous agricultural equipment company in 1842. The manufacturer initially focused on building horse-drawn threshing machines at its Threshing Machine Works in Racine, Wisconsin, where Case IH's worldwide HQ remains to this day.

In 1869, Case introduced the first successful, horse-drawn steam tractor. In 1876 the company went on to build its first self-propelled steam traction engine. By 1886 the JI Case Threshing Machine Company was the world's largest producer of steam engines.

In 1902, separate developments saw five companies merge to form the International Harvester Company, based in Chicago.

In 1915, IH produced its first combine, and eight years later introduced the Farmall, the world's first rowcrop tractor, which went on to sell more than five million units, making it the world's best selling tractor ever.

In 1977, IH launched a new combine design, the Axial-Flow, that was to revolutionize high-output harvesting with its large capacity, gentler threshing and an easy daily service.

Case IH was formed in 1985, shortly after the then-parent of JI Case acquired the agricultural division of International Harvester, uniting the legacies of Case and IH in a single brand.

Since then, the global OEM has led the market with innovations such as its Magnum tractor (the first tractor to win an Industrial Design Excellence Award); the Quadtrac, the first articulated high-horsepower rubber-tracked tractor; CVT for mid-range tractors; and Advanced Farming System (AFS) technology.

"AFS covers all the technologies that help the farmer to operate his products in an easier and more comfortable way," says Peter Friis, a commercial marketing director for Case IH.

Indeed, at the Farm Progress Show in 2016, Case IH created a new industry buzz as it unveiled its Autonomous Concept Vehicle. The future is already being planned... **iVT**

Evolution
Timeline



Jerome Increase Case
(1819-1891)



Case's horse-drawn
steam tractor (c1869)



The first Farmall tractor
model (c1923) from IH



The first IH Axial-Flow
combine (1977)





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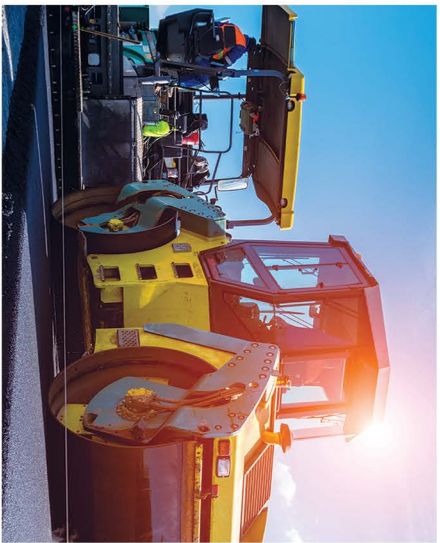
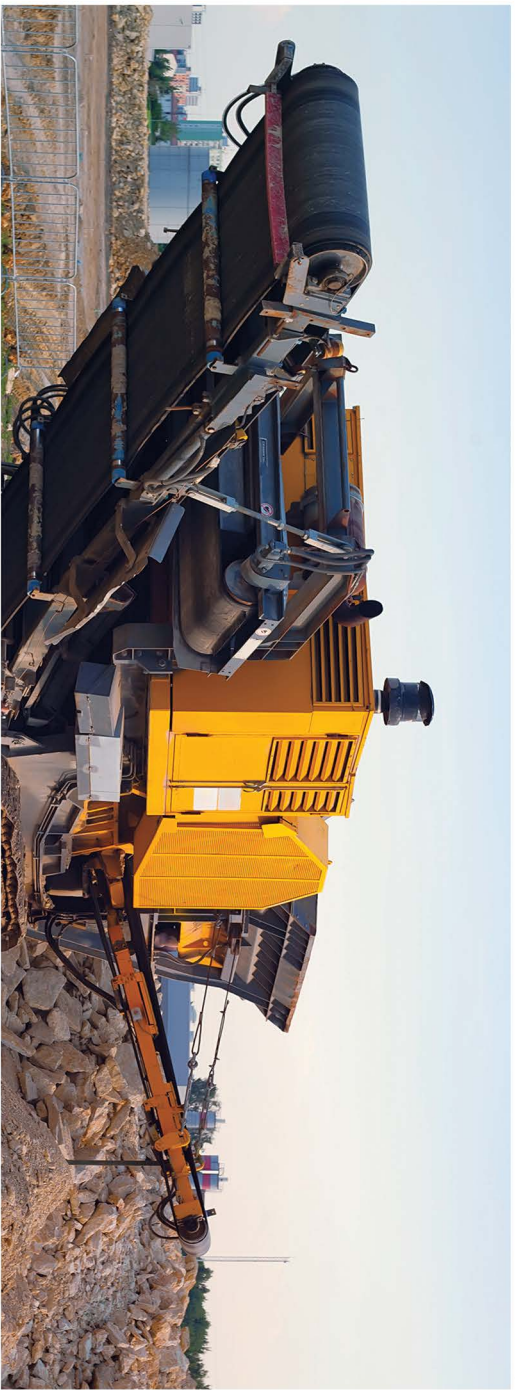
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