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INDUSTRIAL VEHICLE

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On tracking of the field in Hanover?

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Design Challenge/Ergonomics Giving operators of less-cab machines some TLC

Grow your own Sustainability in composites Interview Thomas Böck chief technology officer, Claas

India & SE Asia in the spotlight

Best of the region's industrial vehicle design Market report: The Indian construction equipment sector

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P109 As I've said once or twice before, there are good things and bad things about editing a quarterly magazine. Perhaps most frustrating is the length of time some ideas have to be left on the backburner until the most appropriate issue rolls around

and we have the opportunity to give them the space they deserve. Take one of the main themes of this issue, for instance. I first mooted the potential for a feature on open-cab platforms to our ergonomist pal Steve Casey four or five years ago – by a conservative estimate – but it wasn't until the end of last year that I was able to give him the go-ahead to tackle it, due to other cab-related themes and topics taking precedence in the intervening period. Nevertheless, it's all worked out splendidly, tying in very nicely with the emerging markets theme we have going on this year, and India and Southeast Asia in this issue in particular – a region that somehow seems to be especially synonymous with this Spartan approach.

Although, of course, as Steve points out in the article, this type of cab isn't purely restricted to countries where cheap and cheerful machinery is the order of the day. When I first got involved with this industry back in 2001, I was surprised to see how many construction machines were sold without full cabs in the USA – the reason being, I was told, illegal immigrants from Mexico weren't going to complain about working conditions. I suspect there are far more factors than that at work, but what is

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OREWORD

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certainly true is that some of the most cutting-edge and expensive off-highway machinery – asphalt pavers, for example – wouldn't dream of having a cab. Their operators may work in an extremely smelly environment (albeit very pleasantly smelly, in my opinion), but the need for ease of access and enhanced visibility trumps everything else. And, of course, these are not machines that are used in extreme weather, meaning the climate protection factor is less of an issue. And while warehouse trucks may not be quite as expensive or as advanced in terms of tech as pavers, it's a fair bet that their operators would soon get sick of opening and closing the door every five minutes.

p133

So given that sometimes less-cab will always be the preferred option, whether for cost or other operational benefits, is it possible to smooth away some of their rough edges to remove the inherent disadvantages? Steve explains all on page 44, while a very interesting air-conditioning solution appears in our related Design Challenge feature on page 54.

Perhaps seeing these cabless machines as the poor relation of the off-highway sector is all just a state of mind; a 'grass is greener' or 'be careful what you wish for' type of scenario. After all, there aren't many of us who will feel a twinge of sympathy for the owner of a Ferrari 250 GT California as it whizzes by with its soft-top down in the summer breeze...

Richard Carr, editor, iVT International

Coming up in the November issue of iVT

Crane engines – one lump or two? • Stage V update • Chinese manufacturing in the spotlight
The latest innovative vehicle case studies • Look out for the Off-Highway Annual soon!

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ONALL FOURS

John Deere has doubled up on the number of tracks used in its largest tractor range with the launch of the 9RX series

WATERLOO, IA, USA – More than 15 years after the introduction of its first two-track models, John Deere has added its first ever quad-track models to its high-horsepower 9R tractor line-up.

Ranging from 470hp to 620hp, the four 9RX models are fitted with large, rugged, puncture-resistant Camso Durabuilt 3500 and 6500 Series belts featuring Duradrive Technology for optimized load-bearing performance. Designed to offer increased durability, their 30in width keeps the tractor within 3m machine width, although extrawide 36in tracks are an option.

This positive-drive track system effectively delivers power to the ground, via a large-

diameter drive sprocket and drive lugs, along with optimally placed idlers and mid-rollers, making it ideal for heavy-draft applications such as cultivating, plowing, disking and ripping, large-scale seeding or even non-agricultural assignments.

As well as reduced track slippage and superior power and durability, they deliver improved ride quality, even at transport speeds of up to 40km/h – in conjunction with the articulated steering system and the optional Active Command Steering (ACS), which enhances line-holding ability and maneuverability in the field.

The 9470RX and 9520RX models are powered by JDPS PowerTech PSS 13.5L

engines (Stage II versions are available for the CIS and Ukraine) while Cummins 15-liter QSX units are installed in the 9570RX and 9620RX. Featuring EGR, enhanced turbo technology, DPF and SCR, both engines are Tier 4F-compliant and provide ample power and torque for the toughest conditions.

Quiet efficiency

Like the 9R and 9RT models, the 9RX is available with the responsive, smoothshifting e18 transmission with Efficiency Manager for automated control of engine and transmission. Its redesigned hydraulic system includes up to eight SCVs providing 220 l/min standard flow, or an optional

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illumination around tractor and implement for enhanced operation at night. Fully integrated AutoTrac guidance, the JDLink Connect information management system, and the intuitive-to-use Generation 4 CommandCenter display with custom-built pages that provide fingertip control of tractor and implement functions, further improve operator comfort and performance.



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NORTH LITTLE ROCK, AR, USA – An essential tool for building and maintenance of mine haulage roads, Cat's 16M3 grader is optimally sized for operations using 150-ton or smaller trucks.

To cope with the additional weight (now 32,411kg in total) and power (290-348hp from the Cat C13 ACERT engine with its Optimized Variable Horsepower system) its frame has been redesigned for more durability. The center-shift section is now a heavy-duty steel casting that effectively distributes stresses in this highly loaded area; the hitch plates (at the articulation joint) are 50% thicker than on the 16M, and the rear frame is lengthened – incorporating two bumper castings for added counterweight – for improved machine balance and steering control while providing easier access for routine maintenance.

Key service intervals have been improved – engine air filters and pre-cleaners now have twice the life, as have the main hydraulic, transmission and pilot filters (now 1,000 hours when SOS sampling is used) and transmission/rearaxle fluid change intervals (2,000 hours with SOS). The rear tandems offer nearly 15% greater braking torque, due to the enlarged brake disc diameter and piston area. Brake pods no longer have to be removed to check for wear, thanks to a manual brake wear indicator. An optional enhanced-

access platform offers access to the engine compartment or cab from either side. Inside, a new display shows Cat Grade Control Cross Slope readings and DEF level, while a new keypad with illuminated, onetouch buttons replaces most of the previously used threeposition switches.

A ROUNDABOUT APPROACH

Bobcat's (rebadged) Evo rotary telehandlers are intended as easy-to-use machines, with a higher-mounted cab that ensures greater overall spatial awareness for the operator, plus CANbus management technology.

The four models – TR38160, TR50190, TR50210 and the TR40250 – provide max. lift capacity of 3.8, 5.0, 5.0 and 4.0 metric tons, max. lift heights of 15.7, 18.7, 20.5 and 24.1m, and max. horizontal reach of 13.4, 16.4, 18.0, and 20.5m respectively. A Kubota V-3800 DI T 3.8-liter T4i-compliant engine provides the smallest model with 100hp at 2,600rpm, while FPT's NEF Series 4.5L T4i units give the rest 141hp.

With 400° rotating capability on the TR38160 and 360° for the rest, the Evo models can serve the needs of an entire site from just one position, and can be quickly set up for exceptional stability.

An auto wheels alignment feature (standard on the three larger models) provides easy switching between the three steering modes to enhance maneuverability.

All boom and swing operations are smooth,

precise and monitored by CAN sensors on the main components, with a selfmanaged Boom Cushion system enabling the operator to forget about machine limits.

Self-diagnostics keep the operator informed at all times via the new control panel's digital display, with the boom position and capacity shown at all times.



CONSTRUCTION FOCUS

JIM MANFREDI, MACHINERY OUTLOOK

INTO INDIA, AGAIN

Komatsu has opened a new hydraulic excavator factory in Chennai, India. It initially produced excavators at L&T-Komatsu (LTK), a JV with Larsen & Toubro that was dissolved in 2013, since when Komatsu has been solely responsible for the development and production of its products made in India, while L&T has handled sales and service of those products.

Now the five excavator models previously made by LTK are being transferred to the new facility, which is solely owned by Komatsu.

CAT GOES IT ALONE

Caterpillar will begin independently designing and manufacturing its vocational truck product family at its hydraulic excavator facility in Victoria, TX. Production is expected to begin in the first half of 2016, bringing to a close the existing arrangement it has with Navistar to build the trucks, which Cat launched in the North American market in 2011.

Sales of the three models have averaged an estimated 1,000 units annually for the past three years.

KOBE MERGES WITHIN Kobe Steel plans to merge

its Kobelco Construction Machinery and Kobelco Cranes subsidiaries by April 1, 2016. Historically, the two businesses had always been combined, until Kobelco Cranes was spun off into a separate company in April 2004, following the formation of Kobelco's alliance with CNH for excavators in October 2002. When that venture was dissolved in 2012, Kobelco soon resumed marketing excavators under its own brand.

A Kobe Steel statement said the move was intended to "enhance cooperation between the two companies to improve business efficiency, from development to procurement, and covering production, quality and sales... the combined excavator and crane businesses will benefit from more efficient operations that will further strengthen their business foundation".

GROUND BREAKING

Bobcat and its parent organization Doosan have broken ground on a US\$9.5m headquarters expansion in West Fargo, North Dakota, USA, to help accommodate growth, drive innovation and improve operations. The expansion is likely to double both the square footage and employee capacity and is slated for completion in Q3 2016.

WN DOING GREAT

Wacker Neuson Group has reported record revenue and earnings for the first half of 2015, despite challenging regional market conditions. Revenue increased 14% to €706.4m from €620.0m in the first half of 2014, with profit before EBIT rising 4% relative to the prior year to reach a new record high of €65.7m. ۲

In Europe, which accounted for 72% of its revenue, revenues rose 11% over the previous year. The largest nominal increase, however, came from the Americas region, which reported a 22% rise.

Its compact equipment segment's share of group revenue exceeded 51%, while the light equipment's share fell to just under 30%. Wacker Neuson's services segment accounted for 19% of revenue.

Revenue for the compact equipment segment proved to be the main growth driver, increasing by 25% relative to the previous year.

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DUTY MANAGERS

CUNEO, ITALY – Merlo has renewed its TurboFarmer product range, creating distinct Compact, Medium Duty and Heavy Duty families.

The result of an innovative new modular approach, Merlo developed the Compact Duty range with the technology and performances typical of the higher product ranges. The TF33.7 (pictured, main) and TF30.9 stand at 2.12m tall, but are also available in Low Profile versions at a height of just 2m – retaining the same cab as that used in superior ranges, but sitting lower in the same frame as that used by the standard models.

In the Medium Duty range – marketed as the lightest and most compact in their class at 2.25m high – the new TF35.7 and TF33.9 weigh in at 6,600kg, for greater maneuverability and enhancing fuel consumption by 18%. The new EPD (Eco Power Drive) system helps in this regard, with the 75hp and 120hp engines meeting Stage IIIB without SCR or a DPF.

The first agricultural model that Merlo has equipped with a boom of more than 10m, the TF45.11 (pictured, inset) is one of the two machines in the Heavy Duty range and is ideal for biogas applications.

A maximum speed of 40km/h applies throughout the entire Turbofarmer range, which uses Merlo's patented M CVTronic continuously variable transmission.



BASILDON, UK – New Holland has expanded its T7 tractor line-up with the addition of the T7.290 and T7.315 models. Offering 270hp and 300hp rated power respectively, they use FPT's 6.7-liter NEF engines with EcoBlue Hi-eSCR system to meet Stage IV, in conjunction with an eVGT to deliver high torque at low RPM and react guickly to load changes.

They differ from existing T7 models with the adoption of new hydraulics, rear axle and a swing front axle that is taken from the smaller of the T8 models, but features a specially developed doubleacting suspension cylinder. This front suspension is directly linked to the engine oil sump, which forms part of the tractor frame. Fuel tank size has almost doubled, to 640 liters.

The hydraulic circuits have been designed to minimize parasitic losses, so no oil moves unless it is required. The 220 l/min pump provides a high flow rate even at low engine RPM to enhance fuel efficiency and lift capacity.

The tractors also feature IntelliCruise ISObus Class 3 tractor/baler automation technology that enables the baler to control the ground speed according to changes in the windrow to optimize feed rate and produce a constant flake thickness.

Other automation features, such as the latest-generation Headland Turn Sequencing, IntelliSteer autoguidance and PLM Connect telematics, make life even easier for the operator.

AGRICULTURAL FOCUS

JIM MANFREDI, MACHINERY OUTLOOK

(CARBON) BOOM TIME John Deere and King Agro have partnered to develop and distribute carbon fiber booms for John Deere's application equipment. With 22 years of experience innovating and developing carbon fiber applications, King Agro is a world leader in producing carbon fiber applications for boating and marine products. The company recently expanded into developing innovative carbon fiber structures for agricultural equipment.

The agreement is focused on offering the considerable advantages of carbon fiber's versatility, strength and durability in self-propelled spraying equipment. The reduced weight of carbon fiber sprayer booms can also reduce equipmentinduced soil compaction.

Deere will offer its 2016 model of the 4730 Sprayer with the option of carbon fiber booms exclusively to the South American and Latin American markets, but is considering sales in other markets in the future.

ON THE GRAPEVINE Production capacity for Kubota equipment in the USA is to increase with the construction of a 502,000ft² manufacturing plant plus the expansion of existing operations in Gainesville, Georgia. The new plant will manufacture the OEM's RTV series utility vehicles, with the capacity to produce 50,000 units annually. Mass production is expected to begin in early 2017.

The company's expansion plans come hot on the heels of Kubota Tractor Corp's recent announcement that it will relocate its US HQ to Grapevine, Texas, so as to get even closer to its major markets and customers. The new plant will be

just three miles away from

Kubota Manufacturing of America Corporation's facility, which will also undergo enhancements to increase its production capacity to support Kubota's growing turf business.

M&M INVESTS IN MAM Mahindra & Mahindra and MHI have entered into a strategic partnership in the agricultural machinery field. M&M will invest US\$25m for acquiring a 33% voting stake in MHI subsidiary Mitsubishi Agricultural Machinery (MAM).

The deal is expected to close by October 1, 2015. with the new funding used to increase MAM's capital base. MAM manufactures tractors, combine harvesters, rice transplanters and other ag machinery; it had revenues of approx US\$408m in 2014-15 and has been supplying OEM tractors to Mahindra USA as well as providing the technical license to Mahindra for walk-behind rice planters and a new tractor in India.

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The new partnership is likely to help both companies to jointly develop products to address global opportunities in the agricultural sector, while improving their cost competitiveness through joint procurement and optimizing the supply chain.

MAHINDRA UPSIZES

Mahindra USA has sunk more than US\$1m into a major expansion that will triple the footprint of its parts department and increase office space at its HQ in Houston, Texas.

Mahindra says it is the fastest-growing tractor manufacturer in North America, held the number three position for North American tractor sales in 2013, and has steadily increased market share and brand awareness.

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WHAT'S NEW

HANDLING FOCUS

MICHAEL LEU, FORKLIFTACTION.COM

COMMITTEE MEETING Mitsubishi Heavy Industries and Mitsubishi Nichiyu Forklift are to launch a preparatory committee following the decision to purchase UniCarriers, announced on July 31. It will be jointly operated with UniCarriers and, with MHI director and senior EVP Atsushi Maekawa in charge, intends to draw up business policies and strategies to further enhance its reputation as a world-class producer of logistics equipment.

Through the acquisition, MHI and Mitsubishi Nichiyu Forklift will achieve a full line-up of product offerings and mutually complementary sales networks, giving them greater response capacity to customers' diverse needs. The move is also targeted at enhancing the companies' R&D capabilities and boosting their product competitiveness.

COME TOGETHER

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The planned merger of Terex and Konecranes has taken a step forward with Terex receiving the requisite consents from shareholders. The two businesses will be combined, in a merger of equals, as Konecranes Terex plc, with estimated combined 2014 revenues and EBITDA of US\$10bn and US\$845m respectively.

Consummation of the merger is expected to occur in the first half of 2016. Stig Gustavson, chairman of the board of Konecranes, said this is "a defining step in the history of both companies. With a focus on lifting and material handling solutions, Konecranes Terex will be in an excellent position to deliver enhanced growth in revenues and margins through several strategic advantages, including significant cross-selling opportunities."

Global materials handling online: www.forkliftaction.com

STEEL PULSER

NENZING, AUSTRIA – Eleven years after the delivery of its first reach stacker, the LRS 645, Liebherr has launched the first model of its Pulser series. Efficiently linking quay and yard, the LRS 545 features a "wedge-shaped design that provides the desired agility for smooth container operation", claims Matthias Mungenast, sales director for MHCs and reach stackers.

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Terex CEO Ron DeFeo said:

"This merger brings together

two great businesses and,

through synergies, provides another lever that is within

our control to deliver value-

creation to ... shareholders."

will maintain headquarters in Hyvinkää, Finland and

Westport, Connecticut, USA.

Hoist Liftruck, an OEM of

handling equipment, has

entered into an exclusive

agreement with Toyota

Material Handling USA

to manufacture 10,000-

32,000kg pneumatic tire

forklifts under a private

specifications.

label agreement, to TMHU's

'Our pneumatic-tire

trucks will be an excellent

line-up," stated Stu Jacover,

VP, strategy and development,

Hoist. "This will be integral

announced plans to expand

its manufacturing operations

to our mutual growth."

Hoist had previously

into Indiana, following its

major investment for the

purchase, renovation and

equipping of a 51,000m²

building in East Chicago,

originally used by Blaw-Knox to manufacture tanks

LOGISTICAL DREAM

Jungheinrich has expanded

its logistics systems profile with the acquisition of the

MIAS Group. The acquisition

price was not disclosed and the transaction is scheduled

Jungheinrich says the

acquisition is "a major step

global footprint of the strongly

expanding logistics systems

business". Munich-based

MIAS offers stacker cranes

and load-handling equipment

and generated about €40m

in net sales in FY 2014.

en route to enlarging the

to settle in Q4 of 2015.

for the US Army.

addition to their product

high-capacity material

INFLATED OFFER

The combined company

Designed for highly responsive operation, it stacks five containers high in the first row, where it can handle 45 metric tons, and 31t in the second row. However, the 'banana boom' concept seen on the LRS 645 has now been abandoned in favor of a more traditional, cost-effective design that the OEM believes will allow it to achieve a higher market share.

With a total weight of 69t in Toplift configuration, it provides an optimal balance between speed and stability. The in-house four-cylinder 230kW Tier 4F engine drives Liebherr's own hydrostatic transmission, combining stepless speed control with optimum engine RPM for enhanced fuel consumption.



ON THE WEB

With each wheel being steered separately, wear and tear on the tires has been reduced and the stress on each steering component is thereby minimized to enable a longer service life. In addition, overall agility is enhanced due to the smaller turning radius.

Liebherr's Pactronic hybrid drive – a powerboost system that has been available in its mobile harbor cranes for five years – is also an option for the Pulser. This maintenancefree system can provide an extra 110kW without any increase in fuel consumption or emissions energy. Energy recovered from braking is stored as a compressed gas, and then made available for acceleration of driving speed.

With driver comfort being high on the agenda during the Pulser's development phase, the centrally located cab has been designed to reduce fatigue and enhance safety and performance.

The customer can opt for an ergonomic adjustable steering wheel or additional steer-by-wire control.

LOADS OF IMPROVEMENT

ASCHAFFENBURG,

GERMANY – Linde has launched the Dynamic Mast Control (DMC) operator-assist system for the R14-R20 reach truck series in response to the trend for higher storage racks.

This has created increasing demand for reach trucks with lift heights of over 8m, which places more demands on the skill of the operator, as well as producing more noticeable dynamic oscillations and forward deflection, especially when the mast is performing reach movements while laden and fully raised. This means the operator must wait until oscillations cease, when it is easier to accurately place the load into the rack; otherwise,



it could damage the rack, displace the load stored behind, and create an irregular pattern of load/ pallet faces.

Dynamic Mast Control was therefore designed with a precise electric linear actuator incorporated in the motor compartment to automatically minimize and compensate for any mast deflections and oscillations via precise and seamless counter-movements of the reach carriage.

Operators therefore no longer have to wait until the oscillations subside before storing the load, and because this helps aid the uniform positioning of pallets, the forks can always be fully inserted into the pallet on the first approach when retrieving a load. This adds up to faster cycle times and the risk of damaging the rack or the load stored behind being virtually eliminated.

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160D-7E provides powerful and efficient working experience. Cummins engine with common rail system(Bosch) enhanced fuel efficiency. Thanks to ergonomic cabin design, noise-level is dramatically reduced.

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DESIGN

WITH THE DESIGN CHALLENGE FEATURE NOW MAKING ONLY OCCASIONAL APPEARANCES IN THESE PAGES, WE TURN OUR ATTENTION TO SOME OF THE BEST INDUSTRIAL VEHICLE CONCEPTS COMING OUT OF INDIA AND SOUTHEAST ASIA

Arun Gopalakrishnan, Bangalore, India

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This concept provided the final project for my graduation in 2010 (MSc. Eng - Coventry/MSRSAS Bangalore). Lack of manpower for operational activities, difficult terrain and smaller areas of land are some of the factors that make highland farming extremely difficult. Farm mechanization can play a key role in addressing this, so the aim of this project was to develop a multipurpose compact farm utility vehicle, with a variety of implements and accessories, to address the issues of farm mechanization in upland areas.

A thorough literature review, product study and user study were conducted to identify the important crops, typical land size and shape, terrain, and different operations required for each crop in highland areas. The solution to address all these identified problems was to develop a multipurpose compact farm utility vehicle with multiple accessories. A Quality Function Deployment matrix was developed based on the reports of the user research and questionnaire, and the customer voices were converted to related technical terms to arrive at the PDS.

Different concepts of the vehicle and associated accessories were developed using a variety of concept generation techniques such as mind mapping and ideation sketching. The different accessories that are considered include a tiller-cum-leveler for primary land preparation, a seed-bed preparation tool for ginger, weeding machine, paddy transplanter, paddy reaper and ginger harvester – the latter being two important crops in highland regions. Five different concepts of the vehicle and associated accessories were developed and final concepts of the vehicle and accessories were selected using the dot selection method.

A scaled mock-up of the final concept vehicle has been successfully developed.

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DESIGN DISTRICT

Harsha Engineering, Bangalore, India

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Although primarily a component supplier to leading earthmoving and mining equipment OEMs in India, Harsha Engineering was forced to diversify its business activity following the recession in the Indian mining, infrastructure and construction markets. In 2010, we therefore began to develop a 'disruptive' technology.

Our studies and market research led us to an understanding that, here in India, at grass roots level, the smallest wheeled excavators are prohibitively expensive for new buyers. The result was the Terra mini wheeled excavator concept, and we have now developed the prototype machine. The operating class is 3 tons – other than the weight class and bucket size, we did not have any other benchmark products in India, so we had to go back to the drawing board to redefine the specifications required for our machine. It is also our belief that hydrostatic machines have many losses in efficiency, so we developed a non-hydrostatic system, where hydraulic power is only used to work the attachments, not the driveline.

Having designed and developed the machine from scratch, we have created an ecosystem of designers and suppliers manufacturing some of the components for us locally. This was necessary because, being a first-time entrant into the market – and as most of the off-the-shelf products for axles and drivetrains from leading suppliers are for higher tonnages – we were not able to find the right specifications as most suppliers were not interested in supporting us. We have therefore indigenized the complete design and manufacturing of gearbox, powertrain, axles, steering system, hydraulic system and brakes to meet our requirements, and have applied for patents for some of them.

One key team member was Balasubramaniam Krishna lyer, previously of the AGM-Rotary Wing Research and Design Centre, Hindustan Aeronautics Limited (HAL), Bangalore. He was the designer of the transmission system of India's ALH project (Advanced Light Helicopter Project), and coordinated the design activities and assembly of the first prototype ALH. He also designed the complete Terra drivetrain system. It has a permanent 4WD constant mesh gearbox which operates like an automotive gearbox, has two forward and one reverse gears, and an internal transfer case to drive the front and rear axles. The gear arrangement and the ratios are set up for high torque and low-speed operation, and it also drives the PTO system.

We have also used our existing in-house infrastructure for the manufacturing of operator cabins, fuel and hydraulic tanks, and chassis fabrication. We were able to source the 25hp engines from Mitsubishi-VST India, the clutch assembly from LUK India, antivibration mounts from Trelleborg, hydraulic valves from Walvoil, tires from BKT and wheel rims from Wheels India.

At present we intend to sell only in India, but as the product can be scaled, we are open to any opportunities presented to us. We are not completely averse to using hydrostatic drive systems, however – we are also working on other smaller productivity improvement machines such as a hydrostatic muck truck (powered wheelbarrow), as most of these machines use a transaxle concept. asb@harshaengg.co.in • www.harshaengg.co.in







Harsha's Terra 30 PR features a banana boom design for higher productivity and an improved digging/loading envelope. Constant 4WD and a fully floating rear axle with drive ratio in excess of 6:1 provide max. torque of 7500Nm for high gradability. The front steering axle offers articulation of +/-7°

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ABOVE RIGHT: **The Terra 30 PR was** launched this August

RIGHT: The powered muck truck was due to enter trials by the end of September

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Gokul Venkatesh Chagantipati, Chennai, India

With the ever-increasing world population – particularly in Asia – there is a steady rise in 'global demands'. Developing nations such as India will lean on mechanization in many aspects to meet these demands, and in the field of agriculture, powerful and efficient tractors are a necessity to perform many tasks and applications.

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The Dheera concept is a quick visual envisioning of a future, next-generation tractor for India. Mechatronics will play a key role in the future and tractors are no exception to their implementation – a lot of sophisticated technology will flow into them. Autonomous track bots may be foreseen as the future of agricultural processes, but these operations are only possible with at least one mother/ master tractor, which must be operated manually.

A drastic reduction in NVH levels is required to make tractors more operator-friendly for increased efficiency and output. More insulation of the engine would also be needed, not just to reduce the noise at the driver's ear, but also the noise to passers-by.

Dheera would be based on a platform that can cater to the above 100hp segment in India. The core of the Indian tractor market is currently below 100hp, but should eventually mature and require powerful tractors to perform multiple agricultural applications. Growth in global demand and corporate farming will also trigger this development, which is why the concept is designed for global appeal and combines practical packaging with futuristic styling.

Dheera visually conveys the sheer power of the machine with robust and youthful form and feature lines. The strong shoulder line elevates the muscular feel it carries, while the clean form and elegantly flowing lines enhance the modern and high-tech look. The automobile-inspired Dheera concept envisages even further evolution to a body-on-chassis design, where the cabin becomes an integral part of the body.

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ON THE WEB More images available at: www.ivtinternational.com/ design_district.php

DESIGN DISTRICT



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Ahmad Kamal Ahmad Fakri, Subang Jaya, Malaysia

The BeetleJuice forklift concept is one of a kind. Although able to perform the same sort of tasks as any other forklift, it offers far better stability and strength. Unlike other forklifts that are commercially used today, this concept uses an aluminum pantograph unit to keep weight low, but strength high. This enables the load to be pulled closer to the front wheels during transport and lifting to provide greater stability and maneuverability, while enhancing precision placement of pallets.

It will offer better safety and a more comfortable experience to its user. Its modern design allows the operator to perform tasks with style and confidence, from within a spacious cockpit area that features analog controllers and a 15in screen that displays the current operational state. Joystick-like controllers simplify the handling of the machine and, behind the protection of the polycarbonate windshield, users would have an experience similar to that of playing a simulation video game.

Yellow was chosen as the predominant color for the exterior as it is the color of visibility and caution, helping to increase awareness when the machine is around.

The Atlas beetle was a huge influence in the styling of this machine. For its size, the beetle is one of the strongest animals on Earth and can carry hundreds of times its own weight on its back. The males have specialized horns on the head and thorax that are used to fight with each other to gain mating rights with females. *kamal.fakri@gmail.com • www.coroflot.com/ahmadkamal*

The user is seated high-up to provide better visibility to the ground as well as of the load. The bulky design accommodates the counterweight which covers most of the rear section



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MAN Engines



MARKET REPORT



A PASSAGE TO INDIA

INTERESTED IN BOOSTING YOUR SALES BY TURNING YOUR ATTENTION TO ONE OF THE WORLD'S MOST BUOYANT CONSTRUCTION EQUIPMENT MARKETS? THIS CONDENSED REPORT FROM OFF-HIGHWAY RESEARCH SHOWS INDIA HAS ITS OWN SET OF PARTICULARLY UNIQUE PREFERENCES, SO BE SURE TO READ THIS BEFORE YOU SET SAIL...

Construction equipment demand in India exceeded 50,000 units for the first time in 2007, before declining by 9% and 11% over the next two years, and then recovering strongly up to 2011, when it peaked at 72,197 units. However, sales at this level could not be sustained due to the 'policy paralysis' phase of the previous government and continually declined to settle at 47,871 units in 2014, according to the latest figures from Off-Highway Research.

In terms of the number of units sold, the market is dominated by six machine types that together constitute 94-96% of the total construction equipment market. Of these six products, backhoe loaders, crawler excavators and mobile cranes accounted for 75% of the market in the first half of 2015, followed by mobile compressors, wheeled loaders and compaction equipment, which constituted a total of 16% in 2013 and 2014.

India's market structure has remained relatively unchanged for the past five years. The share of backhoe loaders peaked at 50% in 2013, but fell to 43% in the first half of 2015. Crawler excavators stayed at 19-21%, while mobile cranes declined from 16% during 2009-2011 to 11% last year. The share of wheeled loaders increased from a stable 3% since 2011 to 4% last year, with sales increasing by 15% in the first half of 2015 – during which time sales of skid-steer loaders grew by 48% and mini excavators by 4%.

Off-Highway Research forecasts the market for construction equipment is likely to grow

by around 4% in 2015 and should witness an even higher expansion during 2016-2017, reaching 49,554 units in 2015, and 79,560 units by 2019. Almost all types of equipment will enjoy growth, although the market will continue to be dominated by the six most popular products.

Importantly, demand for equipment that has sold only in small numbers in the past may also increase considerably.

The lion's share

Backhoe loaders are the most popular type of construction equipment, with a 47% share. In 2014, 85% of machines sold fell in the 70-79hp class, usually with a naturally aspirated engine, 2WD, side-shift, a 1.0m³ shovel and a 0.23-0.25m³ bucket. JCB continues to dominate, with a 71% share last year, while Case remained the second-largest supplier with 7%. Caterpillar peaked at 6% while Terex Equipment managed 5%.

Escorts introduced its backhoe loaders in February 2010, and sold 820 units last year for a 4% share. Tata Hitachi's share is in decline, with 2%. Also with a 2% share, Mahindra only entered the sector in 2011 – as did Leyland Deere, which accounted for 1%. Other smaller players include Action Construction Equipment (ACE), BEML, LeeBoy, Preet, and Bull, a new entrant with a 60hp model, which sold around 165 units.

Sales are expected to grow at a CAGR of around 8.7% in the next five years, reaching 34,000 units by 2019.



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MARKET REPORT

Crawler excavators are the second sector in volume terms, with sales peaking at 14,940 units in 2011, before declining steadily to 9,532 units in 2014.

The 18.1-25.0 metric ton class continues to prevail, boasting a 52-55% share since 2010. The share of the 6.1-9.0t segment was 14%, the 9.1-12.0t category represented 5% and the 12.1-18.0t class steadily rose to 16% by 2014. Demand for the 25.1-40.0t segment increased by 2%, to 7%, while the 40.1-60.0t class, which has usually accounted for 2-3%, increased to 4%.

Tata Hitachi (formerly Telcon) still dominates, but its share has declined from 45% in 2008 to 31%. Komatsu, distributed by L&T, is the second-largest supplier, although its share has also declined steadily, from 31% in 2008 to 18% in 2014.

South Korea's Hyundai started local manufacturing at the end of 2008 and has made substantial progress, reaching 17% in 2012 before declining to 14% in 2014. JCB accounted for 12%, while Volvo has retained a steady 7% share since beginning local production in 2011 – as did Kobelco, whose share has recently been growing at 1% p/a to peak at 8% last year. China's Sany began assembling crawler excavators locally that year too, and now has a 3% share.

Doosan typically holds a 2-3% share, Caterpillar 1-3%, and BEML 1%. Other suppliers include LiuGong, Liebherr and LeeBoy, the new entrant that sold 12 units of its 23t model, the 523i.



Off-Highway Research forecasts sector growth of 15% in 2015 with sales of 11,000 units, and likely to peak at 21,000 units by 2019.

Demand for **mini excavators**, however, has remained very modest due to the historic abundance of cheap labor and the popularity of backhoe loaders. However, it is now growing rapidly – in 2004, only 12 models were sold, but sales peaked at 518 units in 2014. The 1.0-3.5t class constitutes nearly 90% of demand.

Tata Hitachi held a 93% share in 2011, but dropped to 72% in 2014. Yanmar controlled 7%, while Bobcat increased to 11%. JCB and Kubota entered the market in 2013, selling 24 and 27 units in 2014 respectively. An increasing shortage of manual labor bodes well for growth – Off-



Highway Research forecasts sales of 600 units this year, with an expected peak of 850 units by 2019.

The **mobile crane** market peaked at 11,306 units in 2011, before continual declines resulted in 5,161 unit sales last year. Sales are dominated by locally manufactured pick-and-carry cranes, which have accounted for 94-96% of the market since 2010, with models rated at 9-16t being the most popular.

ACE led the sector with a 48% share last year, taking over from Escorts, whose share had fallen to 37%. JCB's market share declined to 7%, while Indo Farm, Omega and other small manufacturers accounted for the remaining 8%.

Sales of conventional cranes (truck-mounted, all terrain, crawler, rough terrain and industrial) peaked at 717 units in 2011, slumped in 2013 to 265 units, but recovered to 327 units in 2014. The crawler crane market peaked at 478 units in 2011, but was just 93 units in 2014; the 50-80t class accounting for 34%, 81ABOVE: Tata Hitachi dominates the country's crawler excavator sector, though its share is in decline

LEFT: Another new entrant to the backhoe loader sector, Bull, sold 165 units last year

ABOVE: Escorts began manufacturing TLBs in 2010 and had a 4% share of the market last year



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Carraro Drive Tech Spa Via Olmo 37 - 35011 Campodarsego (PD), Italy P +39 049 9219111 - F +39 049 9289111 www.carrarodrivetech.com 250t 54%, while over-250t cranes accounted for 11%.

Kobelco started commercial production of crawler cranes in 2012, and already leads the market with a 41% share. Sany registered 28%, ACE 17% and Tata Hitachi's share dropped to 6%. Other suppliers were Titagarh Wagons and Fuwa.

The market for rough-terrain cranes was 120 units in 2010, but fell to a five-year low of 67 units in 2014. The under-50t lift capacity range accounted for 80% of sales.

TIL continues to dominate with a (declining) share of 73% in 2014. Escorts enjoyed a 25% share, while XCMG sold just one unit.

Demand for truck-mounted models declined steadily each year to 2013, but grew by 68% to reach 131 units in 2014. The 60t and over class held 47% of sales.

TIL leads with 40%, although Zoomlion, which accounted for 10% in 2013, increased its share to 34% last year. ACE accounted for 11%, while Sany's share doubled to 8%. XCMG's market share rose from 4% in 2012 to 28% the following year, but declined to 7% in 2014.

TIL was the only manufacturer to sell industrial or yard cranes in 2014, with 23 units.

All-terrain cranes have always had a very limited market in India due to their high price, but sales increased to 13 units in 2014 – Liebherr with 62% and Grove with 38%.

Although the outlook for mobile cranes remains optimistic, Off-Highway Research forecasts a decline to 4,700 units this year. The current scenario suggests higher growth during 2016-2019, when demand should reach 8,000 units.



And the rest...

Articulated dump truck sales peaked at 60 units in 2010, but no sales were made in 2014. Seen as being sophisticated and expensive, they face stiff competition from locally made on-road trucks. All ADTs are imported as no OEM manufactures them domestically.

The **rigid dump truck** market has been in decline, with sales of 361 units last year. The 31.0-50.0t sector grew moderately to account

for 29% of that, while the 51.0-60.0t category dropped to 33%. The 81.0-100.0t machines registered 136 units, accounting for 38% of the market.

Most of these trucks are locally manufactured, with BEML being the market leader, although its share declined from 63% in 2007 to its lowest level of 37% in 2014. Komatsu's share witnessed a sharp recovery to 33%, while Caterpillar's share declined to 24%, Tata Hitachi accounted for 6%, and Belaz continues to hold 1%.

Demand increased by 67% in the first half of 2015 and Off-Highway Research forecasts the market to grow from 550 units in 2015 to 700 units by 2019 with an increasing preference for bigger machines.

Asphalt finisher sales peaked at 925 units in 2007, but the 2014 market was 712 units. Sales favor wheeled machines, which remained at around 91% in 2014, especially those up to 5.5m paving width, which accounted for 88% of the total market. Finishers over 9m are invariably track-mounted and fully hydrostatic, with their sales recovering to 60 units in 2014.

Locally manufactured models continue to dominate sales, with nearly 92% of the market in 2014. Ammann Apollo is the largest domestic OEM with an 84% share last year. Other prominent local manufacturers are Unipave (4%), Solid, Vishwakarma, Jay Khodiyar and Volvo. Imported Vögele models sold 47 units, accounting for 7% of the total market and 80% of imported machines.

Potential for these machines will continue to be large, although sales in the first half of 2015 decreased by 25%. Off-Highway Research predicts the market will remain flat in 2015, and peak at 925 units in 2019.

The market for **compaction equipment** peaked at 3,213 units in 2007, but had fallen to 2,387 units by 2014. Soil compactors accounted for 45% of that, while demand for tandem rollers was 48%, rising from 41% in 2010. Demand for pneumatictired rollers was 47 units.



ABOVE: TIL is the biggest player in several crane sectors, including truckmounted and rough terrain

BELOW LEFT: ACE is the new top dog in India's pick and carry crane sector

BELOW: Rigid dump truck sales spiked during the first six months of 2015 – good news for BEML





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MARKET REPORT



ABOVE: Wheeled varieties of asphalt pavers are preferred - Unipave holds a 4% share

Case leads with a 28% share, while Hamm, which sold only 27 compactors in 2010, peaked at 393 units, or 17% of the market. JCB has increased its market share steadily each year, from 2% in 2008 to 16% in 2014, while Volvo's has declined from 21% in 2010 to 12%. Escorts, with a share of 19-21% during 2007-2011, accounted for 8% last year, while Dynapac's sales doubled to account for 8%.

Greaves has now quit the market, while ACE, which entered in 2009, sold 82 units, for a 3% share. Telcon and LiuGong sold eight and four units respectively, while Caterpillar – which sold 103 units in 2008 – did not sell any last year.

Demand is expected to reach 2,500 units in 2015, and Off-Highway Research is confident that the market will reach 3,000 units by 2019.

Demand for **crawler dozers** grew to 463 units in 2014, with sub-150hp machines holding 11%, 150-300hp models representing 47%, 301-400hp machines 22%, and over 400hp machines declining to 24%.

BEML, the only domestic OEM, continues to dominate, peaking at 73% share. Despite increased sales, Komatsu's share declined to 12%, while Cat's share recovered to 11%. Shantui held 10% in 2009, but just 2% in 2013 and 2014. LiuGong's five units constituted a 1% share.

Off-Highway Research forecasts a flat 2015, projecting it to peak at 700 units in 2019.

Motor grader sales peaked at 553 units in 2008, but were just 296 units by 2014. The sub-150hp range accounted for 66%, up from 51% in 2013, at the expense of the 151-250hp segment, which fell to 28%.

Caterpillar's market share rose to 40%. Of the domestic OEMs, BEML's share declined to 13%, LiuGong had 12%, and Volvo 10%. Leeboy, with its locally produced motor graders, grabbed 8%, Mitsubishi 5% and

WORLDS APART: THE INDIAN AND CHINESE EQUIPMENT MARKETS

Many similarities can be drawn between the Indian and Chinese construction equipment industries, with most resting on their large geographical areas, their enormous populations, and their governments' clear understanding that future economic prosperity relies entirely on the creation of a modern and efficient infrastructure. But the two countries are proceeding at different speeds and directions, especially in terms of their construction equipment industries.

India is the world's largest democracy, which results in bureaucratic delays, indecision, and the inability to initiate and complete projects in an acceptable timeframe. China, in contrast, is centrally controlled where the government – at both central and local levels – directly influences all aspects of the economy, which in turn directly affects the structure of construction equipment demand.

China's recent rise to economic power has resulted in the greatest construction boom the world has ever seen. The pouring of unimaginable amounts of money into the creation of a massive infrastructure program triggered a massive growth in demand for construction equipment: in 2000, domestic sales stood at 45,500 units, then more than trebled to 167,000 by 2005. The global financial crash of 2008 prompted another stimulus, and equipment sales soared to 300,000 units the following year, peaking at 490,000 in 2011: a market that was considerably larger than Europe and North America combined.

When the Chinese government wants to turn the economic tap on or off, it does so very quickly. With the economy showing signs of overheating in 2011, many projects were delayed or canceled and demand slumped as rapidly as it had grown: in the past three years, sales have more than halved to 232,000 units, and minimal growth is forecast for the next five years. This, as the Chinese say, is 'the new normal'.

By comparison, India's progress has been much more sedate, but equally unpredictable, and market

volumes have tended to be about 15-20% of those experienced in China. While the amount of work to be done is the same as in China – if not more – the rate of completion is very much slower, invariably caused by the government's 'way of getting things done'. Nevertheless, the market has expanded well since 2000, when fewer than 10,000 units of all types were sold. Strong growth was seen from 2004-2007 when demand more than trebled from 15,800 to 48,000 units. The global financial crisis had a much greater effect on India than it did on China, and demand fell to 37,000 units by 2009: largely a result of the inability to find financing for the purchase of machines rather than a lack of real demand. Following a strong recovery, demand peaked at 68,000 units in 2011, but then drifted back to 44,000 units in 2014: government indecisiveness, bureaucracy, corruption, land rights and a crackdown on illegal mining all contributed to the decline.

However, with the new Modi government in power, there is now renewed optimism – for the construction equipment industry in particular. There will shortly be a huge raft of new projects in place that will stimulate demand. Off-Highway Research forecasts that equipment demand should grow by 50% between now and 2019.

When comparing the structure of demand, it is clear that there has always been an overwhelming demand for wheeled loaders in China, and for backhoe loaders in India. The crucial change that has been seen in both countries, however, has been the strong move in favor of the crawler excavator. This machine has proved to be more productive and profitable to use, and more profitable for OEMs to sell, and this trend will signal that both countries' equipment sectors have reached the level of maturity that will be required to meet the different challenges that lie ahead. Different challenges, different speeds and different directions...





MARKET REPORT



ABOVE: BEML dominates the crawler dozer market, but this 90hp model only has a small share

ABOVE RIGHT: A sharp rise in motor grader sales this year is helping boost trade in this slow sector. BEML is the market leader

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SDLG, which entered the market in 2014, had a 4% share. ACE's share more than halved to 3%, as did Komatsu's (2%).

Half-yearly sales witnessed growth of 70%, so the market is likely to grow to 500 units in 2015, reaching 650 units by 2019.

The availability of competitively priced pick-and-carry cranes and cheap manual labor has always restricted telehandler sales. The total market for these machines, which peaked at 41 units in 2010, was 21 units last year, with JCB selling 11 units, Manitou nine, and Genie two units - JLG and Merlo did not sell any at all.

However, the market is expected to increase to reach 60 units by 2019.

The skid-steer loader market 2014. Bobcat has been the traditional leader, with 47% in 2014, while Terex Equipment's share continues to rise, with 27%. Gamzen started selling its locally manufactured machines in mid-2007 - its peak sales of 60 units last year represent a 12% share.

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JCB follows with 8% while Case, which discontinued sales from midand sold seven units in 2014. Gehl a 6% share by 2012, but sold just three units last year.

The first half of 2015 saw a 48% increase in demand - with increased mechanization and the growing scarcity of manual labor, the market

should expand steadily, reaching

Only a few wheeled excavators have been sold in the past five years. Liebherr managed nine units in 2012, but just three in 2014. Hyundai did not sell any machines in 2013 and 2014, just like Doosan. Due to very limited demand, sales are projected at only 10 units per annum for the forecast period.

Demand for wheeled loaders peaked at 2,660 units in 2010, but by 2014 was down to 1,807 units. Sales of sub-80hp models remained stable at 3% in 2014 (46 units). The 100-150hp class accounted for 77%, and while the 151-200hp class has remained between 4-6% since 2007, it was 2% last year. The 201-250hp segment typically holds 11-14%, and the 251-300hp and the over-300hp classes made up 5% in 2014.

The market has traditionally been dominated by domestic OEMs, with Cat retaining its leadership, although its market share has declined steadily from 45% in 2009 to 33% in 2014. JCB has held 19-23% of the market since 2008. LiuGong had 13% share in 2014 and SDLG 7%, just like Tata Hitachi, and Larsen and Toubro (L&T), which entered the market in 2012.

XCMG and Volvo hold 3% each, Eimco Elecon has accounted for 2% since 2012, the same figure as BEML in 2014, while Changlin, Kawasaki, ACE, Doosan, Komatsu and Liebherr each hold 1%. Other suppliers include SEM and XGMA.

Off-Highway Research forecasts sales of 2.100 units in 2015, which should increase to 3,400 by 2019. iVT

David Phillips is managing director of Off-Highway Research. For further information please contact: Tel: +44 20 7404 1128

Email: mail@offhighway.co.uk

TABLE 1: India: sales and forecast sales of construction equipment units, 2014-2019 (Source: Off-Highway Research)							
	2014	2015*	2016*	2017*	2018*	2019*	% change
Articulated dump trucks	-	10	10	10	10	10	-
Asphalt finishers	712	700	775	850	900	925	30
Backhoe loaders	22,571	22,000	26,000	30,000	32,500	34,000	51
Compaction equipment	2,387	2,500	2,700	2,900	2,950	3,000	26
Crawler dozers	463	450	550	600	650	700	51
Crawler excavators	9,532	11,000	14,000	17,000	19,000	21,000	120
Crawler loaders	3	4	4	5	5	5	67
Mini excavators	556	600	675	750	800	850	53
Mobile compressors	3,477	3,800	4,300	4,800	5,300	5,500	58
Mobile cranes	5,161	4,700	5,500	6,500	7,500	8,000	55
Motor graders	296	500	550	600	650	650	120
Motor scrapers	-	-	-	-	-	-	-
Rigid dump trucks	361	550	650	700	750	700	94
Skid-steer loaders	521	600	650	700	750	750	44
Telehandlers	21	30	40	50	55	60	186
Wheeled excavators	3	10	10	10	10	10	233
Wheeled loaders	1,807	2,100	2,500	2,900	3,200	3,400	88
Total	47,871	49,554	58,914	68,375	75,030	79,560	66
Annual % change	-14	4	19	16	10	6	-



2009, re-entered the market in 2012, entered the market in 2010, garnering



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OLD SCHOOL THAI

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IN A CHARMINGLY ANTIQUATED APPROACH, RICE HARVESTERS BUILT BY THAILAND'S KASET PHATTANA FEATURE AN UNUSUAL MIX OF INNOVATION, PAINTWORK AND SECOND-HAND PARTS SOURCED FROM A DIVERSE RANGE OF CONTACTS

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Globally speaking, off-highway equipment has become pretty standardized. A road-paving machine built in Germany, for instance, will look very much like a similar product built in China, so – albeit with a few tweaks - these can be sold more or less anywhere. This has been the dream of large OEMs the world over - one machine, one manufacturing location, many markets. So to come across a completely unique type of machine is something of a novelty these days. Then, to discover more than one OEM that produces these machines is even rarer. True rice harvesters are only

produced in the Far East – while a lot of rice is harvested in countries such as Italy, the machines used to undertake this are merely grain combines fitted with a rice header – not the same animal at all. On the other hand, the Thai OEM Kaset Phattana is at the forefront of rice harvester development – its name actually translates as 'agricultural developments'.

Man vs machine

At first glance, a true rice harvester may appear to be an ancient grain machine that has seen virtually no development, but these unique machines have their own peculiar set of parameters that set them apart from any other machine in regular mass production anywhere in the world. To understand them fully, one needs to appreciate that these machines replace manual workers





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on an ad hoc basis. Rice is always harvested by the cheapest method, so the farmers may be able to call in manual labor to cut at a good price, or they may choose to employ the services of contractors who own a harvester – but if their quote is too high, they will just switch back to using manual labor.

To cope with such flexibility, the machines must be able to operate in deep paddy (knee-deep mud) – in places so deep, in fact, that tracks are a must. More than anything else, it is this requirement that shapes the profile of these vehicles.

Compared with a typical grain combine, these machines are small, with a grain hopper that is rarely larger than 3m³ so as to keep vehicle weight low and minimize ground pressure. Most, if not all, of the subcomponentry is produced in Kaset Phattana's facilities – either from its headquarters in Phitsonulok or in the factories of its sister companies.

Ever been used?

However, despite the fact that annual production of these machines in Thailand touches 2,000 units, like



most OEMs in this business, Kaset Phattana uses refurbished or secondhand components for many of the key elements. This practice – which would never be considered by most western companies – is widespread, and harks back to the times when the first rice harvesters were cobbled together by entrepreneurial local mechanics a generation ago.

The chassis may look familiar to some – the design started life as a second-hand chassis of the Komatsu 12HT excavator. The frame was then extended to accommodate a higher number of smaller rollers to spread the load on the tracks, as a harvester spends most of its life crawling, as opposed to the more sedentary life of the excavator.

The tracks were changed too. Excavator tracks are straight and

MAIN: Operators need to wrap themselves up against the tropical sun INSET: A sun canopy provides some protection ribbed for purely forward motion, whereas a harvester's tracks must allow turns on the headland, so they are smooth with an angled 'wing' at each end which allows them to float on the mud surface a little. All steel, the tracks add considerable weight to the machine, which it can ill-afford, but so far this has proved to be the best solution as the track blades undertake a punishing work cycle and steel has proved to be the most durable. There are alternatives - in particular, various synthetic-based materials are under consideration, but the cost/durability equation still favors the current solution.

Of course, any design that relies upon the availability of used material is potentially flawed. Some years ago, the supply of used chassis dried up, which forced Kaset Phattana into the development of its own chassis and gearbox. To keep costs down, the final drives are once again secondhand, but the design now uses forged gears and cast subcomponents produced locally. Although it retains some elements of the original unit, wide revision of all principle aspects results in a more controllable product

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from the quality perspective, while all bearings have been replaced with NTN product from Japan to provide a substantial increase in reliability.

Principal control of rotational shafts is carried out via a system of belt tensioners. Pneumatic assist has been added to these functions in recent months to reduce operator fatigue and increase reliability although just taking a look at the machine in operation, one cannot help but notice the mass of moving shafts and belts in close proximity to operators. Unlike conventional harvesters, these moving parts are exposed - even on the latest models, there are no plans to add safety covers to shield these. Covers get removed, guards get trashed - that's how the customers like it. No covers means less cost and less to maintain: it has its own skewed logic.

Impure and simple

Hydraulic motors and pumps are always new. Kaset Phattana fits Eaton, made in Iowa, USA – and is proud of that fact, claiming the products boast superior performance and durability to others on the market. The service

QUIRKS OF THE TRADE

Mung beans are becoming an increasingly popular crop – not just for use as bean sprouts but as a ground bean powder for producing certain types of noodles. For these, however, no alternative header is needed. But as a crop, they produce more juice, so once the sieve has been changed, the threshing, elevator and blower speed can then be adjusted with belts and pulleys.

Interestingly, these machines meet demands that could only come from this market. For example, the unloading auger, once driven by belt, is now hydraulically driven so as to enable the auger to swivel downward to ground level. The reason? Most typical Thai houses are generally raised on stilts above the ground – it seems that many smaller farmers use that space under their house for

storing rice, so, as a result, that is precisely where they need the auger to reach.



support in Thailand also helps but a big deciding factor is the availability of these components as mechanically switched items. Thai farmers don't like electronic valves, seeing them as unreliable principally because of the required oil quality. Mechanical valves will tolerate oil impurities much better than electronic valves can, hence their selection.

Kaset Phattana's harvesters almost exclusively feature used Mitsubishi or Hino truck engines – although a small percentage are now being fitted with new tractor engines. Unfortunately, like so much on these machines, the specification of the prime mover has been dictated by the selection of second-hand product available, so almost all MAIN IMAGE: Deep mud can hamper forward traction, hence the need for a small hopper to reduce vehicle weight

INSET: A rare installation of the new CNH tractor engine



machines are fitted with engines of far greater capacity than is actually necessary. So while, for instance, a 260hp Hino engine has historically been successful in powering a certain class of harvester, no account has been taken of its actual output in consideration of its age or that the required installation peripherals, such as exhaust and intercooler, may not have been met. Also, although ostensibly rated at a certain speed and horsepower, the engines are typically operated at a relatively low 1,800rpm, and in the absence of reliable power and torque curves, it remains unclear how well matched they are to the application.

In fact, Kaset Phattana, like similar OEMs, has no way of verifying the output of any second-hand engine it uses. Suffice to say, the customer will be happy as long as it works and is cheap. The company liaised for some years with New Holland to define a new engine program that would work for its customers, basically employing low rated speed/high-torque tractor engines to replace the second-hand truck engines. This entailed devising a CANbus system based on control
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CASE STUDY





But the development has not been accepted by the market. Despite the advantages, customers would rather take a second-hand truck engine because they are cheaper. The OEM is still struggling to get customers to accept the new engine concept – some do, but sales are limited.

Interchange ideas

Development to reflect new cropping interests has also started to influence rice harvester design and a demand for interchangeable equipment has been seen in recent years. The OEM therefore developed a quick-change system to enable the header to be easily switched from the traditional rice header to, for example, a corn header. This previously required a comprehensive dismantling of the unit from the elevator.

At the time, Kaset Phattana was working with the Italian company Capello to adapt its Quasar 4 row corn header to fit the machine. The design resulted in the development of a modern unlatching mechanism linked to a standard subframe-based quick-change system. To facilitate locking, both the standard rice header and the corn row unit ABOVE: Eaton's pumps and motors are some of the few brand-new components to be specified by Kaset Phattana

ABOVE RIGHT: Steel tracks with an angled 'wing' at each end enable some degree of float in kneedeep mud BELOW: Harvester packed for road transport



frame latches into location pins at the top and standard locks at the side of the elevator. Once these are released, the operator simply guides the elevator into the new header and reverses the process – final locking is still manual, but the change takes seconds rather than hours.

Kaset Phattana says that customers using the Capello headers report that the system is reliable, flexible and time-saving. It is the only harvester on the market to offer this productionenhancing feature – but so far, interest is minimal. Customers 'prefer' dealing with the drawbacks of second-hand headers and changing over in the traditional way. Labour is cheap!

Luxury is for wimps

The customer dictate that everything must be cheap also applies to the operator station. The seat is a basic item from a local supplier, while instruments are typically restricted to alternator charge, engine RPM, temperature and oil pressure. A fuel gauge? Well, there is a clear level tube down the side of the diesel tank...

As much standard product is used as possible, with headlamps from a Toyota pick-up, and Honda supplying the grille. Controls, aside from those pneumatically assisted ones mentioned earlier, are all mechanical and made in-house. Although Kaset Phattana accepts that this is not the most elegant solution, customers continue to emphasize cost – and currently, mechanical equals cheap.

Following an initiative by one of its competitors, Kaset Phattana fitted one of its rice harvesters with an airconditioned cabin – but customers see this as an unnecessary luxury for the operator. The machine stands unused in the delivery yard.

Any review of rice harvesters, however, would not be complete without mentioning the finishing work that goes into these machines. There is no basic color, no corporate identity that must be conformed to - each customer chooses their own scheme. Red and yellow are perennial favorites, but some people are superstitious - certain colors have a meaning to them. Pink and primrose shades indicate favor of the king, but anything goes – including elaborate custom designs from an artist who will visit to paint your heart's desire (elephants, birds, etc) onto the machine. The machine has a spirit and, like everything else, will work better if it is in harmony with its owner and the rest of the world.

Unfortunately, the technological and financial expectations for rice harvesters have, to a large extent, been defined by the fact that this machinery was originally conceived and costed upon the use of scrapvalue components. The scope for development is wide, but customers have no real incentive to demand improvements in productivity.

But they should now be looking to change their approach. As the new generations shun agricultural labor and harvesting rates rise, it will become ever more important to streamline agricultural operations. But until that situation begins to bite, Kaset Phattana is unlikely to get the recognition it needs to live up to its name. **IVT**

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EAST IS EAST AND WEST IS WEST

AND NEVER THE TWAIN SHALL MEET? IN TERMS OF INDUSTRIAL DESIGN AT LEAST, OEMS IN THE ASIAN EMERGING MARKETS ARE STILL A WORLD AWAY FROM PRODUCING WHAT MOST WESTERN CUSTOMERS WOULD DEEM ACCEPTABLE. OR ARE THEY?

> Global markets are becoming increasingly cutthroat, with companies competing on many more levels than as recently as 15 years ago. But why do some seem to do so much better than others?

At the top of the class are the innovative companies, those with appealing offerings who are creating communities around their brand or products. Most of these products are very new – the bulk of Fortune 500 companies barely existed 10 years ago, while those that were around 20 years ago are exceptional. Seeing this rapid growth, many companies want to enjoy the same success and recognition. But in the emerging markets, not a lot of industrial history is known. Such markets usually have a tendency to buy state-of-the-art technology when they need it, having never seen the previous models. It's like explaining to your three-year-old child that the TV doesn't have a swipe function like the iPad – they have never known anything else...

So when OEMs in those regions turn their attention to designing for

the international market, they often think, 'Let's adjust the styling of our products, and we will sell more.'

In full sale?

But does styling really have that much influence on sales figures? It's a question that's been asked many times before, all over the world.

As a company, of course you want your products to sell. One common theory is that the styling of the products is the most visible, and most important, way of pushing the sales figures higher. But does a lackluster impersonation of an international big hit really respond to the needs of a particular market? Companies might think so, but often the truth is different.

Every national market has its own dynamics, and its own specific

DESIGN VIEWPOINT



demands. The answer, therefore, isn't a simple yes or no: when done correctly with a good product, styling can help improve sales. There are many examples of styling bringing added value (Apple products being one of the best known). But styling a poorly functioning product will result in a good-looking product that ultimately still functions poorly. And, unfortunately, examples of bad styling are far more numerous than those of good styling.

The real answer is much more complicated. Successful companies manage to create a buzz around their brand or product. This buzz has more layers than the 'untrained' eye usually sees.

As a customer you want to be proud to use a certain brand, or to feel a connection to it. When this feeling comes naturally, the brand has ultimately been successful in its communication with its customers. Asian OEMs, for instance, have a tendency to use their domestically tried-and-tested ways to push a product in the market, but on an international scale, there is a danger that this approach could miss the ball completely. For instance, flashy colors are common in Asia, but in a more saturated market such as the West, flashy colors can make your brand look cheap and downmarket.

Brands such as Huawei are now penetrating the international market, but using a different strategy to their usual Asian approach. The company's international site does not use a brightly colored layout, but instead promotes the connectivity rather than the products being sold. The cell phone (its main product for EU markets) provides a means of being connected – but it is the actual 'being connected' that is promoted.

If it looks right...?

Nevertheless, for the end customer, one of the most visible layers will undoubtedly be the styling. Without good foundations and a clear message, however, the entire house will fall. Innovation is key.

From the 1980s through to beyond the millennium, styling was a winning criteria, with nicely styled products winning sales against less attractive offerings. But it's no longer quite so simple – styling has become such a basic criteria that now every product needs to look good. ABOVE: Renders of CAD models during the development of XCMG's latest wheeled loader cab designed by Joeri de Vriesere (see overleaf) Coming from an industrial design background, focused mainly on industrial vehicles, I have been working in the emerging markets for more than six years, and have helped some major Asian companies adjust their styling closer to Western standards. I'm still amazed, however, at the difference in goals and their correct execution: styling should be phase one!

Many companies have told me they want to boost their international sales, and have asked me to redesign their products, but I have still often struggled to get them to accept the importance of styling, specifically as a first step, while simultaneously making their approach much more international. That's not because a product styled by Europeans will automatically be successful, but because much more is needed to make a sale. Good styling, without a good story, is useless. If you're not able to sell your values, then the styling is pointless...

Gangnam style

The definition of styling has changed: no longer is it an independent phase in the design process, but the result

DESIGN VIEWPOINT

A TOTAL APPROACH FOR XCMG

Working with XCMG, the fifth-largest construction machinery company in the world (ranked 119th in the list of China's Top 500 Companies, 44th in the list of China's Top 100 Manufacturing Enterprises, and second in the list of China's Top 100 Machinery Manufacturers) Joeri de Vriesere's design agency helped to develop a new standard in operator cabs for its wheeled loaders.

Styling was of course a key issue, but XCMG also recognized the importance of the overall picture. Next to the styling, the production process was completely reviewed, the cab upgraded to conform with all necessary international standards, including ROPS and FOPS, the color scheme defined, and ideas shared on how the company wanted the operator to use the cab, and how the operator's boss will be convinced to buy that new machine. A total approach.

When the cab was presented to the Asian market in Shanghai during Bauma China 2014, it was very well received – not only by the Asian users, but more importantly, perhaps, international users could see that XCMG had taken a real step into the international market.

of a feeling or a solution you want the customer to buy. The styling of a product (or service) represents the values a company wants to underline, which is more than a nice-looking feature. The values the OEM wants to highlight need to be supported and strengthened by the styling of the products.

Asian companies seem to struggle more with the values they want to underline in an international market than with the styling itself. I have received a number of Asian design briefs stating: "Our product needs to look like that one." And if I'm lucky, they may state some other demands in a (maximum) two-page document.

By contrast, when working for a European company, the design brief will cover 40-50 pages, explaining the culture of the company, the feeling the product needs to represent, and the ease of use the operator needs to feel. I will need to go on courses to learn how to use the machines, and interview the users. In short, I will need to understand the company inside-out.

Many Asian OEMs seem to want to move so quickly that they overlook the basics: they rarely ask themselves what their customer wants. Any research on that topic is considered overkill – which is too bad, because that's where your basic users are, and to whom you should be listening.

Important as styling may be, and as visible to the end user the styled

product will be, more is needed to create and sell a successful product. Effective communication with the customer is vital – customers today are well informed, and want the product they buy to be top class.

Styling can therefore not be the only reflection of those values - the company must start with innovative solutions. Throughout the entire production process, the brand values need to be underlined. Material choices, the chosen production technologies, the correct use of resources (labor, energy, and so on), end-of-life recycling – they will all play an important role in the final product. Western brands have had 50 years to learn this, which is why they are still the reference point. Asian OEMs are rapidly joining the party, but more eagerness to listen to the user is needed if they want to play an international role that involves more than being a price breaker.

Appearance aside, there is a lot more to take into account for the successful marketing of a product. The way you communicate to the customer (English-speaking sales people is a must, but many Asian companies fail to see this), the channels you use to communicate (blocking Google, Facebook and others does not help OEMs), and the marketing material that's used to achieve good communication:



ABOVE: Renderings not only help discussions on styling, but are a powerful visualization tool to show the marketing and other departments the progress

these also need to be developed in accordance with the company values.

Online communities, word of mouth, webshops, specialized stores – this is the new buyers' world, this is what makes a product sell. This is also what a company should invest in. Good styling will support that, but I see it as a necessity, not as a luxury.

Many of my Asian customers have built an 'English' website. Or more accurately, they translated the Asian site they already had – and that's where they lose sales. They do not really feel the need to adapt their communication to any specific needs. They might think they are doing the right thing but fail to see that no one is interested in their site because it's just not relevant to them.

I no longer see myself as a stylist or designer, but more of a product consultant. I make sure the product provides an innovative answer to a market question, I streamline the production process, and I ensure the product does not use environmentally unfriendly resources. On top of that, I assist the marketing department in communicating with specific markets, and help the sales department to organize its platform. Ultimately, it is the combination (the team) that will be winning, not the styling (the individual). **INT**

Joeri de Vriesere is co-owner of Adams International, and has been developing cabs for over 15 years for major OEMs worldwide



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A TRIUMPH OF ROPE OVER EXPERIENCE

SOMETIMES END USERS ARE SO ACCUSTOMED TO DEALING WITH DIFFICULTIES THEY NO LONGER RECOGNIZE THEM AS SUCH. EXPERIENCE DEVELOPMENT – THE LATEST BUZZ PHRASE IN INDUSTRIAL DESIGN – SEEKS TO OFFER HOPE, AS WELL AS INNOVATIVE SOLUTIONS



RIGHT: Manitowoc's KZ100 synthetic rope, as shown here on a Grove rough-terrain crane, is 80% lighter than wire rope

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There's a common theme running throughout 21st century design. Whether it's service, software, tangible goods, or in our case, cranes, you'll find that designers and innovators have one endgame in mind: 'experience development' that demonstrates true differentiation.

Most breakthroughs in this century, such as Apple's computing dominance, Virgin's airlines, Google's maps and self-driven cars, Facebook's social networking platform, or even Amazon Prime's logistical excellence, are successful because they directly tune into customers. They provide a platform where people can create their own experience.

In past centuries, the emotional component of a job was frequently neglected. The notion was that simply designing tools or equipment with features and benefits that led to the completion of a project was innovative in itself. The main themes were new product development, lean design, design for manufacturing, or design for manufacturing and assembly.

With cranes, we saw this type of design in the proliferation of tower cranes, crawler cranes, mobile cranes, boom trucks and industrial cranes. But the goalposts have moved and a new design ethic has taken hold, with its own unique set of goals.

In the 21st century, experience providers and experience empathizers drive the global economy. Innovative products and services emotionally engage with customers – they don't



DESIGN VIEWPOINT



just buy the product, they buy into the reason behind the product, and the experience it brings.

The winners in this new market landscape will provide far superior customer experiences – products or services that change customer behaviors or attitudes, rather than those that simply fulfill a need.

Design for experience relies on emotion- and empathy-based design techniques. It seeks to understand a customer's pain and their inherent difficulties – even if that customer doesn't realize there is a difficulty, because dealing with it has become second nature. The goal is to ease those pains by providing a better experience by blending technology with humanity.

Enter the KZ100

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It's with this concept in mind that I helped lead a joint venture between Manitowoc Cranes and Ferndale, Washington-based synthetic rope developer Samson. The company is our partner in innovation, helping to co-create a new lifting experience with the KZ100 synthetic hoist rope for crane application.

For our team, it's not just a rope, it's an experience. Sure, the product is as strong as conventional ropes and does not require replacement due to common damages such as load spin, cabling, bird caging, kinking and diving. And yes, it is stronger than steel and lighter than water! But we consider the KZ100 a success mainly because of the superior experience it provides.

For example, the KZ100 is much lighter than traditional ropes, making

"IT'S JUST A MATTER OF THE EXPERIENTIAL KNOWLEDGE MAKING ITS WAY ACROSS THE INNOVATION CURVE"

it easier to handle when rigging – a better experience. Conventional wire rope gets very dirty and greasy when being dragged around a jobsite. The KZ100 is aesthetically pleasing; it's soft, smooth, gentle, and much more pliable in handling – again, a better experience.

Ultimately, by considering the inherent difficulties that have now become second nature to riggers and operators, we hoped to design a lifting experience with synthetic rope that changes their attitude and behavior. We sought to establish an emotional connection between operators and the KZ100.

The synthetic rope makes people happy and the jobsite a more fun place to work. It makes a palpable difference in day-to-day operations, making projects easier and more efficient.

The innovation curve

And as we design for experience, it is important to remember that these experiences will be new to customers. In his book *Diffusion of Innovations*, Everett Rogers described how innovation in the marketplace typically adheres to a bell-shaped curve. On one side of the tail are early innovators and early adopters; on the other side are the laggards. Throughout the middle of the curve are the early majority and the late LEFT & FAR LEFT: First introduced on the Grove RT770E at ConExpo 2014, the KZ100 boasts torqueneutral construction that eliminates load spin and cabling majority of the market. The laggards won't adopt until they are forced to.

We are seeing the diffusion of innovation play out now with the KZ100. Early adopters, such as the US Navy, are on board and reporting great results from the synthetic rope. The laggards will see the benefits of the KZ100 only when their current method stops being useful.

I recall speaking with a customer in Florida wary of embracing the fiber technology on a crane – but had already been using a fiber sling for more than 25 years. I asked, "You are already using a fiber sling under the hook – so why would you be hesitant to use similar, but better, fiber technology above the hook?"

That customer quickly realized the irony and embraced the KZ100. The company is now a champion of synthetic rope because of the experience it provides. Surely we will see the switch to synthetic ropes take hold in the marketplace – it's just a matter of the experiential knowledge slowly making its way across the innovation curve.

The land of lifting experience

Given that experience providers dominate the 21st century economy, companies will have to compete on customer experience with empathy. They will have to become trusted partners, not just the sellers or dealers of goods, and that's why I like to call Shady Grove, Pennsylvania 'The land of lifting experience'. At Shady Grove, more than building cranes, we create a lifting experience for our customers around the world.

My definition of innovation is: "People creating experience through connecting and developing, and the implementation of ideas to disrupt the status quo and stay ahead in business." The great thing about innovation is that it's not confined to any one medium – although I may be talking about products here, the method is applicable in many areas, such as the support you give your own customers. It's well worth thinking: "How might our company design a better experience for our own customers?" **IVT**

iVTInternational.com Sept/Oct 2015



ABOVE: A CAD drawing of the KZ100 during its design phase reflects the flexible nature of

the synthetic rope

Sammy Munuswamy is senior manager of global engineering and innovation at the Manitowoc Company

OPEN-CAB DESIGNS AREN'T JUST A FEATURE OF CHEAP EQUIPMENT FROM THE EMERGING MARKETS – IT'S HOW MOST FORKLIFTS AND COMPACT TRACTORS ARE BUILT TOO. BUT THAT'S NO EXCUSE TO VIEW THEIR OPERATORS AS SECOND-CLASS CITIZENS...

LESS IS MORE?

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When most people think of an industrial vehicle, a so-called 'with-cab' design is what will usually spring to mind. Be it a modern farm tractor, harvester, mine excavator, construction machine, haul truck, forklift or aircraft tug, we often envision a glamour shot (in *iVT*, of course!) of a top-of-the-line machine complete with cab – perhaps even one with vault-like doors, suspension, soundproofing, air-conditioning and heating, air filtration and a firstclass music system.

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There is no question about it: a cab can really make a vehicle – especially one that is operated in highly demanding environmental conditions – infinitely safer and more pleasant to operate.



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ERGONOMICS



But like most things in life, good things invariably come at a price – and sometimes the cost of a cab and even the special requirements of the operating environment and the work to be done will necessitate that the vehicle be a so-called 'less-cab' machine: an industrial vehicle without a recognizable cab.

Considering worldwide markets and the extensive array of industrial vehicles of all kinds, it is likely that there are far more of the less-cab type than there are with-cab. This is somewhat ironic in view of all the attention given to vehicles with cabs and related top-end, operator-centric offerings from major manufacturers.



Reflect on, for example, the millions upon millions of less-cab tractors operating in the Indian subcontinent and Africa, where models with cabs are very rare indeed. Even in North America, only a small percentage of compact tractors operated by homeowners, small farms, landscape contractors and the like have cabs due to their compact size, low frequency of use (most of which is in milder weather), required ease of ingress and egress, cost, or a combination of all these factors. Most material handling vehicles operated within warehouses, such as lift-trucks, tugs and pallet trucks, do not need a full cab either,

ABOVE LEFT: Freedom to reach out from the cab to adjust implements or other items is a major point in favor of less-cab designs ABOVE: With no need to open the door when you need to discuss the day's tasks, less-cab designs have the occasional ergonomic advantage because their operators are already provided with protection from the elements by the building in which they are operating.

Does this have to mean that the with-cab machine's lowly less-cab brethren, the ones that lack an operator's cab, need not provide common creature comforts, safety and conveniences? The answer is 'No, not necessarily'.

Accordingly, we must ask: 'What can be done to improve the comfort, habitability and safety on a vehicle without an enclosed cab where the operator is exposed to the elements and the natural environment?'

The advantages of doing without

But first, let's consider some of the advantages of not having a cab. Surprisingly, there are quite a few!

A vehicle that does not have doors, doorways and a roof to duck under, can be – potentially – easier and faster to board as well as exit. This could be especially important for an operator of a backhoe loader at a construction site where it is necessary to repeatedly get on and off the machine. The same might be true for a warehousing truck whose operator works off the machine just as much as on the machine. There are many such examples of where this type of ingress/egress flexibility is beneficial.

An industrial vehicle without a cab can make communication with



LEFT: A sheltered working environment and the need to regularly jump on and off the vehicle make forklifts the ideal machine for the less-cab approach



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North America, passengers on lesscab agricultural tractors are strongly discouraged and even prohibited due to safety concerns.

The disadvantages of wide, open spaces

Most of the disadvantages of not having a cab are associated with the environmental protections provided by a cab. Cabs can provide a barrier to rain, snow, icy winds and noise. When fitted with a heater, a cab can protect against the cold; when fitted with air-conditioning, fans, or even windows that open, a cab can also provide protection from the sun's heat. A cab can block the sun's rays and its glass can reduce the intensity of sunlight and block UV rays.

A cab can protect the operator from dust too, particularly if it has an air filtration system. With positive interior pressure and appropriate air filtration, it can also fully protect the operator from airborne toxins such as pesticides. A sealed cab can isolate the operator from stinging or biting insects – a consideration of surprising importance in some markets.

Most cabs also do double duty as a rollover protective system, thereby greatly improving operator safety on many types of machines.

nearby co-workers easier and more direct. They can talk to the operator, and the operator can talk with coworkers who are off the vehicle but still within hearing distance. The operator can also hear more within the operating environment, including the sounds of other vehicles and even machine sounds, providing helpful auditory feedback about the health and operation of the machine.

A less-cab vehicle can also be advantageous in terms of visibility. Without an overhead structure or roof there can be a direct line of sight to a controlled implement overhead such as a bucket or forks, a visually important area such as a high wall face, an overhead rack in a warehouse, or an overhead power line on a construction site. The lack of pillars, dirty windows or reflections on glass results in improved visibility to the outside environment.

A mobile machine without a cab also makes it easier for the operator to physically reach out from the immediate workspace of the vehicle to adjust a mirror, to manipulate a device or object behind the operator compartment, such as when pulling or inserting a latch pin when they are connecting a trailer to a tractor or a tug, or to hand something to a



co-worker on the ground or floor. The vast majority of small rice planters and harvesters in Japan do not have a cab, partially due to the high level of interaction the operator has with numerous parts of the machine during its operation in the field.

In some markets, less-cab vehicles are often used to carry passengers, sometimes in surprising numbers. In these markets, tractors will often have flat fenders with backrest bars that can accommodate up to three passengers on each side. In other markets, most notably Europe and TOP: Operators of backhoe loaders will benefit from the ease of access and egress a less-cab design offers, as well as the enhanced view

ABOVE: There are canopies and then there are 'canopies' TOP RIGHT: The tractor as transport – an enclosed cab just wouldn't be the same BELOW RIGHT: A better view to the attachment doesn't always compensate for the increased exposure to the elements



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LEFT: A simple, but effective, less-cab structure on Claas's Indian-manufactured Crop Tiger protects the operator from some of the elements





Lastly, a cab can provide a high degree of physical security for the machine itself. A locking cab door helps guard against vehicle theft and vandalism, as well as protect personal items or add-on items inside the cab, particularly expensive electronics.

Improving the quality of life on a less-cab industrial vehicle

Having considered the pros and cons of cabs, let us return to the original question: 'What can be done to improve comfort, habitability and safety on an industrial vehicle that does not have a cab?'

In actuality, there is no shortage of practical and design solutions for enhancing these aspects. Firstly consider the safety issue, as it is of such importance. The effectiveness of rollover protective structures, especially in combination with a seatbelt, has been extremely well documented. Studies of rollover injury and fatality rates, as well as controlled testing by laboratories, demonstrate the benefits of ROPS. These structures work. and it is troubling to see that such a large percentage of less-cab machines in the developing markets still do not have them.

Neither does the absence of a full cab automatically mean that the operator can't be shielded from the



TOP RIGHT: It may be a spartan cab on Átlas Weyhausen's compact loader, but operator safety is guaranteed with the use of a large ROPS ABOVE RIGHT: The

operator in this advert for Mahindra's Swaraj tractors appears to be passionate about them, despite the lack of ROPS. Perhaps its because the backrests on those flat fenders enhance the passenger-carrying capability?

ABOVE: An enclosed cab here would protect the farmer from flying debris as well as noise

sun and rain. Canopies can provide very good protection from direct sunlight and falling rain, and can also contain useful integral storage compartments for personal items such as a jacket or water bottle.

Better still, a hard canopy roof can be fitted to a ROPS to provide rollover protection as well as sun and rain protection.

The lack of a cab need not mean that the operator has no means of keeping cool on a hot day or staying warm when it is cold. Most owners of a convertible automobile have experienced the pleasure of running the heater with the top down on a brisk night. Running the heater has no impact on fuel efficiency because the engine's heat would be expelled regardless. Should a less-cab vehicle have a strategically placed heater vent or two to warm up the operator on a cold day or night? Perhaps.



Providing air-conditioning on a less-cab machine may not constitute a rational use of fuel and money. However, a carefully positioned fan can be surprisingly effective and efficient at increasing the operator's comfort by increasing evaporative cooling. Ventilated seating and cool seating surfaces can also provide much-needed added comfort in the heat of the day.

Similarly, surface treatments of touched machine parts can greatly impact operator comfort. Potentially hot surfaces such as handles and controls made of non-conductive materials such as durable plastic will be much cooler to the hand than surfaces of heat-conducting material such as aluminum or steel.

Also, exposed vehicle workspaces invariably become dirty from dust and grit and should therefore be water- and dirt-resistant and easily

ERGONOMICS





These can be user-provided locks or manufacturer-supplied locking mechanisms. Locking fuel caps are standard fare in many markets.

Finally, simply because a vehicle does not have a protective and quiet cab does not necessarily mean that all operators are not interested in, or should not have, the comforts of musical entertainment to help pass a long day's or night's work. "Music on a less-cab machine?" you might ask. This concept might appear at first to be quite oxymoronic.

However, travel through the Indian subcontinent and you will see thousands of less-cab agricultural tractors with large speakers mounted to the fenders or suspended overhead under a canopy. When the days are simply too hot and farmers with less-cab tractors resort to working through the night in the field to avoid the heat, ethnic melodies and Bollywood dance tunes can be heard blaring across the green and remote cultivated farmland. The louder it is, the better! **iVT**

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cleanable. Surfaces such as frames around displays should be designed to shed water and dust, as opposed to having horizontal ledges that can accumulate dirt and airborne debris. It is safe to say that most less-cab vehicles operated outside will be exposed to dust in varying degrees. Electronics, displays, switchgear and other important and vulnerable parts of the work platform must be designed and selected accordingly.

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Vehicle workspace designers often fail to consider the potential consequences of mud, snow and ice on controls, particularly on, and under, foot controls. One should check whether the areas between pedals can be easily cleaned of mud and dirt, or even snow and ice. Seats with built-in drain holes are much appreciated in a rainy climate!

It should not be forgotten that the operator of a less-cab vehicle has the same requirement for information connectivity as the operator who gets to sit inside a cab. Cell phones and mobile devices of all kinds are ubiquitous across most of the planet, and providing a source of reliable power for their operation or charging has become a necessity. Power outlets can be used for all manner of common onboard devices including lights, fans, phones, radios and music systems.



TOP: A lack of horizontal ledges on the frames around the dash display should keep this Massey Ferguson 1500 a little cleaner

ABOVE: Operators of cabless vehicles are not second-class citizens - they would welcome a dedicated phone-charging point ABOVE RIGHT: An audio speaker strapped to the fender is a common modification to Indian tractors

TOP & CENTER RIGHT: Lockable boxes are an even more vital addition to less-cab machines than on their more expensive counterparts



In fact, most of what might be expected from a with-cab machine with regard to personal needs such as food, water and clothing should also be expected from a less-cab machine. Many with-cab machines have powered coolers for food and drink, so why shouldn't the same apply to a less-cab machine? At the very least, accommodation should be provided for the clean and protected storage of drinks, food, clothing items and basic tools. Unfortunately, the lack of a lockable door on a less-cab vehicle means that unprotected items are exposed to theft. Locking compartments such as tool boxes can therefore meet this need, while engine and machine access points can be easily equipped with locking hardware.

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IS IT POSSIBLE TO PRODUCE AN OPEN-PLATFORM OPERATOR COMPARTMENT THAT DELIVERS SIMILAR LEVELS OF COMFORT AND SAFETY TO THOSE FOUND IN A FULLY ENCLOSED CAB?

AIR CURTAIN SYSTEM

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Javier Gutiérrez Casal A freelance mechanical design engineer based in Pontevedra, Spain, Javier has worked for many companies specialized in the development of industrial equipment

Most people will be familiar with the air curtain systems that are installed at the entrances of supermarkets and department stores. In this Design Challenge, I looked at incorporating a similar system in the cabin of a mini excavator to improve the working conditions of the operator. This features an air-generating device that enables a dual-airflow system – providing an internal airflow system in addition to the external airflow system that creates the air curtains.

The external air system consists of a centrifugal fan that drives the air through ducts that are part of the cab roof structure. The air is distributed around the rear, sides and front of the cab, which also prevents the windshield from becoming dirty. Thanks to this airflow, the temperature of the cab is reduced during hot conditions, while also preventing entry of dust and rain into the cabin. The windshield further increases operator protection from flying particles and dust.

The internal air system comprises an axial fan that will blow the air into the area around the driver's seat, to improve worker comfort on the hottest days. In winter, it could incorporate an air heater, making the working day more enjoyable.

The automotive sector is beginning to make the use of composite materials more commonplace and eventually this will also filter through to the development of industrial machinery. So another measure that has been applied on this less-cab machine has been the use of composite materials in the construction of the cabin, which reduces weight, inertia and the energy consumed. In this case, the cabin is constructed using tubes and carbon fiber panels. With this type of structure, the center of gravity is lowered, while increasing the rigidity of the cabin, stability and safety.

Finally, to avoid the feeling of a 'burning back' after spending a long period in the operator's seat, the seatback is divided into two halves, which improves ventilation and delays the onset of fatigue. *javier@javieringenieria.es*



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KARL VADASZFFY, iVT INTERNATIONAL

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GREEN

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TRADITIONAL COMPOSITE MATERIALS MAY ULTIMATELY REDUCE FUEL CONSUMPTION BUT THEIR ENVIRONMENTAL CREDENTIALS ARE RARELY FAULTLESS. UNLESS THEY'RE MANUFACTURED FROM BIODEGRADABLE – OR EVEN WASTE – MATERIALS, THAT IS...

COMPOSITE MATERIALS

They're used widely in the automotive and aerospace industries, and their benefits have been known for decades. Indeed, in the 1930s, Henry Ford considered how an organic car body could be built from natural materials such as cantaloupes, carrots, cabbages and onions. He even, in fact, developed a prototype using hemp. A decade later, scientists at Ford managed to use soybean oil to produce paint enamel, and discovered it could also be molded into a fiber-based plastic, offering about 10 times the shock resistance of steel.

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Today, when there's even more research and development going on into composites, and as their use in other industries widens, more unusual – and more environmentally friendly – options are becoming more viable.

Rodney Hansen is managing director of Dark Matter Composites, which offers composite training and consultancy services. He says that thermoplastics are fast becoming a popular and interesting option as they're low cost as well as reasonably easy to recycle and reform: "In India, for examples, plastic bottles are remolded. They're collected, heated

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MAIN IMAGE: Agave and other tough plants could be the key to your next sustainable composite material solution

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up, put together with fillers and reinforcements, and crushed into railway sleepers."

It's these kinds of innovations that are necessary to ensure as many options as possible are available for a green end of life.

Looking ahead, he suggests that the industry might model what's happening in the aerospace sector, where thermoplastics are being developed for applications that need structural performance over a wider temperature range. "That's not something you'd naturally think about for off-highway, but it might lead to an application in the future," he comments. "As other industries show what can be done, the knockon effect will impact R&D in other industries."

The popularity of bioresins is also increasing. "They're another cheap option," he explains, "and if you only want something for a limited life, they'll decompose once they've been disposed of."

Natural fibers can have many uses. Hansen says that using fibers

such as hemp, flax and bamboo with epoxies can be easily done for semistructural components, but that they should also be considered because of their vibration/sounddeadening characteristics.

"In addition, they're easy to grow. But natural fibers like these aren't just mixed with bioresins, which you might expect; they're actually being mixed with resins such as urethanes, polyesters and epoxies to get different tailored properties – including sound deadening, structural, vibration absorption, and impact resistance."

The long and the short of it

Hansen suggests that flax and hemp, both short fibers, would be ideal for use as matting to provide sound and vibration absorption in panels: "You'll get enhanced sound-deadening and vibration-deadening properties. Therefore, you won't need insulation materials."

Longer fibers, such as bamboo, can impact load in two ways when used for structural components. He



ABOVE: Bamboo could have more uses than scaffolding when it comes to construction equipment

BELOW: How much natural composites will future cabs employ? (Designed by Burak Yesildurak for *iVT* Sept/Oct 2013)

"IN A CAB, FOR INSTANCE, YOU DON'T NEED TO HAVE A SINGLE MATERIAL WITH CHANGING SECTIONS/ WEBS, BUT A SINGLE PART WITH MATERIALS PLACED STRATEGICALLY TO DISTRIBUTE STRUCTURAL/IMPACT LOADS"

Rodney Hansen, managing director, Dark Matter Composites



comments, "The longer the fiber, the better the load transfer/distribution. First, it can be designed to withstand a load by making the part thicker than normal. And second, it can also be designed to transfer a load and distribute it across a structure, making it lighter and more efficient.

"In a cab, for instance, you don't need to have a single material with changing sections/webs, but a single part where the materials are placed strategically to distribute structural/ impact loads across the part and into lightly loaded areas of the structure, which can incorporate sound-deadening materials that can also absorb energy. And when it comes to their end of life, like any other natural fiber textile, they'll biodegrade."

Now that the use of composites has greatly increased in a variety of industries, companies are exploring their potential for use in components beyond structural and visible panels: increasing interest, Hansen says, is being seen in engine and protective components. "We're making inroads into the underlying components that can benefit from reduced maintenance costs, improved durability and reliability – things you can't see, such as sump guards and hydraulic reservoirs."

He therefore suggests using composites in pressure vessels, making them lighter while being more durable and resistant to the elements, eliminating the effects of corrosion. "And with composite driveshafts, they're lighter, take less energy to turn, are resistant to the elements, and they'll get you more power transfer. At this stage, it's expensive, but in the future things normally associated with rubbers, metals and heavy-duty fittings



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might become composite since they can withstand harsh environments.

"We're also now starting to see composite hydraulic rams – they're lighter and easier to move. Because you need less energy to move the ram, you can make components smaller, or start to move more. Ultimately, composites are starting to make their way into traditionally metal mechanical components, and that's where we'll see it expand in the future."

Bio-engineering

Muthuramalingam Krishnan, managing director at Gruntech Polymer Consultants in India, agrees that manufacturers of body panels will steadily increase their inclusion of bio-sourced resins and natural fibers, replacing glass, aramid and even carbon fibers in many of their products. "There is a lot of potential with flax and hemp for off-highway vehicles because they're already popular choices in the automotive components field," he says.

Awareness of the potential for recycling flax and hemp is growing, he adds, but points out that many countries still lack proper recovery techniques. However, he says that the USA, UK, Japan, Germany and France are leading the way: "They try to use recovered materials from





ABOVE: Flax after scutching (top), after combing (center), and formed into a car door panel (above)

BELOW: A banana plantation could provide much more than just a tasty snack

BAMBOO-ZLED BY SUSTAINABILITY?

Inspiration for composite use can come from unexpected places. Gary Young, owner of Bamboo Surfboards Hawaii, has been building surfboards since 1976 and also pioneering the use of natural fiber composites. This experience, he suggests, could benefit automotive-related markets.

Young has used several natural fibers in epoxy composites, but years of research and experimentation have led him to albizia, "one of the premier materials from strength to weight and sustainability perspectives", he claims. "In foam core structures, albizia/epoxy laminates are lighter and more durable than fiberglassreinforced plastic. They use less than half the resin, while the refuse, sanding dust and trim scraps tend to biodegrade."

Albizia is grown on plantations in countries such as Indonesia, but has become a runaway pest in Puna, Hawaii. Young's use of it in surfboards is popular with locals for two reasons: the high quality of the boards it produces, plus the fact that he's using a much-maligned tree.

In terms of creating a composite core, he suggests albizia is ideal: "It's lightweight, has fiber in it, and doesn't absorb much of what it's being mixed with. Surfboards have to handle a lot of stresses, just like vehicles – hot sun, cold water, collisions. I could use materials that are used in the automotive industry, but nothing works as well as albizia – carbon fiber, for example, is brittle and expensive."

One use he suggests albizia could be considered for is creating dashboards: "If you had an albizia core and then had a higher-value wood [veneer] – teak, for example – it would be lightweight, strong and durable. This approach could also work for door panels or possibly even structural components."

The main advantage of the material, though, is its green credentials. In terms of end-of-life cycle, Young comments, "You could grind it and integrate it into another mix of composites. The wood component of the composite would, of course, be biodegradable."

recycling in existing products. So,

in some pyrolysis processes, the

recovered fiber can have more than

80% of its original strength and it

again without losing many of its

can be used in the same applications

But, he argues, this approach will

only become better addressed once

the authorities impose stringent

laws concerning the recycling of

composite materials.



As part of his current research, he is exploring hau, a plant the Polynesians brought with them when they settled Hawaii. With wider research, he says, it could become the green composite of the future: "The wood is light. Inside the bark is a fiber whose tensile strength I'm testing. I predict it'll have a similar tensile strength to carbon fiber.

"Some manufacturers don't consider the waste stream. A big component of the waste stream in composites is the dust. Synthetic fiber dust is just as bad as asbestos. But wood dust from hau would break down into dirt and wouldn't itch, so it would be kinder to the waste stream and the people who work with it."

Krishnan suggests that as the off-highway industry develops its use of green composites, the agave species should be given significant consideration. "There has been tremendous progress made with it," he comments. "Agave is the future of the fiber industry as sweeteners are already manufactured from the species. Agave americana opuntia, agave fourcroydes, and agave cantala offer a high cellulose content of



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properties."

COMPOSITE MATERIALS





fiber, which will be just as good as carbon and aramid fibers.

"Research has shown that both agave (with high cellulose content) and opuntia or nopal (with high starch content) are able to produce bioplastics with excellent results. There are commercial plastic-bag producers that use agave biomass as feedstock because it gives excellent tensile strength, and the properties match other existing aramid and carbon fibers."

Such fibers, he predicts, will be used for items such as vehicle body panels and bumpers in coming years.

And speaking more of the future, Krishnan says: "Nano-cellulose fiber, which comes from various sources including agave and banana fibers, will find its entry into many products that have the need of high-strength characteristics, such as body panels, doors and bumpers. This fiber seems

TOP & ABOVE: The headlamp supports of MAN's TGX and TGS trucks are made of Durethan DP BKV 60 H2.0 EF, a highly reinforced polyamide 6. The U-shaped center front step, which is connected to the headlamp supports, is injection-molded from the PET+PBT blend Pocan TS 3220

BELOW: Polvamide engine oil pans from Lanxess are highly resilient, even in heavy-duty applications

to be equal to carbon fiber in its mechanical properties."

Krishnan also highlights kenaf as a cost-effective option for future green composite production of body panels, doors and bumpers. "It's very easy to harvest; it doesn't need much water and it can be grown in almost all conditions. It's the best green alternative to glass fiber and basalt fibers."

Live long and prosper

Longer-lasting solutions, of course, provide a different kind of green benefit; if the need for replacement and repair is minimized - which is a main advantage of composites then resources can be saved as a result of components having greater



"NANO-CELLULOSE FIBER, WHICH COMES FROM VARIOUS SOURCES INCLUDING AGAVE AND BANANA FIBERS ... SEEMS TO BE EQUAL TO CARBON FIBER IN ITS MECHANICAL PROPERTIES"

Muthuramalingam Krishnan, managing director, Gruntech Polymer Consultants

service life. Specialty chemicals company Lanxess has been working on developing thermoplastic bumpers for trucks and HGVs – an approach that could comfortably cross over into the off-highway market. Examples include models from MAN's TGX. TGS, TGL and TGM series. Unlike on previous models, these bumpers are no longer produced in one part from SMCs, but are manufactured on a modular basis from several parts, using, for example, Durethan and Pocan polyamide and polyester compounds.

Head of global product and applications development, Hartwig Meier, explains, "The big advantage of our thermoplastics is they offer greater design freedom and higher surface quality than SMCs. They're also tougher and easier to coat."

The center front step for the TGL and TGM is produced from highly reinforced Durethan DP BKV 60 H2.0 EF. A very strong and rigid material with outstanding dynamic load strength was needed because these vehicles are used heavily on construction sites. The step is partly concealed by other components and, in visible areas, is covered by Pocan C 1206, an unreinforced PET+PC blend noted for its good surface quality and excellent UV and weather stability.

The company has also developed engine oil pans for the 12.8-liter Euro 6 engines for the Mercedes Actros from Daimler. Made from polyamide, which offers a viable alternative to aluminum, sheet steel, and SMC, and which is known for its resilience characteristics, they're up to 120cm in length, 40cm wide and 35cm deep. iVT

FIMALIN UPDATE

FiMaLin is an association in France that is concerned with organizing an industrial supply of high-quality technical flax fibers for composite applications, improving the fibers' mechanical properties, and developing its own quality label, Qualiflax, to award to producers able to guarantee their supply with regard to fiber and semi-product properties. Membership has grown from 20 to 35 over the past year.

The first Qualiflax-certified products namely, those with proven sustainability and a quality-consistent supply - are expected to be available toward the end of this year.

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They say "Never meet your heroes", but I can safely say I came through such an experience without any major disappointments. For at the beginning of my interview with Thomas Böck, chief technology officer at Claas, I discovered that he was the man behind what is perhaps my favorite ever industrial vehicle – or at least its complex electronics – namely, Kässbohrer's Pistenbully 600 snow groomer (*iVT* Sept 2007, p32).

He had joined that OEM in 2002, after spearheading electronic and hydraulic controls at Fendt, where he had worked on the hydraulic 'personalities' of its Vario tractors, their Vario terminal, and tractor implement control systems, as well as working with precision-farming technology. In 2006, he returned to the Ag sector, joining Claas as head of system technology and later as

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PREVIOUSLY THE BRAINS BEHIND *iVT*'S FAVORITE MACHINE, THE PISTENBULLY 600, THOMAS BÖCK IS NOW PUTTING MOST OF HIS EFFORT INTO ENSURING CLAAS MACHINES MAKE MAXIMUM POSSIBLE USE OF THE LATEST PRECISION-FARMING TECHNIQUES

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MD for R&D, production and logistics, before assuming responsibility for its Technology and Systems division in late 2014. So in addition to R&D, quality, production, design and corporate IT, he is now driving the OEM's latest electronic ventures.

Given his strong background in electronics, I'd initially feared that much of our discussion would be way over my more-mechanical head, but I was soon reassured. "I would say I'm more mechatronics now," he responds when I ask if everyone in agriculture sees electronics as the undisputed way to improve productivity, "although electronics is my origin and track record, and I've done a lot of work on electronic control systems.

"Agricultural machines are increasingly being equipped with technologies to communicate with each other and to automatically coordinate working processes. This means the task of data management for improving efficiency throughout the production process is becoming more challenging."

Claas therefore recently set up a software company, 365FarmNet (partnering with Amazone and GEA Farm Technologies) to develop across-the-board digitalization of farm processes, whether that is seed application maps, weather data, constantly optimized and updated



TOP: Yield mapping and data management is becoming more complex as machines increasingly begin to communicate with each other

ABOVE: Implement control via tablet with the Easy onboard app machine settings, or recording of data via the OEM's own Telematics system. This is a prime focus of its E-Systems division which specializes in networks, electronics, communications, steering systems, and precision farming.

"It has about 180 engineers, and we're planning to expand to around 250 people working on the overall configuration of all our machines," Thomas says, slightly reinforcing my initial fear of tunnel vision as far as electronics is concerned. "So they do the display development, the GPS technology, software architectures



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"I WOULDN'T SAY IT'S A CONCERN, BUT IT'S A NECESSITY TO HAVE SECURITY BUILT IN. WE HAVE TO PROVIDE THE SAME LEVEL OF SECURITY AS THE CAR INDUSTRY"



TO CVT OR NOT TO CVT?

Claas joined the exclusive band of CVT manufacturers in 2013 when it created the EQ200 Cmatic drivetrain for its Arion 500/600 tractors, but it has offered larger (900 and 800 Series) CVT tractors for some time, courtesy of ZF. So what's the OEM's strategy on that front?

"Our vision is to expand internally and of course win external business with that, and maybe more variants depending on price and torque and so on. Of course we want to extend outward through the ranges but for the moment we have decided to optimize the quality and productivity before we move to the next step. You cannot run a transmission production on less than 10,000 units, so of course there is a desire to grow."



So while producing larger CVTs in-house might be a long-term possibility, is there an interest in extending the option into smaller machinery? "Yes, of course – the market for small vineyard tractors is quite niche, but we are looking at it very closely and we'll see where the potential lies.

"Any design would have to be outsourced because it would be a completely different dimension, so there would be virtually no reuse of existing components." and the connectivity between the machines, including communication over the air. But it's not just, let's say, the current needs – there is a lot of future already built in to the DNA of this company."

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This had been a topic touched upon when I'd interviewed Thomas's predecessor, Hermann Garbers, in 2013. He'd highlighted sensor fusion and swarm robots as areas of potential long-term significance. "Of course, sensor fusion is a big area because you can combine camera systems, GPS, local sensors such as ground penetration sensors, and data from the implement, to derive decisions just like a normal driver would," Thomas agrees. "So if we're talking about more-intelligent machines, this is a definite topic.

"I think the swarm idea [where a traditionally operated lead vehicle controls several smaller, following machines] is a good one, but in terms of efficiency and the possibility of transportation, the optimization will go on with existing large machines.

"The idea of intelligent machine systems interacting in a network will come and, as Hermann said, the operator is necessary, but more as a supervisor than a driver, as the machine would configure itself.

"For example, our CEMOS [Claas Electronic Machine Optimisation System] automatically adapts the cleaning and separation according to the crop and the environment."

Easy does it

More immediately though, the Easy onboard app, which enables an implement to be controlled from the tractor via a tablet once its ISObus system has been mapped, is receiving quite a lot of attention. But just how much more potential is there for this avenue - and could farmers one day even take a BYOD approach to buying a tractor, so that it is sold without any displays at all and controlled completely by their iPad? (Assuming that Apple's scandalous built-in obsolescence policy wouldn't lead to their brand-new €100,000 tractor gathering dust in the barn following a change of port, that is...)

"I don't see any chance of that, because from the legal standpoint, you need to have a dashboard. And that couldn't be replaced with a tablet because you can't guarantee their reliability.

"So we see it as an add-on display that could replace GPS terminals or precision-farming terminals. It's already connected to the internet and it has the full Office package so you can do a lot of precision farming and planning while you're in the machine, removing the need to sit in the office after you have finished work in the field.

"So at Agritechnica we'll be showing how you can read out the data and even operate the implement with this kind of technology. But the biggest potential is when you combine it with telemetric systems, and do the data exchange with cloud-based farm management systems [ie 365FarmNet] – you've everything at your fingertips and it's completely integrated in the operation of tractor and implement, combined. So as the internet moves into machinery, [see page 92] this app will make a big difference."

If you believe the more histrionic of our newspapers, data hijacking of state-of-the-art cars is apparently the latest problem threatening western civilization – so how much of an issue might it be for agricultural vehicles?

"I wouldn't say it's a concern, but it's a necessity to have security built in," he confirms. "We have to provide the same level of security as the car industry, but as we have fewer machines in the field, they are

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RIGHT: Optimization of harvesting logistics with Claas Telematics

BELOW: The Claas field route optimization tool will be awarded a silver medal at Agritechnica. By determining the most efficient pattern of working passes – in irregularly shaped fields in particular – up to 6% reductions in processing time can be achieved

BOTTOM: Automatic throw direction adjustment of chopped material when combining uses a sensor to react to changes in wind speed and direction for an even spread of material







unlikely to be the center of attack. But those machines produce a lot of high-value data which is highly confidential for the customer, so we must make sure that data is secure."

World Claas Manufacturing

Given the emerging markets theme of our issues this year, I was particularly interested in Thomas's view of how willingly those regions might embrace precision-farming technologies in the future. "It's no longer true to say that it's just basic technology used in the BRIC markets," he states. "We are seeing a mixture between low-cost machines and those that will be adapted with tracking tools, GPS navigation or even the first steps of site-specific precision-farming tools. So we see those trends already in India, the big farms in Brazil and Argentina, and in Africa, especially when big investors come into the game. Whether it will become a trend is hard to say – in Europe it's all about labor cost, whereas in the BRIC countries it's more concerned with improving the production quality, a control system.

"What we did in the past – putting existing technology from





ABOVE: The Jinyee production line may begin assembling green products for export too

RIGHT: Production of the **Claas Scorpion telehandler** is to transfer from Kramer to Liebherr in 2018



also be in the field of vision, but for now we are thinking more about the classical harvesting and implement business."

As far as Russia is concerned, Thomas reveals that the integration of production technology in a second factory in Krasnodar is currently being finalized before it officially opens in October. "From a quality perspective, the production technology in this facility is exactly comparable to the technological standard we have in Harsewinkel, so we'll be producing the high-quality, upper-middle-class harvesters like the Tucano or Lexion.

"We're still looking forward to the development of the Russian market, which is one of the biggest, and we realize that the crisis will take some time to recover but, in the long run, will move up a gear."

Perhaps most interesting, though, are the two Indian facilities where Claas has manufactured the Crop Tiger and Crop Tiger Terra Track harvesters since 1995. "They're very much specialized for rice but we see increasing demand from some regions in India for wheat and other grains, so we are developing machines to handle those different needs. So there will be more products to come!"

Could that offering include tractors – most likely of the compact

"IT'S NO LONGER TRUE TO SAY THAT IT'S JUST BASIC TECHNOLOGY USED IN THE BRIC MARKETS ... WE ARE SEEING THE FIRST STEPS OF SITE-SPECIFIC **PRECISION-FARMING TOOLS**

Western Europe into those markets - isn't enough anymore. We have to offer adapted products that are ready to integrate tracking and positioning systems, etc."

Conveniently then, Claas has long been making inroads into producing machines in three of those countries - in fact, it now employs more staff outside of Germany than within. Following its acquisition of harvester manufacturer Jinyee in January 2014, the Chinese OEM is slowly but surely becoming integrated into the Claas family. "We are preparing our first products to be produced over there -

localized products for the Chinese market - but still we have to convert the dealerships we acquired to the Claas standard. I think the biggest changes to the technology will come in response to demands for greater productivity, when small fields are aggregated into bigger fields, so I would expect to see machines with greater working widths and different harvesting technology as well.

"Then, over time, we'll go more and more into green [Claas] products that can be exported to southeast Asia for example, or other regions connected to China. Tractors could

variety – that have been specifically designed for that market, I prod?

"Yes, we see India as one of the biggest markets for the next 10 years so we will definitely have an Indian offer over time. That could well be a rebadging deal," he answers as I prod further, "as we think about possible partnerships, but it's not open for disclosure."

Claas mates

The company is no stranger to this approach, of course. Its entry into the tractor market came with the acquisition of Renault in 2004, though having rebuilt that product line twice over the years, little of that DNA remains and the majority of its products are now truly green. The new Atos line-up of 76-109hp tractors, which replaces the Axos range, has however been adapted from the Same Explorer range what was the reason behind that choice, and why is there such a big overlap with the existing 75-103hp Elios range?

"Previously we had decided to concentrate on the bigger tractors – from our harvesting machinery, this was where we knew the customer best, and it's where we are able to produce a design that completely meets their needs," he explains. "Also, because of the exhaust gas regulations and so on, reshaping the entire portfolio would place a huge load on our R&D department, so it is a question of capacity too. Sometimes it doesn't really make sense to start development from scratch for the volume we need or expect.

"Although there is a bit of an overlap with the Elios models, we still needed to fill some gaps in the portfolio. The Atos range is of course bigger than the gap was, but as we are



"IT WILL BE A 'SCORPION MADE BY LIEBHERR', BUT A FULL CLAAS PRODUCT WITH THE CLAAS GENES ... WE CAN SEE MORE PROSPECTS THAN JUST THE TELEHANDLERS"

constantly reshaping the portfolio, with the next steps of the exhaust gas and mother regulations we will change the portfolio regarding the Elios, etc, as well.

"But we're quite happy with our current portfolio – we can now offer 51 tractor models between 72-530hp. We are not interested in producing smaller tractors, and have partners for spraying and mowing."

On the topic of rebadging, I, of course, had to ask for further details regarding the transfer of the Scorpion telehandler partnership with Kramer to Liebherr (having initially begun with the Targo-branded Caterpillar models, of course). What attracted Claas to join up with this German family-owned company that produces many of its own key components?!

"Until the end of 2017, we'll continue to develop the Scorpion together with Kramer – for example, with regards to the Tier 4 Final emissions standard," he clarifies.

"From 2018, retailers will be able to take advantage of the development opportunities that will arise from our collaboration with Liebherr. "It sits very much with our own genes so this is a good partnership for the future," he agrees. "Liebherr is also at a very high technological level so we will follow the path of using the most efficient drivetrains, integrating diagnostic systems and developing the operability – this will be one of its differentiating factors.

"It will be a 'Scorpion made by Liebherr', but a full Claas product, with the Claas genes when it comes to operation, and, of course, we will think about expanding the product range. So with a combination of two big brands, we'd expect an increase in sales – we can see more prospects than just the telehandlers, which is why we talk about a partnership. We both produce drives, hydraulics, electronics, etc, so there are ideas we could exchange."

As he continues, the similarities between the two OEMs become even more apparent, so much so that I feel compelled to close by asking whether an in-house engine has ever been on the Claas agenda. "We have examined that, but developing an engine is highly costly," Thomas confirms. "We are now in the best position to ensure we have the ideal fit of engine technology to each product, whether in Europe or in the United States – it's not easy to make a 'one size fits all' engine for the whole world, so we will continue to purchase the right engines and customize them to our needs." iVT

BELOW: The Crop Tiger may soon not be the only harvester to be produced at Claas's facilities in India



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IF YOU'RE PAYING A VISIT TO HANOVER IN NOVEMBER, YOU'RE BOUND TO LEARN A LOT ABOUT THE LATEST AGRICULTURAL MACHINES AND TECHNOLOGY. HERE'S OUR PICK OF THE BEST TO MAKE SURE YOUR EXCURSION GOES WITHOUT A HITCH. (UNLESS YOU'RE ON THE HUNT FOR ONE, OF COURSE)

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After 30 astonishing years, the Agritechnica success story is still continuing – round about 2,800 exhibitors from 52 countries have already registered for the year's leading trade fair for agricultural machinery. Hanover, Germany, is where the industry meets and where the visitors are offered an extensive international program of special events and top-class lectures.

During November 10-14, 2015 (preview days November 8-9), DLG, the German Agricultural Society, is anticipating hosting more than 400,000 visitors from all over the world. DLG conducts a constant dialog with its 26,000 members and, by operating at international level, serves as the knowledge base for the agricultural industry. Agritechnica is the international hub of innovative products and pioneering solutions in crop production and farm machinery.

In a few decades from now, the agricultural industry will have to provide food for more than nine billion people – an enormous task which calls for the application of new technology and can only be met by close interaction between scientific research, R&D departments, manufacturing and farmers.



Advanced technology will help to make cropping and harvesting healthier for the environment, more sustainable and, above all, more efficient. Agritechnica offers unique and resourceful opportunities to exhibitors and visitors alike.

Agritechnica as initiator

All the world's leading companies in the industry will be represented at this forward-looking forum. Their innovation cycles have long since been tuned to Agritechnica's show dates, so that new products can be presented to the world market there.

More than 60% of the exhibitors are from abroad, a testimony to the growing internationalization of business and the global integration of the agricultural economy. There has also been strong growth in the number of registrations from China, the USA and Canada, while national delegations from 20 countries will be present at the trade fair.

Important agricultural markets will once again be the focus of the series of events grouped under the general heading of 'Ag Machinery International – Access to Emerging Markets'. These events will take a close look at agricultural equipment in three blocks of countries covering Eastern Europe and Africa. A further event will shine the spotlight on the component markets of the BRIC (Brazil, Russia, India and China) countries.

With all the exhibition halls fully booked, Agritechnica is laying on a program that will be more varied and comprehensive than ever before. For example, the new Smart Farming module addresses the challenges surrounding a sustainable production increase of raw materials, food and feedstuff. At the forefront are digital solutions for networking and the interpreting of data. The Digital Cropping special forum introduces technologies and systems that will help farmers decode their sites and understand yields. The Major Crops Worldwide event not only offers the technology for increasing yields, but also opportunities to meet exhibitors and decision makers from around the world.

The Campus & Career platform is the interface between the industry and scientific research. Hosted by DLG for the first time, special show space is being dedicated to careers in agriculture, bringing together everything to do with jobs, further training and careers, as well as scientific research, providing great opportunities to chat with the industry's young talents.

Suppliers as innovation drivers

In the central halls 15, 16 and 17, the Systems & Components international platform for suppliers will welcome scientists, developers, purchasers, manufacturers and dealers in the agricultural industry.

Appealing to other industries as well as agriculture, the Systems & Components platform anticipates a cross-industry technology transfer at a very high level. The agricultural industry will be presenting several breakthrough technologies that surpass those of the automotive industry and are even catching up with the aerospace industry.

Here, visitors can enjoy the opportunity to meet suppliers from other off-highway, road construction and earthmoving industries – and even shipbuilding – for expert talks, to explore new cooperative ventures, secure procurement opportunities, and obtain useful international market analyses.

Learn tomorrow's solutions today

Future Farming is a keynote theme that comprises an extensive range of events and programs. Featuring special visual effects and themes, the pathways will guide the visitors through four main topics: efficiency; reliability; ergonomics/safety; and resources/environmental protection. These are addressed in the context of engine technology, hydraulics, axles, transmission, operator cabs, electronics, software and, of course, tires, giving an overview of the entire industry.

While the four pathways focus on innovations and specific solutions by individual manufacturers, the Special Show in the Systems & Components Lounge in Hall 16 takes visitors into the world of tomorrow. This exciting show simulates a networking scenario between manufacturer, farmer and supplier, presenting an industrysourced solution that is geared to retail customers and also encompasses the high economic potential of 3D printing. Visitors will discover the possibilities for engineering offered by this new technology – and much more besides.



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AGRI TECHNICA AGRITECHNICA PREVIEW



Fendt is promising to reveal "all the technical details of the revolutionary design concept" of its spectacular **1000 Vario** family in Hanover.

Purposely designed to fit in the largely unoccupied 400-500hp sector, they are powered by 12.4-liter MAN engines that have been finely tuned with the other main components to produce the desired 'high torque/low engine speed' result. As a result, max torque of 2,400Nm lies at 1,150rpm (in

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the 1050 Vario) and its rated engine speed of 1,700rpm is claimed to make it sound more truck than tractor. Its 60km/h top speed is achieved at just 1,450rpm, and 40km/h at 950rpm.

New cooling technology has also been developed. The Concentric Air System (CAS) fan sits in front of the cooler and is tilted upward to suck in colder air so that more of it can be pressed through the heat exchanger. Driven by its own hydraulic motor, it is decoupled from engine speed so it can be actuated on demand, resulting in efficiency improvements of 25-70%.

VarioDrive, a completely new transmission concept, means that when 4WD is engaged, the front axle is now driven by a second, separate transmission output independent of the rear axle. The hydro motor RA drives the rear axle via hydromechanical powersplitting across the entire speed range, while the hydro motor FA mainly supplies the front axle with high torque in the field, decoupling above 25km/h to increase efficiency and economy for on-road driving.

This technology has also enhanced maneuverability due to the lack of a fixed forward driving ratio on the front axle – now the active front wheel drive uses the 'pull-in turn' effect to reduce the turning circle by 10%, almost on a par with that of the 900 Vario. Tire wear caused by turning on the road is also minimized.

Two highly efficient independent hydraulic circuits use two autonomous axial piston pumps to provide 220 l/min and 210 l/min of flow, which enables the different demands for flow volume and pressure level from an implement's consumers to be satisfied.



Challenger's Rogator 600D self-

propelled sprayer is the first machine to use AGCO's global platform Vision cab. This Cat. 4-certified cab is 22% wider than that of the OEM's previous C-Series model (which was adapted from its tracked tractors) and as a result provides a generous 14.3% (0.5m³) interior volume increase. This offers plenty of space for a passenger seat, which contains an integrated storage box capable of both cooling and heating its contents.

The front windscreen is $1.34m^2$ larger, an increase of almost 90%, greatly improving forward visibility in combination with the narrower steering column. The total glass

■ Deutz-Fahr may not be announcing any new tractors in Hanover, but its new **Driver Extended Eyes** safety system is definitely worthy of the DLG Silver Medal it will be awarded. Installed in response to the trend for larger tractors resulting in reduced visibility to their extremities, the system's three cameras integrated into the hood – one in the front and one at either side – broadcast a live video stream to the in-cab iMonitor 2.0. This is likely to enhance safety in two particular scenarios – when a child or animal moves in front of the stationary tractor while the driver is distracted, or when the tractor is approaching an intersection where buildings obscure the view to either side. For the latter, the camera enables a 180° view left and right without the need to drive further forward, into the path of crossing traffic.





The driver is warned by acoustooptical signals if there is a person or object dangerously close (passive prevention). The system will even automatically prevent the driver from moving the tractor (active prevention) until it is safe to proceed or the driver 'deletes' the obstacle from the screen. A further benefit of the front camera is the optimized view it provides to the front lift, supporting the driver when mounting or dismounting implements. It is also likely to simplify the future automatization of safety functions such as speed reduction, braking or automatic lane changing. ۲

With the **C6000** Series, the OEM will reveal its third new combine harvester range in as many years. Featuring the brand-new Evo II Commander cab, the Giugiaro-designed machine provides high standards of comfort and technology, a soundproof interior, state-of-the-art controls, and a modern air-conditioning system. All functions can be activated at the push of a button. The second seat and the optional 21-liter portable thermo-fridge complete the ergonomic and comfortable working environment.

The controls for the transmission and main equipment functions are built into the new joystick, which makes operation extremely simple and intuitive. The Combine Control Management (CCM) system allows the operator to verify the quality of work at any time, presenting key information about the harvester's activity at a glance.





area has increased by almost 25% – although now lower, the wider and curved design of the rear windows and slimline rear cab posts optimize the view from the driver's seat for improved visibility to the booms.

The new cab also features an updated climate control system as standard. This enlarged heavy-duty HVAC system produces the same cooling capacity at a lower fan speed as the optional system on the C-Series, helping to reduce in-cab noise levels.

The fine design work continues with a facelift for Challenger's **MT800E** Series tracked tractors, featuring a new hood design

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with additional work lights in the front grille to provide greater visibility and reduce driver fatigue. The new design also improves natural airflow around the engine compartment, so it runs cooler and with improved efficiency, while providing full service access to the radiators, batteries, engine and air filter.

The tractor's updated air-conditioning system boasts a 10% increase in the cooling capacity within 10 minutes cooling from 50°C, and 20% after an hour. New insulation materials providing higher heat reduction capability have been installed and the new compressor features 15% increased capacity over the previous model. ■ New Holland's **FR Forage Cruiser** line-up has been completely revised for 2016, with probably the most significant change being the use of FPT engines throughout, now that an 824hp 20.1-liter Vector engine in the FR850 has replaced the Cat C18 used in the previous range-topper.

The two smallest models, the FR480 and FR550, are powered by Cursor 13 engines delivering 476hp and 544hp, while Cursor 16s power the FR650 and FR780 with 653hp and 775hp respectively. The engine in the FR780 was completely overhauled to handle that power, being given a new cylinder head, pistons, injection system and turbocharger.

Engine tuning specific to forage harvesting needs delivers almost instantaneous transient response, making the Forage Cruisers able to handle sudden changes in load without stopping or plugging, and increasing capacity up to 5% over the previous model.

The combined effect of the new Cursor engines and the EcoBlue Hi-eSCR technology enables the new FR models to use up to 21% less fuel than the equivalent Tier 3 model at the same length of cut.



■ Massey Ferguson will preview the three models of the long-awaited cab version of its Tier 4 Final (75hp, 85hp and 95hp) **MF 4700** Series compact tractors that are to be launched early next year.

A brand-new design, the cab is approached via large steps that lead up to its wide-opening, full glass doors. These offer superb access to the flat floor cab, with car-style pendant pedals keeping the area uncluttered. The gear levers fall easily to hand to the right of the seat.

There is excellent all-round visibility through the large front screen and to the sides as a result of the wide glass doors and curved quarter windows. The opening rear window offers an unrivaled view to the rear. A Visio roof option further improves vision when operating with a loader.

The modern design of the MF 4700 Series provides excellent levels of control and automation, such as electrohydraulic activation of the diff-lock and four-wheel drive for convenient operation.

A different control layout, with greater use of consoles than that of the cab-less version, is used in the new models. The clear but slim dashboard uses a mixture of analog and digital displays, providing operators with all the essential information in an easy-to-read format.

A screen in the center shows additional tractor information with easy navigation through the various settings using buttons mounted conveniently just below the dashboard. This screen is also used for simple fault diagnostics. The sculpted console on the right contains the throttle lever and mechanical spool valve levers, which can be locked into position. Behind these is the electronic linkage control (ELC) 'mouse'. This nestles comfortably in the operator's hand and adjusts implement settings with a thumb-slide lever, with a separate up/down rocker just below, along with a 'quick engage' button.

Further ELC settings and controls are found on the B-pillar. These look after rate of drop, intermix

(between draft and position) and Active Transport, which provides suspension for mounted implements during travel. The PTO switch has three positions: on; off without brake; and off braked, which stops the shaft turning. Further back on the console are a range of socket types to power implement terminals and screens. There is also a diagnostic socket that enables technicians to connect into the tractor's CANbus. AgCommand advanced telemetry monitoring is available as an option.







AGRITECHNICA PREVIEW

ENGINES

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TECHNICA

With its engines for agricultural machinery, **MAN Engines** is now steering away from merely delivering its products to manufacturers, and is shifting its focus to suit the specific needs of major customers through targeted customization. To this end, a broad portfolio of the latest 6- and 12-cylinder engines is available with outputs of between 294-816kW (400-1,110hp).

Thanks to a modular exhaust gas aftertreatment kit, single components can be freely positioned to permit various different installations. This modular exhaust gas aftertreatment kit offers manufacturers a great deal of flexibility across all series when designing their machines.

The MAN D2862 LE13x 12-cylinder engine and the MAN D3876 LE12x 6-cylinder engine make a significant contribution toward expanding and reforming the engine portfolio for agricultural technology. Both engines will be presented to the world for the first time at Agritechnica 2015 in Hall 17/D52. The units are integrated into the overall concept of efficient MAN engines and are designed to create a high power density that provides maximum power from compact dimensions.

Both series are based on the latest MAN series, meaning that OEMs will have access to them in the long term, even beyond EU Stage V. Both engines comply with the strict emissions standards of EU Stage IV or US Tier 4 Final and are ready for EU Stage V.

Zeppelin Power Systems, the exclusive partner for **Caterpillar Industrial Power**, features the latest generation of its engines at 17/C21. The experts for customized drive and energy solutions will offer comprehensive information on the current Caterpillar engine installation program and drivetrains.

In addition to proven Caterpillar engines for industrial and agricultural applications, the focus will be on the Tier 4 Final/Stage IV latest emissions standards and readiness for the forthcoming EU Stage V.

In many industrial and agricultural machines, Caterpillar engines have

proven their high reliability and robustness. Two selected engines, the C4.4 ACERT and the C18 ACERT meeting Tier 4 Final/Stage IV, will be on display. Furthermore, a Cat C7.1 with hybrid technology developed by Zeppelin will be presented. An especially efficient means of emission reduction is ensured by the combined use of a catalytic system (SCR) and particulate filter.

As an official partner of Caterpillar, Zeppelin Power Systems offers engines, transmissions and complete drivetrains. Among its customers are leading OEMs of machines for the construction industry, agriculture, forestry, logistics, manufacturing and the recycling industry, as well as manufacturers of equipment for special applications.

Perkins returns to Agritechnica with an exciting line-up of engines and services that demonstrate its commitment to the agricultural sector. With many of its customers exhibiting and thousands of users of Perkins-powered equipment visiting the show, the company will be promoting the very latest advances in its agricultural product line-up.

Of particular interest will be the launch of a new compact engine, whose power and torque benefits will be welcomed by agricultural manufacturers and end users.

Perkins will also be talking about its product support capability, and its extensive European distributor and service network, as well as showcasing its work with a variety of OEMs.

Features on stand 17/D42 will include a selection of EU Stage IV engines – the 854F-E34TA and

ABOVE: MAN is shifting focus but will still have its spectacular 12-cylinder engines on display



ABOVE: Volvo Penta will be showcasing 5- and 16-liter engines



ABOVE: Perkins will be launching a new compact engine at the show

BELOW: Cat C18 ACERT Tier 4 Final/Stage IV industrial power unit

1204F-E44TA models – as well as the Stage IIIA 1104D-44TA, a mechanical four-cylinder engine targeted at OEMs whose machines are used in the less highly regulated countries, such as Turkey.

For manufacturers wanting higher power, the single turbo, aftercooled 1204F-E44TA produces 110kW, delivering improved fuel economy, while offering superb power and torque. Its compact aftertreatment comprises an integrated DOC/SCR module, which removes the need for any regeneration strategy for soot.

Agritechnica is now set to be a regular stop on **Volvo Penta**'s exhibition calendar (17/D33), following its successful debut at the show two years ago. Because Volvo Penta engines are ideal for many agricultural applications, the company has committed to growth in this segment with a range of key customers throughout Europe.

It will be showing 5-liter and 16-liter engines, as well as its SCR technology. Elsewhere at the show, Volvo Penta engines can be seen in machines built by customers Agrifac, AVR, Caffini and Siloking.

With its commonality and ease of installation, its complete engine range was created with OEMs in mind. But the focus at Volvo Penta is on the end customer and operator, as well. On top of already low fuel consumption rates, Volvo Penta boosts uptime, offering an optional 1,000-hour oil change interval without requiring increased oil volume or extra oil filters.



AGRITECHNICA PREVIEW TECHNICA

POWERTRAIN

Part of the trend toward one-parted coupling solutions, **KTR**'s Monolastic coupling series is mainly used in hydrostatic drives – it not only compensates for misalignment, but also allows for elastic damping of torsional vibrations.

The success of the series, which was initially available for drive performances up to 120kW made an extension appear logical – so in Hall 16/C40, KTR will therefore present Monolastic 75, which boasts a permissible rated torque of 1,500Nm. It can be used on diesel engines up to approximately 250kW, enabling compensation of high radial and angular displacements. As a consequence, the power packs of the drive are loaded less, which results in a longer service life.

The pre-assembled hub can immediately be provided with the requested spline. This allows for a simple axial plug-in assembly of the hydraulic pump without the need for any further tools and devices.

Monolastic couplings are available for torques from 40-1,500Nm and flange sizes up to ø395mm. Thanks to the simplified design of the coupling, special connections without complex adapters can be realized at low cost. As a result, a perfectly adjusted, one-parted coupling system is now available for the connection of the engine and the hydraulic pump on higher power mobile hydrostatic drives, which can be easily assembled by the plug-and-play procedure. The OEM merely has to fix the coupling to the engine flywheel and push the pump shaft into the coupling.

NAF AG will be introducing an outstanding innovation for agricultural applications at the show (17/A06) – the front bogie axle drive system for harvesting machines.

Instead of using expensive track systems as front drivelines, NAF will suggest OEMs instead consider its cost-efficient bogie drive solution, which benefits from the company's decades of experience in forestry and construction applications. In combination with A complete new, innovative driveline from NAF provides a cost-effective solution for harvesters (inset: centrally driven rear steering axle)



KTR's Monolastic coupling – a one-parted solution that is ideal for hydrostatic drives

Dana's modular axles enhance the possibilities

for customization

the integrated Permanent Bogie Balancing System (PBBS), the oscillating bogies provide an even distribution of weight and tractive effort on all four tires, effectively resulting in very similar driving performance to track systems but with drastically reduced costs.

The advantages at a glance: • Optimum adaptation to the application due to modular system; • High tractive effort with reduced ground pressure;

Superior stability due to the PBBS;High-capacity oil-immersed disc

brake integrated in the planetary drives;

Proven reliability and cost efficient;

Low maintenance, reduced wear;Optional tire pressure control

system (CTIS).

To complete the driveline, NAF's centrally driven rear steering axles with a weight-optimized design and adjustable track width are the ideal choice. Their easy and simplified hydraulic control and regulation system requires only one central motor, while tractive effort is almost doubled in comparison with legacy systems. These axles adapt easily to a variety of tire sizes and also offer the optional CTIS tire pressure control system.

Dana offers a full range of Spicer steer axles for agriculture with a modular three-piece construction that allows engineers to reduce the time from design to production to delivery, while supporting a wide range of customization options.

It currently offers eight steer axles for combines, forage harvesters, and other agricultural equipment with engines from 33-301kW (45-410hp) and maximum output torques from 2,000-40,000Nm. Available now, these modular axles can replace traditional single-piece steer axles, which have large, specialized castings that often restrict customization and limit production options.

The components used in the new line of modular agricultural axles provide engineers with a flexible, global platform that is able to be produced at numerous Dana offhighway facilities, including those in emerging markets.

The design features a common center section and wheel ends, while

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60% of the global population will live in cities by 2025.

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ENGINEERING TOMORROW



accommodating multiple traction devices on a single carrier. Spicer agricultural axles are available with a steering sensor, application seals, and a wide selection of brake and differential options.

Dana will display these axles, along with a full selection of its drivetrain solutions for agriculture applications, at 17/C22.

How is it possible for a light vehicle to haul a heavy trailer without a loss of overall performance? The answer is **Black Bruin** hydraulic motors (16/C16), because a light vehicle can also act as a tractor if the trailer wheels also are driven. This means that dead weight is no longer hauled, because the whole mass of vehicle is deployed to ensure the driving capability of the driven wheels. Therefore, less tractor power is needed and a smaller prime mover can haul larger implements.

Black Bruin puts its high torque just where it is needed for greater productivity – under the cargo! An extra pulling force is generated as needed and when higher tractive effort is no longer required, the motors switch to freewheeling mode. Driving at road speeds without the need for specific hydraulics leads to considerable savings on the control system and fuel consumption.

Installation ready, these compact wheel motors provide an all-in-one package to ensure a perfect fit for the most common rim sizes. Their flexible hoses are easy to install inside the trailer frame, where they are well protected. Strong, certified (TÜV/UTAC/Cemagref) brakes are available for selected motor frames.

A new range of variable displacement motors from **SAI** (16/A02) reinvents what a wheel drive can do. Their extremely high flexibility in terms of torque and speed offers fantastic power regulation possibilities, making them the complete solution to increase the productivity of ag machinery such as crop sprayers.

With variable displacement down to Occ/rev, it is possible to downsize the transmission by using the power provided at high torques up to the maximum permissible speeds.

SAI manufactures the whole radial piston hydraulic motor with



ABOVE: Variabledisplacement motors from SAI can enable the downsizing of the hydrostatic transmission and cooling system



Black Bruin motors can turn a trailer into a tractor

Paul Forrer's Trailer Drive

System modular drive axle

can improve traction while

reducing fuel consumption

continuous variable displacement, with feedback provided on the actual displacement. It is possible to optimize the traction of each single wheel based on the type of slope and the soil conditions.

The displacement of the motors can also be improved to facilitate the steering radius and to minimize the damages on the soil.

The high efficiency offers a high starting torque, and the ability to use the motors at reduced minimum displacements: the downsizing of the hydrostatic transmission and of the cooling system helps minimize the soil compression and enables the use of sprayers even on very steep slopes.

The motor is able to vary its displacement continuously in full power, to reach every single wheel torque limit, to prevent spinning the wheel and avoiding the need for expensive alternative circuitry, such as the inclusion of flow dividers or by connecting the motors in series.

With safety being a major factor, when maneuvering on steep slopes the operator can reduce or increase the displacement as required, thereby boosting the braking torque on any individual wheel, according to the current specific needs.

The Swiss company **Paul Forrer** offers many customer solutions,

with its innovative Trailer Drive System TDS modular drive axle for initial or retrofitting being one of the highlights at 16/B14.

AGRITECHNICA PREVIEW

🗢 AGRI

Increasingly used on agricultural trailed equipment such as round balers, this offers many advantages: • More efficiency through improved traction, even work on uphill slopes; • More environmentally friendly via lower energy consumption due to the use of a lighter towing vehicle thanks to the trailer drive;

• More security through excellent synchronization of the trailer drive and braking function;

• Soil conservation, by applying the appropriate additional driving force to avoid turf and soil damage.

A variety of hydraulic drive axle control options can be selected for each usage: TDS-Eco is an emergency or auxiliary drive for short periods; TDS-Drive is a partly synchronized drive control for prolonged use; and the TDS-Synchro patented system is the most comfortable solution – this adjusts each auxiliary drive operating mode independently via intelligent sensors.

The hydraulic system is usually driven through Power-Beyond connections from the hauler or by its own onboard hydraulic system. Special radial piston motors provide the required thrust in the field, then switch to freewheeling mode when on the road.

Thanks to the new RVBR regulation, the braking performances and safety conditions of agricultural vehicles are set to be greatly improved. Hydraulic trailer braking systems will see shifts from single to dual lines, consequently increasing their complexity. **Safim** (17/B12) has developed products boasting small dimensions that are easy to fit, have a limited number of connections, are



Ingenious solutions move us forward



Grain, millet, soy, corn: Farmers grow the fuel that powers our bodies.

Those of us in the engineering arts respect their work and ensure a perfect energy balance in their agricultural machinery and tractors. Bosch Rexroth offers energy-saving hydraulic solutions for every performance class – from load-sensing technology through to the Electrohydraulic Hitch Control (EHC). Our technology assists farmers as they contribute to society's well-being. Combines and forage harvesters mow, collect and load the crop with absolute reliability – for high productivity. The service network maintained by Bosch Rexroth is as global as farming itself. This guarantees speedy delivery of spare parts.



The Drive & Control Company



AGRITECHNICA PREVIEW TECHNICA

easy to use, and comply with the requirements of the new regulation.

The company's range of products therefore not only meets the needs of tractors and trailers, but also the requirements for testing equipment.

The braking valve for tractors – the TBU (trailer brake unit) - can be fed by gear or piston pump, and an LS port is embedded should it be required. The TBU, in addition to the hydraulic control head, can be controlled by mechanical cable or by the pressure of the SAHR brake when the tractor driver applies the secondary brake. It can therefore be used for tractors running above 40km/h. For tractors running above this speed, with a manual mechanical parking brake used as the secondary brake, Safim has developed a special handbrake lever that allows the tractor to be parked with the TBU unloaded.

For trailers, in addition to a simpler coupling device, the company will be offering an automatic trailer braking valve that, using an accumulator, applies automatic braking. The same operation will be possible with a device that applies the spring force for the parking and automatic braking of the trailer. This is a new function developed to overcome the connections limitation of the regulation. Documents and samples will be made available for discussion at Agritechnica.

For trailers, Safim also provides a valve that manually limits, or automatically corrects, the braking pressure to comply with the new legislation.

Stop by 17/C42 to discuss your braking needs and see MICO, Inc's display of electrohydraulic and hydraulic components. A global supplier of hydraulic components, controls and brake systems for offhighway applications including agricultural machinery and equipment since 1946, the company offers an extensive range of braking components, including caliper and multiple disc brakes, brake actuators, specialized valves, reservoirs, pedals, controls, switches, and advanced electrohydraulic controllers and software.

Modern brake systems require integration of new technology to

MAIN: Knott hydraulic brake systems are claimed to be the first to meet the latest EU regulations

INSET: Safim will display a range of products for tractors and trailers – pictured is its TBU meet customer expectations and improve machine efficiency, and can do more than just stop your vehicle.

Practicing 'excellence in engineering', MICO's engineers are skilled in the design and application of brake systems and components; its engineering department uses state-of-the-art design tools and equipment; and cross-functional product development teams strive to quickly create new designs and working prototypes that meet or exceed customer expectations.

The company prides itself on its ability to become an extension of its customers' engineering departments, providing expertise in the design of brake systems and components.

BELOW: MICO practices 'excellence in engineering' Agricultural machinery continues to grow both larger and more powerful.





The logical consequence: new EU regulations need to be introduced to guarantee their safety. The **Knott** hydraulic brake system to achieve one such requirement will be on display in 17/C37.

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"From increased load to everincreasing maintenance intervals: the demands on brake systems become more and more complex," explains Hans Loipl, Knott system technician, adding, "Up to now, normal braking systems have quickly reached their operating limits, which is why we are the first manufacturer to ensure our systems full comply with these new regulations.

"We are proud to say that the first hydraulic brakes that will wholly meet the new EU regulations are made by Knott. With our hydraulic simplex and servo brake models, we offer excellent solutions."

Extremely powerful solutions can be integrated into the tightest space envelopes, such as small wheel rims. "This special design means that these brake systems are perfectly protected against both dust and dirt ingress. The greatest safety and minimum servicing are guaranteed," he adds.

Knott is geared up to all the latest demands on brake systems used for agricultural machinery. In accordance with its motto 'We make your brake!', customer priorities are at the heart of what it does, ensuring that its solutions are customer driven.

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AGRITECHNICA PREVIEW TECHNICA

FLUID POWER

Hansa-TMP, an Italian manufacturer of hydraulic components, will present its innovative solution for on- and off-highway equipment, whether tracked or wheeled, at Hall 16/A15.

The system is comprised of a TPVT 1500 tandem axial piston pump (displacement 17-24cc/rev and peak pressure of 400 bar), optionally equipped with a full range of electronic sensors that transfer the output signals of the pump to the electronic box, four wheel drive units with integrated brakes (a compact solution that is ideal for machinery with space constraints), and a one- or two-axis hydraulic or electronic joystick available with customized switches to control the pumps.

The Hansa-TMP mechatronics research center has developed a comprehensive line of efficient, high-quality solutions for today's demanding machine applications. The research team makes use of the most advanced software, from the development of the project concept throughout the fluid simulation and fast prototyping technique.

The state-of-the-art technologies and the on-going commitment to simultaneously increase performance and compactness ensure that each machine is equipped with reliable, durable and serviceable components.

The company recently made some important investments in its research center to reduce the time to market of new models and sizes, which makes it an ideal partner for turnkey solutions.

In 17/F13, **Turolla** will highlight a pair of solutions aimed at increasing efficiency and safety on industrial vehicles.

The first is the Electro Hydraulic Power Steering system (EHPS): this solution, even when using hydraulic power to accomplish the steering function, does it in a completely different way. The need to create a more efficient solution is fulfilled by an inverter that modulates the speed of an AC motor directly connected to the steering hydraulic pump.

The advantages of such a solution are persuasive, and include:





ABOVE: Turolla's EHPS concept provides a more compact, comfortable steering solution

BELOW: Award-winning Oasis WetSeal technology from Ace Pump



• Power on demand and consequent downsizing of the system compared with the traditional configuration (pumps attached to an endothermic engine);

• Reduction of installation and maintenance costs;

• Improvement in comfort during operation.

The second solution, known as Supplementary Steering (sometimes called Emergency Steering) kicks in should the primary steering fail. Thanks to a pump driven by a small DC electric motor, the operator will still be able to maneuver the machine and park it in a safe area.

This solution will improve the safety of the driver, as well as other machines in the vicinity.

Ace Pump Corporation will present the Oasis WetSeal product

HydraForce will show its next-generation powertrain controls in Hanover



line at the stand of its German distributor, agrotop. In 2009, Ace won an AE50 award for Outstanding Innovations in Product Technology with the first wet seal pump for agricultural spraying, and since then has continued to lead the market in development of this innovative design. Today, three pump sizes and nine models are available that can be customized to fit virtually any application.

The WS-650 Max, 750 Max and 855 Max pump models feature Oasis WetSeal technology. The dual-shaft seals run in a pressurized barrier fluid that is specially formulated for seal face lubrication and heat dissipation. The liquid that is being pumped never comes into contact with the seal surfaces, so abrasive wear failures are prevented.

In addition, the buffer fluid lubricates and cools the seal faces, even when run dry, to eliminate costly failure. These pumps easily meet the most demanding spray applications with pressures up to 11 bar and maximum flows ranging from 640-1,300 l/min.

Visitors to 8/D20 will be able to take a close look at the latest 650 model in 316 stainless steel.

HydraForce (16/C07) will display its newly developed line of efficient drop-in cartridge valves for diesel engine, powertrain and hydraulic pilot-control applications. These next-generation G3 valves have a new actuator mechanism that draws less current. Typically, drop-in-style cartridge valves use between 1.0-1.3A, but these valves use 0.7-0.8A, have low hysteresis of 2-3%, and resist pressure ripples and shock loads.

The G3 line includes three-way, two-position solenoids and a fourway, two-position solenoid with flow ratings of 8.0 gal/min (30 l/ min) at operating pressures of 652psi (45 bar).

G3 proportional pressurereducing/relieving valves include: a pilot valve with optional manual override; a high-flow, direct acting valve; and a high-flow, pilotoperated valve. Flow rates are 1.0 gal/min (4 l/min), 8.0 gal/min (30 l/ min) and 9.0 gal/min (34 l/min) at operating pressures of 435 or 580psi (30 or 40 bar). Visit us at Hall 16 Stand E29

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- Interchange: Flat face ISO16028
- Internal pressure release valve system allows manual connection with high residual pressure

Stucchi®

- Flat face is easy to clean, reducing contamination in the hydraulic circuit
- Minimal fluid spillage during disconnection
- Minimal air inclusion during connection
- Patented internal valve design creates minimal pressure drop
- Modular design allows flexibility with a wide range of configurations
- Safe and simple to use

a constant flow of solutions





Flow ranges for G3 proportional valves serve different segments of the powertrain market. The lower flow valves are used in piloting circuits, while the higher flow valves can be used for direct-acting circuits. With top-mounted solenoid coils, compact G3 valves can be spaced more tightly. Top-mounting makes it easier to attach wiring harnesses and enables a smaller manifold.

How can the increased power demanded of modern agricultural machines be safely transferred to their attachments?

Correct working pressure from the hydraulic system is not the only factor – full performance can only be developed if sufficient volumetric flow is available. Pressure drop in the lines and couplings also has to be reduced to prevent an increase of motor load and fuel consumption.

Specifically for this application, Voswinkel – a recent acquisition of **Stauff** (16/E28) – has developed a high-performance coupling system that exceeds the requirements of ISO 7241-1 series A and ISO 5675.

In combination with the new HX male tip, the UX female body achieves a maximum volumetric flow of 240 l/min – a record level. At the same time, pressure losses remain low. Operation in heavy-duty tractors and attachments such as tippers is now safe.

The female body is available in two different lengths (versions S and L), which makes it compatible with most of the commercially available couplings. The newly developed single-hand coupling sleeve can be TOP: Roquet Hydraulics' new facility will produce large hydraulic cylinders

ABOVE: Stauff's Voswinkel range ensures attachments get the full benefit from the increased power of modern tractors connected under full operating pressure. Further advantages include the breakaway function and the pushpull function, in addition to the low connection and disconnection force.

AGRITECHNICA PREVIEW

The systematic further development of the male tip from the Voswinkel range has ensured it meets the extreme requirements of practical use. The geometry of the male tip, the spanner size and the thread variants correspond to the standard of the HP series from Voswinkel.

Roquet Hydraulics will be displaying a selection of gear pumps, gear motors with speed control for air-seeder fans, control valves and cylinders for agricultural applications at 17/E26.

Last year, the company supplied over 360,000 cylinders for compact loader, backhoe loader, wheeled loader and mini-excavator applications, which was close to the maximum capacity of the Dinacil factory in Spain. In July this year, the new Roquet cylinder factory, Roquet Eastern Europe (REE), opened in Ploiesti, Romania, to manufacture larger hydraulic cylinders up to 145mm tube I/D and 80mm rod. The company is also transferring the production of larger cylinders from Dinacil to free up capacity for smaller cylinders for new projects for skid-steer loaders, compact front-loaders, etc.

Production capacity in Dinacil is now well over 400,000 cylinders per year and REE has started out with capacity for 120,000 cylinders, increasing to 300,000 within three years. Roquet has decided to employ an increasing number of experienced hydraulic engineers in its design and development departments to accelerate the development of new control valves, pumps and motors for applications such as those mentioned above. The active employment of non-nationals with interesting language skills (German, Japanese, English, Swedish, Russian, etc) aids the development process with new projects enormously.

🗢 AGRI

CBM Group is one of the world market leaders in the design, manufacture and OEM supply of three-point linkage and hitching systems to all the main tractor manufacturers.

Located at 3/F06, the company will present its new HD^{PLUS} Series products that will set new standards in terms of strength, reliability and safety. The brand name that has been assigned to these outstanding products clearly expresses their strength and robustness.

These parts have been designed, tested and developed over the past few years to satisfy the demanding requirements of the market in terms of loads, high stress and wear. These very special HD^{PLUS} parts, produced uniquely by CBM, can provide an improved resistance of more than 25% with respect to similar products in the market.

The material quality and production process make the difference: the company considers the HD^{PLUS} series as the pinnacle of its efforts in ensuring a high level of material quality, coupled with leading-edge technology and production processes. Its intention is to provide end users with a reliable and resistant product – and the company is convinced the HD^{PLUS} can successfully achieve this.

CBM's HDPLUS Series of hitch products set new standards of strength, reliability and safety

AGRITECHNICA PREVIEW

ERGONOMICS

TECHNICA

🖾 AGRI

A pressurization system is now mandatory for some agricultural machines (norm EN15695) so a new standard pressurization system now exists. **Kalori**'s K Protec is easy to fit under the roof of a cab due to its thin profile of just 109mm. This device can be coupled with the airconditioning and enables EN15695 certification.

To achieve the best results, it is recommended to develop both the pressurization system and the cab HVAC at the same time. Integrating these two systems simultaneously enables a better handling of noise, reduced pressure loss, and increased comfort. Pressurizing the cab may be mandatory, but the driver must nevertheless enjoy total ease of use.

Kalori's off-the-shelf evaporators such as SuperK, Kool and Falkon have been designed to provide maximum comfort, from smalldimension cabs up to largedimension cabs. The Falkon+ has now joined the product range for very large cabins with little space for the evaporator. The functioning of air-conditioning and pressurization is also tested in full at the company's test laboratory in Lyon, France.

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As it has become more difficult to close the doors of pressurized cabs that are very air-tight, Kalori has developed an overpressure flap that can resist a pressure slightly higher than the regulatory pressure. This flap opens when the door closes – the opening of the flap enables the door to be fully closed.

Find out more in Hall 16/E46.

Car Studio was founded in 1986 on its president Dario Abrami's initiative after having gained over 20 years' experience in the design Kalori's K Protec pressurization system integrated in a cab roof – the evaporator is inside the trim



industry. Expanding rapidly, it soon approached new sectors and, as a partnership, eventually became one of the leading companies in the automotive and agro-mechanical sectors, serving companies such as Ferrari, Maserati, Alfa Romeo, FCA, Same Deutz-Fahr and CNHi.

Today, Car Studio boasts extensive experience in many different sectors and can offer a high level of technical competence thanks to its qualified collaborators and avant-garde IT systems. Over the years, Car Studio has expanded its business, adding new prototyping and polyurethane production services using the latest technology on the market.

Car Studio recently took the decision to set up new engineering offices in China, North America and Romania, as well as a joint venture with Yaris Kabin and Yaris Otomotiv for a new company and new brand named Car Studio Yaris Design. Its flexibility, quick response, ability to propose and to evolve, truly make it stand out from the rest.

At its stand (16/D36) it will feature a 3D-printed scaled tractor model and make its technical staff available for detailed briefs.

Yaris Kabin's new plant in Balıkesir, Turkey, has now begun production in a covered area of 70.000m² as part of the facility's total area of 300,000m². The facility has a total capacity of 65,000 cabs annually, including tractor cabs, earthmoving machinery cabs, speciality cabs, and platforms for OEMs all around the world.

Its current customer portfolio includes CNHi Italy (in Jesi-San Matteo), CNHi Mexico, CNHi Brasil, CNHi USA, Hitachi Holland, Türk Traktör, Yanmar France, AGCO France, AGCO Holland, Bomag, Agritalia, Gallignani, Polirim, Sanko, Basak Tarim, Tümosan, Hidromek and Hattat Tarim.

The company employs more than 1,000 people and produced 34,000 cabs last year. It has 84 robots in total and the welding process is robotized using 68 Kuka robotic welders, with the welding quality regularly checked by the internal (\bullet)

BELOW: Yaris Otomotiv produces a huge range of plastic and sheetmetal parts for off-highway machinery

RIGHT: Car Studio Yaris Design – from style sketches to 3D prototyping additive printing



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AGRITECHNICA PREVIEW TECHNICA

labs and reported to customers. The paint line has e-coating and robotic powder-paint capabilities. The dimensional laboratories use GOM, Zeiss, and Leica measuring systems.

On the assembly line, products are tracked using barcodes and more than 30 touchscreen computers on the shop floor contain detailed online assembly instructions.

An automated warehouse system improves the transfer of parts to the assembly line. Visit 16/D36 to see cabs produced for a variety of OEMs.

Its sister company, **Yaris Otomotiv**, was established in nearby Bursa in 2005, producing ROPS, welded assemblies, hood grilles, polyurethane inners, trim parts, floormats, sheetmetal fenders and a variety of plastic parts for industrial applications such as tractor and earthmoving machinery. It produced 300,000 grilles, 15,000 platforms and 75,000 polyurethane parts last year. These products will be on display at 16D36.

Processes used include laser cutting, CNC bending, sheetmetal forming (up to 800 tons), robotic welding electrostatic powder paint and e-coating. Its main customers are Türk Traktör A.S., CNHi, Alçelik Çelik Yapi Insaat San.Tic. A.S., Basak Traktör Is ve Tarim, Makinalari San. Tic. A.S., Gallignani, Yagmur Tarim Mak.San.Tic. A.S., Hattat Tarim Makinalari San.Tic. A.S., Yaris Kabin A.S., Hema Endüstri A.S., Polkima Polyster Kimya A.S.

The welding quality is checked by the internal labs and reported to customers regularly. The dimensional laboratories use GOM, Zeiss, and Romer measuring systems.

Yaris Otomotiv employs 400 people and has tooling design capabilities in-house. The software used includes Catia V5, Solidworks, Microsoft Dynamics AX and SharePoint.

Car Studio Yaris Design is a joint-venture of Car Studio S.N.C., Yaris Kabin San.Tic. A.S. and Yaris Otomotiv Mak. San.Tic. A.S.

Headquartered in Bursa, Turkey, the company provides design and engineering services including reverse engineering, style sketches, concept development, technical



Ergonomic analyses are a key part of Car Studio Yaris Design's business

documentation, 3D prototyping additive printing, and highresolution rendered images and videos for marketing use. Seatingbuck production and ergonomic analyses are conducted using Creo Manikin extension. The software used includes Autodesk Alias 2016 , Showcase 2016, 3ds Max 2016, CREO 3.0, NX 10. Visit 16D36 to discuss its design and engineering services with the experts.

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EVERY DAY MILLIONS OF PEOPLE RELY ON INNOVATIVE AND CREATIVE SOLUTIONS MADE BY GRAMMER





ELECTRONICS

Curtiss-Wright's Industrial division – a recognized leader in providing components and subsystems for a wide range of agricultural applications – will be using Hall 15/A10 to promote products from its legacy brands of Arens Controls, Penny & Giles and Williams Controls.

With the industry moving away from discrete hydraulic controls, fully electronic operator controls will offer huge improvements in reliability and operational comfort, and improve vehicle productivity and reduce operator fatigue.

The Penny & Giles JC1500, JC6000 and JC8000 joystick controllers are available in singleand multi-axis configurations and multiple handle options to provide proportional control within the HMI for numerous applications. Its linear, rotary and tilt sensors are also suitable for numerous agricultural applications.

Complementary systems from Williams Controls include leveroperated and rotary electronic hand controls, standard and customizable heavy-duty joysticks, and contact and non-contact rotary sensors. Floor-mounted pedals such as the WM-537 are extremely durable and provide outstanding performance.

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For agricultural vehicle control applications, operator interface



ABOVE: IFM's mobile 3D smart sensor 03M151



ABOVE: TT Control's TTC 30X family of CANopen Safety I/O modules have completed safety certification



Joysticks from Penny & Giles will be just part of the display at the Curtiss-Wright stand

control and power management systems from Arens Controls include the single- and dual-lever T Series cable-operated shifters for automatic and hydrostatic transmissions, and fully customizable C Series range of lever controls with options to remotely actuate hydraulic valves via push-pull cable or rod linkage.

The Essen, Germany-based automation technology and sensor manufacturer **ifm electronic** has now added intelligent 3D sensors for mobile machines to its product line. The focus is, among others, on the automation of agricultural machinery. At this year's show, (15/G34) ifm will present a 3D smart sensor

CAN IS GOING NOWHERE!

Holger Zeltwanger, managing director of CiA (CAN in Automation), says everyone may be talking about the Internet of Things these days, but it is really just 'new wine in old bottles'



In many industrial and commercial vehicles, CAN networks are true workhorses. They transmit data in the diesel powertrain, in the vehicle body, and in the more machinerelated parts. This is particularly true for self-propelled agricultural machines – in particular, combine and forage harvesters are equipped with several CAN networks, some of them connected by bridges, routers and gateways. The CAN datalink and physical layer are internationally standardized. However, the higher layer protocols are frequently still proprietary, although in diesel powertrains the J1939 application profile is mainly used. There have been, of course, some OEM-specific extensions implemented, but in general they comply with J1939-21 and J1939-71.

In the agricultural industry, the CAN-based ISObus, internationally standardized in the ISO 11787 series, is being increasingly adopted. This communication standard is dedicated to the communication between a tractor and one or more implements. Unfortunately, the bandwidth is limited to 250Kbs. To overcome this, the industry is looking for a so-called high-speed ISObus. As far as I can see, an Ethernet solution is preferred.

CAN FD, the improved CAN datalink layer, is not a candidate for this application. Nevertheless, CAN FD might be used as an upgrade for the embedded networks in the body, in the powertrain, or in the implements.

If, one day, ISObus is based on Ethernet and the embedded networks are based on the CANopen higher layer protocol, it would be possible to make use of the already specified CANopen to TCP/IP gateway. The CiA 309 specification describes an





providing automatic line guidance, for example, to automatically follow a swath.

Due to a highly developed algorithm from the automotive industry, the system recognizes the scene in front of the vehicle and, by extension, the swath, within a fraction of a second. Besides the actual line guidance, the volume flow of the harvested material can be determined at the same time, and the speed of the tractor unit or harvester can be adapted to the respective quantity of material.

The patented 3D time-of-flight principle developed by ifm is not only fast and robust, but also offers an as-yet unequalled price/ There's no uncertainty involved – Epec's 5050 is now available as a CODESYS 3.5 programmable version performance ratio thanks to the efficient system-on-chip production.

3D sensors from ifm electronic have now been used in agricultural machinery for many years, ensuring more efficient harvesting and support for the operator.

TTControl – Hydac

International (16/A08) has completed the safety certification of its CANopen Safety I/O modules. Two variants of the HY-TTC 30X family – HY-TTC 30XSH and HY-TTC 30XSI – have been assessed and certified in accordance with EN ISO 13849-1:2008 (Performance Level c) by TÜV Nord. At the same time, the EC-type examination has been completed and approved, and the EC declaration of conformity has been issued.

The modules can be used as I/O extensions for safety-relevant functions of control systems for mobile machinery. The standardized CANopen Safety protocol is used for communication with the master controller. TTControl's customers benefit from the TÜV certification: as an off-the-shelf module delivered with ready-to-run software, it can easily be integrated into a safetyrelevant system. The module's hardware metrics (MTTFd and DC values) are available on an I/O level, so the performance level for the whole system can be easily determined.

The modules provide a wide range of configurable I/Os and allow local current control for its PWM outputs. All I/O slave modules are delivered with ready-to-run software and an electronic datasheet (EDS-File). When the master is programmed in CODESYS, the EDS-File can be easily imported into the CODESYS development environment.

Displayed at 15/F39, **Epec**'s 5050 control unit is now available as a CODESYS 3.5 programmable version. At the same time, the company has also released improved 5050 hardware versions (both 4MB and 8MB RAM memory versions).

The new hardware versions have an improved analog input overcurrent protection feature. Whereas the previous 5050 products only have hardware protection, this is implemented using a combination of hardware and software protection, giving more flexibility for using the analog inputs. The software protection feature is implemented as a CODESYS application library and automatically included to the code template generated by Epec MultiTool to make it convenient for application developers using it.

CODESYS 3.5 offers some unique benefits for application development compared with CODESYS 2.3, such as modern and improved editing and the possibility to extend the

ASCII-based protocol to access a CANopen network from a Ethernet device. Of course, CANopen is going to be used in CAN FD networks. The related CANopen FD application layer is already under development.

The newly developed USDO (Universal Service Data Object) will provide high flexibility as well as communications services for remote access to devices in other networks. This sounds rather like what we often discuss these days under the term of Internet of Things (IoT).

With this approach, we do not address devices as such but rather the functional elements, wherever they are located. All the necessary building blocks are already available or under development and will be released within the next year. Of course, this is complex. Some companies might not like to part with the necessary resources – but if you want to have IoT functionality in your agricultural vehicles, you have to do so! I know this industry is conservative – but the future is all about networked data. In order to simplify the complexity, standardization is a good option. Whether the SAE J1939

application profile is going toward CAN FD is not yet decided. CiA is pre-developing, in the CiA 602 series, a proposal to reuse the Parameter Group Numbers (PGNs) and to map multiples of them into a longer CAN FD. And there is still some place for Safety/Security headers. This approach also provides the opportunity to specify PGNs with other lengths than 8 byte.

The 64-byte payload is also interesting for gateway designs, because the shortest Ethernet frame also has a length of 64 byte.

Far from being an 'old lady' born in 1986, CAN is still young and will continue to be used heavily in the next 10 to 15 years in the auto industry. This is good news for the lower volume industries such as agricultural vehicles!



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Molex's ML-XT sealed connection system features a permanently bonded one-piece plug housing and seal design

functionality of CODESYS Development System by installing additional new features such as static code analysis, test manager and UML support.

The CODESYS 3.5 programmable 5050 temporarily supports only a CAN interface for software debugging and downloading, although Ethernet will be available in future Runtime releases. However, 5050 CODESYS 3.5 version supports SDO block transfer for CODESYS IDE communication. Block transfer speeds up the software download in the development phase compared with traditional SDO communication.

Both new 5050 hardware versions are available as CODESYS 2.3 and CODESYS 3.5 programmable – but be aware that it is not possible to download CODESYS 3.5 Runtime to products delivered as CODESYS 2.3 programmable or vice versa.

Displayed on the Kienzle Automotive booth (15/J020a) the **Murphy** Powercore controllers offer the flexibility, power and capabilities to handle tough jobs. Paired for electronic or mechanical engines, these controllers support J1939 communication, withstand all weather environments, and offer easy-to-read displays – even in sunlight. Available as standalone controllers and panels, they are Tier 4/Stage IV ready.

The Murphy MPC-10 Controller is an all-purpose manual/auto start and manual/auto throttling engine controller designed mainly with rental applications in mind. It is purposed primarily for applications where a wide array of inputs and outputs are not required. This powerful controller supports J1939 CAN protocols for electronically governed engines, as well as I/O for mechanical engines for fault and safety shutdowns.

While reprogrammable, the MPC-10 follows a standard operating sequence of 22 machine states that happen in a predetermined order. The menu structure is versatile, with the ability to change many settings without a PC.

Murphy's MPC-20 Controller is an out-of-box, fully sealed, industrial controller designed for use in harsh environments. Full of easy-to-use features, this powerful controller pairs with PowerVision Configuration Studio software to be customizable. The MPC-20 handles sophisticated engine diagnostics for mechanical or electronic engines. Default settings can be customized and saved with the free configuration tool.

At 15/C06, **Molex** will introduce its ML-XT sealed connection system, a highly reliable, securely sealed solution that minimizes electrical failures in grueling industrial vehicle applications, while delivering assembly cost savings to OEMs



BELOW RIGHT: **TE** Industrial & Commercial Transportation products help protect electrical connections



and harness makers. Rated IP68 and J2030 power-wash capable, the ML-XT system features a one-piece plug housing and seal design, which is permanently bonded using cuttingedge, two-shot LSR (liquid silicone rubber) molding technology.

The ML-XT rear seals are made from high-consistency rubber (HCR) for greater protection and tear resistance during terminal insertion and extraction. The protective rear covers allow for flexible cable exits and cable movement, while still maintaining the optimum seal position to prevent leak paths.

Wedgelocks, or TPAs (terminal position assurances), lock the terminals in position for a reliable electrical contact, while the plug housing features an integral locking latch for secure mating.

The ML-XT system is currently offered in 2-, 4-, 6- and 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 easy visual mating of harnesses to prevent mis-mating.

TE Connectivity Industrial & Commercial Transportation (TE) will be presenting its extensive portfolio of rugged electrical connectors and sensors – specifically designed to stand up to the challenges of the agricultural industry – at 16/F08.

Because vibration, moisture, dust and mud can quickly render an electrical system useless and cause operations to come to a halt, many agricultural equipment OEMs turn to TE for help.

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innovative solutions to meet numerous design and application requirements. Included in the company's product portfolio are the heavy-duty industrial Deutsch, HDSCS, Leavyseal, Superseal 1.0, Circular DIN, Ampseal, and Ampseal 16 connectors. These connectors accommodate wire sizes from 0.20mm² to 25.00mm², include cavity arrangements from 1 to 128, and feature several rugged shell materials.

As one of the largest sensor companies in the world, TE offers a variety of sensor solutions that are designed for agricultural equipment. Its portfolio ranges from level and temperature sensors, to DEF quality, humidity and pressure sensors.

Radio control systems, cable control systems and infrared control systems are increasingly being used in many industries such as construction, forestry and municipal vehicles and systems. The functional safety of the product and system is always in the foreground for all of these professional applications.

In addition, we are seeing the market's development toward a higher machine and product intelligence that leads to further functions of the controls, such as for machine management and control.

The safety requirements therefore set high standards for the quality and sophistication of all technical components, particularly for a radio control system. If a radio control system is part of an innovative development, as a developer and manufacturer with extensive depth of production, **NBB** will be an ideal



partner – the company offers a wide range of experience in application technology gained over many years, with extensive technical knowledge for specific or innovative solutions for control systems via radio.

Established in 1978, the company's first products were used for controlling forestry winches. In the 1980s, the product program was extended with the introduction of controls for construction and industrial cranes. Today, the main focus of its product range concerns the mobile hydraulic area, hydraulic applications and handheld machines – find out more at 26/C36.

"Creating the perfect interface between man and machine" – this is the answer concisely given by **Wachendorff Elektronik** (15/ H49) when faced with the question of the future: "Just how can the increasing functionality of mobile machinery be handled without overwhelming the user?"

The German company is inextricably linked with the world's first agricultural-based electronic operating concept developed back in 1998. Since then, it has been The Opus A8 is Wachendorff's new flagship display, with a high-resolution 12.1in modern screen

BELOW LEFT: NBB's Nano-M SMJ with 4.3in LCD color display

BELOW: maximatecc's CrossFire SX and CCpilot XM (bottom)





optimizing its successful core product, the Opus series, and is renowned for its innovative technologies well beyond Germany's borders.

Since November 2014, it has been a fully integrated member of the Topcon family, being selected as its Display Development Competence Center Europe.

At Agritechnica, the company is set to present its new flagship – the Opus A8. Setting new standards with its high-resolution, 12.1in screen and aluminum casing, the Opus A8 has a high-class, modern look that will look at home virtually anywhere.

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.

maximatecc will showcase the CrossFire SX – a new safety certified I/O controller – at 15/J04. With its I/O flexibility and range of options for software programming, CrossFire SX offers system developers and OEMs an open platform for easy design of safe machine control systems.

The controller is based on a modern ARM Cortex R4 Safety CPU, enabling an efficient implementation of safety functionality. The result is a safe controller, meeting ISO 13849 PL d and IEC61131 SIL2 safety requirements, at a similar cost to a non-safe controller.

CrossFire SX has 16 inputs and 16 outputs, all totally configurable in terms of I/O type. Inputs support digital, current, frequency and voltage on different levels.

Outputs support high and low current outputs, PWM, PWMi, Digital HS/LS and H-bridge.

CrossFire SX is freely programmable in either C or CODESYS. It has CANopen Safety and a set of safety features that make it easy for system developers to implement safety functions. The controller features three CAN interfaces supporting either CANopen or SAE J1939.

With an attractive cost per I/O channel and a compact and robust design, CrossFire SX now makes it possible to design a distributed control system, and gain all the

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technical and performance benefits such a system brings, while keeping system cost low.

The latest upgrades to the **Bauser** display range will be highlighted at 15/G42. 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 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 (320x240) to 7in (1024x600) color transmissive TFT displays with LED backlight between 350-1,000cd/m² over a lifetime of up to 50,000hrs. 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.





ABOVE: ISObus is the new standard interface for Gessmann's V85 (top) and V25 (above) joysticks

ABOVE RIGHT: Bauser's wide range of displays offer extensive data connectivity options





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.

Makersan, an innovative manufacturer of engine throttle and motion controllers, will display its widened product range which makes optimum use of fully redundant, contactless Hall-effect technology manufactured at its integrated factory in Turkey, at 15/C19.

All of the company's accelerator pedals and hand throttles, designed for use with commercial and specialpurpose vehicles, are equipped with contactless and non-wearing Hallsensor systems.

In addition to superb levels of mechanical durability and very high (IP6K9) IP protection level, the quality features of its throttle controllers also include a redundant design for both return springs and the redundancy principle at the signal output on two channels.

At the same time, Makersan has developed the use of Hall sensors with technology that enables it to offer throttle controls with CANbus protocols, SAE J1939 and CANopen on request.

A developer and producer of highperformance joysticks with electronic



interface adaptors for all offhighway machinery, **Gessmann** will present its newest products at 16/F17. Developments over recent years have shown that ISObus is the new standard for agricultural vehicles and attachments. As a result, the joysticks need to follow this standard to perfectly integrate with the new systems.

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Gessmann has developed ISObus as a new standard interface for its latest V25 and V85 Hall-effect joysticks. Besides CANopen, J1939, ProfiBus, ProfiNet, PVG32, voltage or current interfaces, the ISObus interface will make it much easier for customers to implement new joysticks into existing systems as well as new platforms.

Together with the most ergonomic handles and individual configuration possibilities, these joysticks easily meet all customer requirements at the highest quality level. All that – and this is what makes Gessmann truly unique – is possible not only for high-volume applications, but also for small quantities or even one-off joysticks.

The new **Nordic Lights** Gemini LED N4701 work light offers a

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dazzling light output with an evenly distributed light pattern. Featuring a theoretical output of 40,300 lm and an operational lumen output of 252,00 lm, and a power consumption of 300W, it gives a high lumen/watt efficacy. The work lamp is offered in two light patterns: high beam and flood. At 409x318x137mm and with a weight of 18kg, it is undoubtedly a very robust model.

🚅 AGRI

The Gemini is available in two additional versions. The N4702 model offers 18,000 operational lumens at 270W, while the N4703 offers 13,800 operational lumens at 240W and also has a pencil beam light pattern.

The 24V lamp offers an optically even distribution of light pattern, has a long lifetime, and requires minimum maintenance as a result of its heavy-duty construction. It is waterproof, has extensive EMC, and is protected against load dumps, overvoltage, reverse voltage and overheating.

The light's IP rating covers IP68, IP6K9K and SAE J1455, and it withstands salt mist according to ISO 9227 for more than 240 hours. The Nordic Gemini LED N4701 fulfills the EMC standards of ISO 13766. ISO 14982 and ISO 7637-2. and is available with five different lens colors.

Nordic Lights is based in Finland and develops and manufactures LED, HID (Xenon) and halogen work lights for the heavy-duty onroad and off-road industries in

harsh working environments. Its products ensure that neither darkness, vibration, shock, dust or humidity will affect visibility when the results of an operator's work and safety depend on effective lighting. Find out more in 15/C10.

LED technology is becoming increasingly popular for agricultural vehicles, not only due to its potential for saving energy, but also because it can be used to highlight the features of a particular brand. In recent times, the design, aesthetics and individuality of agricultural vehicles have had to fulfill increasingly sophisticated requirements. This trend is reflected particularly strongly in vehicle lighting.

BELOW: Nordic Lights work lamps have been developed to meet demanding mining industry requirements





LEFT: Hella's automotivestyle design for the Deutz-Fahr Series 9. Its LED lights (above) are available in many forms

As a lighting specialist, Hella (16/D15) is at the forefront of this development and is applying its many years of experience in original automotive equipment to the field, with a wide selection of products ranging from standard high-power LED modules through to innovative, customized LED lighting solutions.

Hella always works closely with OEMs and designers so that defined requirements such as available space, light output, type of illumination and legal regulations can be established early on to allow the element of design to be given full consideration. Light simulations and rough layouts precede the design and simulation phase to form a basis for the construction of prototypes.

Similarly, customized work lights can be designed at this point so that they can be used in several model series in a modular form, unleashing the full potential offered by LED technology to initiate new trends.

Hella products are renowned for their consistently outstanding quality. This is achieved by defining quality criteria and checking every detail using carefully selected methods throughout the entire manufacturing process. Production quality is ensured by parallel quality monitoring and testing.

The company also demonstrates enormous flexibility when it comes to the production of small volume numbers. Assembly lines can be converted in a very short space of time to realize very different products.

"This ability is essential given the development in the agricultural vehicle sector toward customized and semi-customized LED worklight bezels," says Kristian Vuksan, head of innovation management in the off-highway division.

The Deutz-Fahr Series 9 is revolutionary in this respect. Working with the OEM, Hella created the first fully customized LED worklight bezel in automobile design, lending the new tractor an unmistakable and stylish appearance and generating an impressive output of 4,200 lumens.

"This approach is allowing us to systematically extend our expertise as a specialist for custom-tailored lighting systems for agricultural vehicles," Vuksan concludes. iVT



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ADVERTISING FEATURE

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AUSTRIA'S MAUSER CONTINUES SETTING STANDARDS IN CABS

ounded as a small family firm in 1960, Mauser has grown to be a highly respected mid-sized supplier of cabs for all sorts of vehicles. The company combines engineering design and manufacturing under one roof. Its motto: if Mauser doesn't have your cab, we'll make it. The philosophy seems to be paying off: with over 200 employees and full order books, the prospects are looking good.

The cab is key to the success of a work vehicle. Cabs have essential roles in safety, protection from weather and comfort, but also in ergonomics and productivity. A vehicle may be equipped with excellent technology for its special purpose, but to achieve the best performance of the machine, the human operator also must have an optimal working environment. Walter Mauser GmbH knows what it takes to create that workplace, in many different kinds of industrial vehicles.

From tractors to construction machines and utility vehicles, from forklifts to golf carts, from street cleaning vehicles to special harvesting machines – every cab is used differently. Mauser currently makes 147 different models. Some are more complex than others: the spectrum reaches from roll bars and safety cages to fully enclosed models with complex shapes and special fixtures for instruments and controls. In this business, customization is standard.

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What it also takes to make good cabs is reliability. A cab should simply work for the lifetime of the vehicle





– not create problems with rust or wear, or because parts are not adequately dimensioned. Because cab designs need to be individual, but are produced in relatively small series compared with other vehicles, it is a challenge to create products that give practical and trouble-free service from the start. There is no shortcut to this quality of engineering – only a highly experienced and competent development team can deliver the goods.

The other side of reliability is the quality of manufacturing. There is no substitute for good





November 8-14 Hanover, Germany Hall 16 Stand D42 www.mauser-cabs.eu

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workmanship. Just to take one example, the durability of a cab depends on the quality of the paint – and not just on the outside, but also in the cavities, where you can't see. And that in turn depends on how thoroughly the metal is cleaned before coating. Keeping up the highest standards when nobody is looking is the definition of good workmanship.

Bringing all of these aspects together is where Mauser's history and philosophy come into play. The company stands firmly in the tradition of mid-sized, family-run engineering firms that is characteristic of



Austrian industry. It has been in the business of making cabs for over 50 years. Its engineers have built up a wealth of experience, which is the foundation for meeting customers' individual needs. Another part of the Mauser philosophy is doing everything in-house. Cutting, forming, welding, machining – the full range of metalworking processes is handled by Mauser's own craftsmen on state-of-the-art equipment. The plant also has its own coating unit to apply CDE base coat and then powder coat, giving the cabs a highly durable and aesthetic finish. The intention is obvious: this company aspires to be a trusted name. But that trust doesn't have to be blind: certifications to ISO

9001:2008 and EN ISO 3834-2:2005 confirm that Mauser is a solid proposition.

However, just because Mauser has invested so much in tradition does not mean that the company is a stranger to innovation. On the contrary – besides the ongoing development work on individual customer projects, a dedicated team has been working on the future of cab technology. Cab2020 is the name of the project and the result will be a completely new cab concept. Mauser will present details of this pioneering design at Agritechnica in Hanover in November. Maybe you'd like to visit the company there (16D42) and find out more!



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THE INTRODUCTION OF A RANGE OF SUPPLEMENTARY TECHNOLOGIES DESIGNED TO GET EVEN MORE OUT OF AN EXTENSIVE ENGINE LINE-UP IS A STRATEGY THAT WILL BOOST FUEL ECONOMY, ENHANCE INTEGRATION ON THE MACHINE AND ENSURE FULL EMISSIONS CERTIFICATION

Cummins will officially reveal a range of diverse technologies to meet the upcoming needs of the agricultural market at Agritechnica in November. Complementing a full diesel engine line-up at the show, these component innovations will enhance fuel efficiency, performance and reliability of agricultural equipment across the board.

Introducing the first of a next generation of aftertreatment platforms for compliance with future emissions regulations, the single-module platform product offers a potential solution for the Stage V regulations commencing in Europe from 2019. A small, lightweight, simple and robust advanced aftertreatment system package designed for diesel engines from 4-16 liters, it is up to 60% smaller and 40% lighter than today's combined SCR and DPF systems, while delivering advanced emissions reductions. The system enables easier equipment integration for agricultural equipment OEMs, while its lighter package minimizes the impact on equipment weight, which will contribute toward improving fuel economy and reducing soil compaction.

Advancements in catalyst technologies are enabling efficiency improvements throughout the entire system, and Cummins has invested in diesel particulate filter technologies offering higher ash capacities, so as to allow for more time between cleaning intervals for its customers. The SCR catalysts, coupled with the UL2 liquid-only urea dosing system, offer enhanced NOx reduction and, linked with improved thermal management capability, deliver the optimum solution for emissions reduction and minimized fuel and AdBlue (DEF) usage.

Turbocharging and CCV technology

Revealing the latest advancements in wastegate technology, the electric wastegate turbocharger is suitable for a range of engines from 3-16 liters. This new turbocharger has been engineered to increase the fuel efficiency of a modern diesel engine. With its fast response and precise control at all areas of the engine performance envelope, it helps to improve performance and reduce emissions to meet the stringent targets of the market. Offering two actuator options, the electric wastegate also ensures flexibility and reliability for the customer.

The company will also be displaying another of its diverse range of technical solutions, the M² two-stage



system with wastegate technology. Yet another first reveal for the agricultural market, this two-stage turbocharger enables improved performance for the end user, providing benefits in transient response via its high- and lower-pressure turbos, which also ensure machinery can meet the desired speeds faster and more efficiently to increase productivity during the busy harvest.

Also on show, the latest crankcase ventilation technology has best-in-class separation efficiencies as well as turbocharger protection. The modular design of the product ensures easy engine integration while using less energy than the competition. This latest technology enables customers to not only meet current emissions requirements, but prepares them for future regulations by considerably lowering total engine emissions and ultimately minimizing the impact each vehicle leaves on our environment.

"These diverse component technologies deliver a number of technical advances to satisfy the market and customers' future demands," says Suzanne Wells, executive director, sales and marketing, components business. "Engine component technologies have a huge impact on the efficiency, reliability and overall performance of the engine, so it is critical for us as a business to be leading the way in these advances and be in a strong position to offer our customers a range of solutions for the future."

As well as the new products on display, Cummins will also announce technical advances in fuel system technology. A new closed-loop fuel control is in development that will ensure consistent fuel injector performance throughout the lifetime of the engine, offering some major improvements in performance and reliability.

As the agricultural industry transitions to greater needs for efficiency, reliability and performance, improvements in engine componentry are becoming increasingly desirable. These next-generation products from Cummins provide a robust solution to this evergrowing need. iVT

Tim Eady is components marketing communications leader at Cummins



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ENGINE & PUMP CONTROL MADE EASY



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The DSEE400 and DSEE800 are designed and manufactured in the UK for high quality and reliability, offering many advanced features for engine applications. Operating parameters, sequences, timers and alarms are easily changed, allowing the products to be adapted for use, allowing OEMs to standardise on one product, while covering multiple applications.

The new DSEE400 is a compact, waterproof module with a combination of multi flex and digital inputs, dedicated emergency stop and configurable outputs.

The DSEE800 includes configurable digital and ratiometric inputs, configurable DC and PWM outputs, remote communications and sophisticated data logging and trending.

Engine protections, status, diagnostics, alarms and an event scheduler, is displayed on a clear LCD screen in a choice of languages, making both units suitable for overseas projects.

Both modules are compatible with conventional engines and the latest Tier IV electronic (CAN) engines, providing built-in governor control, pump control, automatic and manual speed control including speed ramping, clutch control and flexible automatic start control. The CAN features include full DPF regeneration management to help prolong engine life. Many other features are included as standard. ۲

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PRODUCTS & SERVICES



Behind the beet

BEHIND EVERY SUCCESSFUL BEET HARVESTER – OR HOLMER'S TERRA DOS, TO BE EXACT – LIES AN MTU 1500 SERIES ENGINE THAT OFFERS AN IDEAL MIX OF OPERATIONAL BENEFITS AND EMISSIONS COMPLIANCE

At the Holmer plant in Eggmühl, Germany, up to 10 giant Terra Dos beet harvesters are manufactured weekly, each combining approximately 40,000 individual parts. At a length of 15m, a width of 3m and a height of 4m, the beet harvester is one of the largest agricultural machines. "But the Terra Dos is still kinder to the ground than a woman wearing stilettos," explains Eduard Richer, who has worked for the agricultural machinery OEM for 20 years, first as a mechanic and now as a developer, or 'tinkerer'.

Today, he is driving a beet harvester to a field next to the factory for a quality check. This can be done without any beet, and involves shaking, jogging, extending and retracting the machine, as well as fully testing all the other functions. "We do this with all of our vehicles before they are delivered to the end customer," explains Richer. His colleague, senior marketing manager Andrea Heinrich, also confirms that "Top quality is very important to us. We cannot afford for a beet harvester to break down during the harvest, when every day counts for the farmers."

It is for this reason that Holmer relies on MTU 1500 series Tier 4 Final-compliant engines. "MTU is a wellestablished name – you know what you are getting from them," states Heinrich. "The emission standard, the service network and the engine settings are very important to us," adds Richer. "During the harvest, the machines must be able to keep running, and a mechanic must be on-site as quickly as possible in the event of an emergency."

The MTU 6R 1500 series is specifically equipped for these needs. "Heavy loads and changing speed ranges are not a problem for the engine," says Frank Bühl, head of sales at MTU Friedrichshafen. "Furthermore, the 1500 series provides its maximum torque at 1,300rpm, which is precisely in the range at which the Terra Dos mostly runs. This also means that fuel costs can be reduced."

With an output of 460kW, the engine provides enough power for tough applications. And Heinrich is impressed by something else: "We finally have an engine that sounds incredible!"

The MTU Series 1500 six-cylinder in-line diesel engines cover a power range from 400-460kW (536-617bhp) and were developed specifically for powerintensive off-highway applications. Meeting the latest emissions requirements using only EGR and an SCR system, the units do not need DPFs.

With the 1500 Series, MTU offers a robust and space-saving system that can be installed with a





minimum of fuss due to standardized mechanical and electronic interfaces. Manufacturer and end-users alike benefit from this reliable and economical solution: fuel consumption is notably better and service life longer than the predecessor engines, there is higher torque at low RPM, plus quick and easy maintenance.

The beet surrender

To harvest sugar beets that each weigh up to 1.5kg, all the driver has to do is choose the correct setting on the Terra Dos. From that point onward, the high-tech vehicle does almost everything automatically – the automatic fold-out system moves the harvester into the harvesting position, where vibrating blades lift the beet before the beet rollers pass them on for cleaning. Once in the silo, they are distributed using several augers, until all of the 45m³ capacity is filled.

"On average, our Terra Dos can be used to harvest one hectare [approximately 95,000 beets] per hour," explains Richer. During the harvest, the pressure is taken off the driver as far as possible. If all the settings have been made in the cockpit, the machine does almost everything automatically. In fact, "to fight the boredom, some farmers have even fitted a PlayStation in the cockpit," claims Heinrich.

People all over the world rely on technology developed by Holmer. The Terra Dos gives farmers a pure high-tech product: thanks to the fully floating front axle, the driver is not shaken about. Moreover, the drivers can make every possible setting for themselves, or they can allow the automatic system to take over so they simply monitor the process; for example, at which height the beets are topped, how wide the row distances should be, or how much cleaning power should be used. In the past, the driver had to painstakingly get off the machine to make certain settings, but everything is now integrated in the company's own software. As a result, previously back-breaking work has now been simplified.

"For me, a Holmer is also something you can be proud of," concludes Heinrich enthusiastically. "Other people say: 'My wife, my house, my car', but I would say: 'My house, my yacht, my Holmer'."

MTU will showcase the 6R 1500, 6R 1000 and 10V 1600 engines at Agritechnica. It will also be highlighting its ValueCare service program. **NT**

Yvonne Wirth is editor-in-chief of the customer magazine MTU Report, and is in charge of the MTU Report web magazine (www.mtu-report.com)




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AGRI TECHNICA The World's No.1 November 8-14 Hanover, Germany Hall 13 Stand D30

MARTIN RYLEY

PRODUCTS & SERVICES

Managing expectations

AN INTEGRATED EMISSIONS CONTROL SYSTEM THAT ENSURES EFFECTIVE COMPLIANCE WITH THE LATEST REQUIREMENTS, AND A TELEMATICS SOLUTION THAT ENABLES OEMS TO OPTIMIZE OPERATION OF THEIR MACHINES – WOULD YOU EXPECT ANYTHING LESS?

In showcasing five engines (the 2.9L, 4.5L, 6.8L, 9.0L and 13.5L) plus its Integrated Emissions Control system, John Deere Power Systems (JDPS) will be exhibiting its entire Tier 4 Final/Stage IV off-highway diesel engine range at Agritechnica.

Constantly striving to better meet its customers' needs, the company has developed a range that offers low cost of operation, optimal equipment performance and confidence, thanks to the proven reliability of its engines. To meet Tier 4 Final/Stage IV emissions regulations, JDPS has continued with its planned approach by developing an Integrated Emissions Control system, encompassing a variety of aftertreatment and emissions-reduction component combinations. Integrated Emissions Control system technology configurations are tailored to meet regulations and customer needs in each power range.

JDPS is offering three Integrated Emissions Control system configurations for Tier 4 Final/Stage IV engines: • For the 36-55kW (48-74hp) power range, it is offering engine models using an exhaust filter that contains a diesel oxidation catalyst/diesel particulate filter (DOC/DPF) and without requiring the use of cooled exhaust gas recirculation (EGR) or selective catalytic reduction (SCR).

• In the 56-104kW (75-140hp) power category, the PowerTech PWL 4.5L engine is equipped with a cooled EGR and an Integrated Emissions Control system configured with SCR and a DOC.

• Engines in the 93kW (125hp) and above power range will feature an Integrated Emissions Control system consisting of cooled exhaust gas recirculation, a DOC/DPF and SCR.

All John Deere Integrated Emissions Control systems are designed to meet the specific demands of off-highway applications.

As well as powering John Deere's inimitable yellow and green machines, JDPS engines are also installed in a wide range of equipment from other OEMs, including feeder mixers, harvesters, spreaders, sprayers, handling equipment, irrigation pumps and other specific applications – such as the RM8100, a silage bagging machine manufactured by Budissa BAG, an innovative German company that will also be present at Agritechnica (Hall 7, Stand B12).

As revealed by Stefan Bresan, technical director at Budissa BAG, "When we started bagger machine production in Germany, we chose a John Deere





engine for our mechanical models. The Tier 4 Interim/ Stage IIIB 6.8L engine gives the RM8100 just the right power while keeping noise levels down.

"John Deere's engine distributor, DGS GmbH, has proved very competent, is always available to help and made some engine modifications to ensure a perfect fit. We work with over 30 dealers worldwide, so John Deere's global service points are a real plus."

Introducing John Deere PowerSight

John Deere is a leader in the development of innovative machine management solutions including telematics. The company offers exclusive John Deere FarmSight technology suites to help agricultural customers turn data into fleet management and LEFT: PowerTech PSS 6.8L Tier 4 Final/Stage IV John Deere engine

BELOW LEFT: The compaction pressure pushes BAG's RM8100 bagger, leaving the bagged forage behind

maintenance answers. Introduced at Intermat 2015, JDPS will present a corresponding solution for its offhighway diesel engines installed in OEM equipment: John Deere PowerSight. The telematics offering was unveiled in the US market in 2014 and is now being introduced to the European market.

More than just a telematics system, John Deere PowerSight is an umbrella of John Deere technologies and solutions that integrate seamlessly to help customers manage their equipment. Today, the technology features four components: the JDLink machine monitoring system, remote diagnostics and programming, machine health prognostics, and the John Deere PowerAssist mobile app.

John Deere PowerSight offers a robust equipment management solution – including industry-unique remote diagnostics and programming capabilities – for JDPS Tier 3/Stage IIIA, Tier 4i/Stage IIIB and Tier 4 Final/Stage IV engines installed in OEM equipment.

Using the suite of services available in John Deere PowerSight, customers can optimize the uptime and operation of their machines, increase productivity and manage total cost of ownership. Future enhancements of John Deere PowerSight are planned to provide customized whole-machine functionality. **IVT**

Martin Ryley is manager of marketing support and sales engineering EAME for John Deere Power Systems



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Good News for Diesel Engines

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Multi-Wing introduces...

its new axial fan with exceptionally high pressure capabilities - the PMAX3. With a high-strength design it is built specifically for rugged Tier 4 applications. The PMAX3 has a very narrow axial depth and a minimum axial deflection which makes it a perfect fit for compact engine compartments. The hub parts are specifically designed to accommodate clutches to optimize fuel consumption.

The PMAX3 fits the Multi-Wing modular design giving 12 possible pitch angles to match different duty points. It has an available diameter range of 445 to 640 millimeters and is molded in glass-reinforced polyamide.

Meet Multi-Wing at AGRITECHNICA in Hanover - Germany: Hall 17, Stand no. E45

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The stage is set

NOT CONTENT WITH JUST MEETING TIER 4 FINAL, ONE ENGINE MANUFACTURER'S USE OF ELECTRONIC CONTROLS TO ENABLE MORE PRECISE COMBUSTION IS SET TO PAY DIVIDENDS WHEN IT COMES TO MEETING STAGE V TOO



Starting at Intermat 2015, Yanmar introduced a new philosophy to its engine design. The idea is to gradually introduce a raft of smart new techniques that will help the company to stay one step ahead of the emissions legislation.

While many manufacturers adopt features such as common-rail fuel systems and DPFs, Yanmar is differentiating itself with its electronic controls. By monitoring a host of factors such as the temperature and oxygen level of the surrounding air and engine loading, the ECU can determine the optimum running conditions to deliver maximum combustion efficiency – even in cold environments or at altitude.

As the industry embraces EU Stage IIIB/Tier 4 compliance, these subtle differences will become increasingly important over an engine's lifetime. Yanmar's latest engines comfortably meet US EPA Tier 4/EU Stage IIIB requirements, and also already meet the proposed EU Stage V with the PM limit regulations expected in 2019.

One of the traditional grumbles about the DPF method of particulate reduction has been that of time: they just don't heat up quickly enough, and fuel economy can suffer. However, with carefully designed electronic controls, precise combustion is possible, reducing particulate matter at source and, with improved DPF design, excellent environmental standards can be achieved.

Also key with these new engines is the fact that during low loading and low temperature operation, when it is difficult to produce the high temperatures required for regeneration, rather than using oxidation heat via post-fuel injection, the company's assist regeneration system elevates the DPF temperature via the intake throttle valve and combustion controls. This enables fewer PM elimination cycles, meaning improved fuel economy overall.

This DPF exceeds 6,000 hours of use before maintenance is required. The models benefiting from this new approach range from the current TNV Common Rail Series – 3TNV88C up to 4TNV98CT – and the upcoming CHT Series, the 3TNV86CHT, 4TNV86CHT and 4TNV94FHT. Visitors to this year's Agritechnica will be able to see the full range at the booth. **iVT**

Carlo Giudici, senior manager of the Industrial Powertrain Department at Yanmar Europe in The Netherlands, is responsible for sales of Yanmar industrial diesel engines throughout Europe

THE YT TRACTOR DEBUT



Engines will not be the only new technology on show at Agritechnica, as Yanmar will be using the event to debut a large tractor concept destined for the Japanese market. Finished in a bold, bright red, the new YT series (featured in *iVT* Sept 2014, p26) draws on engine technology highlighted on the left to meet the Tier 3 Japanese emission regulations, as well as using the e-Control system to adjust engine speed, cutting fuel consumption by 20% when compared to the outgoing equivalent model. The engine is coupled to the proven Yanmar I-HMT variable transmission.

Great emphasis has been placed on operator comfort. For example, the aluminum steps up to the cab are fully adjustable, and thanks to careful ergonomic planning, all the most frequently-used controls are located in the most comfortable position above the armrest. A colour monitor is included, to ensure the clearest possible interface. This can be password-protected.

The new YT tractors can be seen in Hall 13, Stand B68 in Hanover.



FREE READER INQUIRY SERVICE

ACHIM LIECKER

PRODUCTS & SERVICES

In the line of (heavy) duty

WHETHER THEY'RE CONVEYING COOLANT, FUEL OR OIL AND AIR, HOSE LINES RUNNING THROUGH THE ENGINE BAYS OF INDUSTRIAL VEHICLES NEED TO GO ABOVE AND BEYOND WHAT IS EXPECTED OF THEM

Highly resistant, compact cooling water hoses for internal combustion engines, an electrically conductive fuel hose, and a new generation of OLN lines for oil and oil/air mixtures, are new highlights from ContiTech Mobile Fluid Systems for agricultural and other industrial vehicle applications.

High resistance to cooling water and the usual additives in the form of antifreeze and anti-corrosion agents makes the Conti cooling water hose the ideal solution for cooling systems in IC engines. It is suitable for a media temperature of up to 115°C, or briefly even 135°C. Thanks to a special strength member, it can be used at ambient temperatures of up to 190°C, or briefly even 210°C. This means no additional heat protection is required.

Where, in the past, steel-braid or Teflon lines were used, ContiTech now uses very light rubber lines, which have been adapted to the ever-increasing temperatures in the engine surrounds. The compact hose design also enables very small bending radii. The Conti cooling water hose is also configurable as a molded hose for particularly tight package spaces.

The company has also developed an alternative for higher temperatures up to 230°C, with cooling water hoses made of silicone. These can be supplied both as bulk stock and as molded hoses.

Inner lining prevents sparking

Electrically conductive fuel lines have been fitted as standard in passenger cars for some time. Now this application – not least because of the need to meet appropriate regulations in the USA – is becoming increasingly attractive for farming applications as well as industrial trucks. The conductive inner lining made of FPM (fluorocarbon rubber) prevents static build-up at high throughflow rates which, in the worst-case scenario, could result in sparking and spontaneous ignition of the vehicle.

ContiTech's highly flexible fuel lines are suitable for gasoline, diesel and biodiesel, and can withstand operating temperatures from -40° to +150°C. Another characteristic feature is their low permeation rate, while they also meet the most stringent cleanliness requirements. The outer lining is resistant to radiant heat up to 150°C, and briefly even 175°C.

Diesel fuels have been blended with renewable raw materials for some time. In Germany, up to 7% RME



ContiTech Mobile Fluid Systems has revised its lines for compressors, trucks and industrial applications, incorporating the latest in materials technology

or PME (rapeseed or palm oil methyl ester) is currently added to mineral oil-based diesel fuels, though higher RME proportions are under discussion. However, RME has been shown to be more aggressive than mineral oil diesel, which results in faster aging, and therefore earlier failure, of the conventional NBR-based hoses and lines. ContiTech Mobile Fluid Systems therefore employs modern, three-dimensionally cross-linked fluoroelastomer materials (FPM-FPM) for fuel hoses and lines which have a very wide temperature range of -40° to +200°C for use with fuels containing RME. These materials are just as non-critical for the currently used mixing ratios as for the possible increased levels in the future.

ContiTech also offers fuel lines that withstand both pure rapeseed oil and rapeseed methyl ester – also known as biodiesel – but can, in addition, also be used with conventional diesel fuel.

The next big thing with regard to fuels is dual fuel - the combined injection of natural gas and diesel



November 8-14 Hanover, Germany Hall 16 Stand G05

ContiTech's electrically conductive fuel hose prevents static build-up at high throughflow rates

fuels. The latest generation of fuel hoses represents an ideal basis for material that can be developed in this direction. The company's new elastomer fuel lines have also been adapted to the ever-increasing pressures and temperatures found in truck engine compartments. At present, they are already resistant to an operating pressure of up to 35 bar and temperatures of up to 135°C, and testing is already in progress with a view to expanding these parameters.

The company is supporting the trend toward the use of alternative fuels, which is particularly prevalent in Europe and North America, with hose assemblies for gases such as CNG and LNG.

OLN lines for hot, tight package spaces ContiTech's OLN lines are used wherever oilcontaining air has to be conveyed, such as in compressors, trucks and industrial applications. The company has now re-engineered these hoses, which have been tried-and-tested components for decades, incorporating the latest in materials technology. FKM-based hoses for oil and oil/air mixtures are the newest development, withstanding continuous temperatures of up to 230°C at 15 bar, with transient peaks of 250°C.

This is becoming necessary because of the growing trend toward enclosed units, higher engine outputs and the increasing use of turbochargers. As a result, the ambient temperatures to which the hoses and lines are exposed are rising. These latest adaptations mean that ContiTech's hoses are equipped to cope with these, and future, requirements. Other benefits are the very compact design and the capability of forming tight bending radii with these hoses, which are also available as molded hoses. **IVT**

Achim Liecker is head of sales, industrial vehicles at ContiTech Mobile Fluid Systems



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Backdraft

THE PURGING FUNCTION OF THE RDM FAN DRIVE DOESN'T JUST ENHANCE COOLING EFFICIENCY WITH ITS REVERSING FUNCTIONALITY – IT AIDS COMPLIANCE WITH THE STRICTEST EXHAUST EMISSIONS TOO

Agricultural machinery such as tractors, crop sprayers, combines and specialty harvesters operate in demanding environments that constantly expose them to dust, dirt and debris, as well as extreme temperatures. While these may be ideal conditions for wheat or corn crops, they can pose a threat to machine efficiency.

The Danfoss RDM is changing the way fan drives are implemented and is claimed to be a unique option in the design of agricultural machinery. As OEMs work to meet Stage IV/Tier 4F and eventually Stage V/Tier 5 emission regulations, Danfoss is committed to providing them with components that help optimize their systems.

The airflow of mechanical fan drives can be inefficient as they are inherently unidirectional and their performance is tied to engine speed. Many OEMs are now opting for hydraulic fan drives. Unidirectional hydraulic fan drives are commonly used in these systems to mitigate the impact of heat, but debris from the harsh agricultural conditions can block the heat exchanger and lead to overheating. With the already high air temperatures in which these machines often operate, efficiency suffers. In addition, manually clearing the debris from the cooling system requires valuable operation uptime. In extreme cases, these conditions can lead to machine breakdowns, which become even more costly. Because of these costly inefficiencies, Danfoss engineers have been exploring alternatives to unidirectional fan drives.

Getting more with less

The alternative to the mechanical and hydraulic unidirectional fan drive is one with bidirectional functionality. A reversing functionality purges trapped dirt and debris, improving cooling efficiency. In 2014, Danfoss introduced the innovative RDM, which offers the reverse circuit functionality necessary for a bidirectional fan drive. The purging function of the application, however, is just one of the efficiencyimproving benefits of the RDM.

By eliminating the directional control valve and integrating the shift valve, the Danfoss RDM reduces system design variables and opens up space for emission technologies and other innovative uses. Because of its simplified design, the RDM requires fewer components and a simplified or eliminated HIC block, resulting in less assembly time and about 15% system cost savings.



Traditional reversing systems generate heat of their own and are then responsible for eliminating this heat in addition to that of the engine. But due to the RDM design, less heat is produced from the hydraulic circuit, allowing the engine heat to be more efficiently eliminated. Additional heat challenges arise when debris gets sucked into the engine compartment. The reverse functionality of the RDM enables the debris to be blown out of the engine, restoring the machine to maximum operating condition in a quick and efficient manner. By reducing the heat generated by the hydraulic circuit and eliminating inefficiencies of a directional control valve, the RDM reduces power consumption by up to 10%. This means more power is available for machine work functions, or may allow system designers to resize the engine, and thereby optimize machine and operating costs.

With the success of the initial compact motor (available in 25cc, 30cc and 35cc displacements with a 12V integrated proportional shifting valve), Danfoss has now introduced additional RDM sizes including 38cc and 45cc displacements, a speed sensor feature and a 24V valve option. The increased displacements mean the RDM system solution will be useful for larger machines, while the speed sensor option provides more precise system efficiency control. The 24V valve enables the RDM to accommodate additional machine electric architectures.

All RDM options are complementary to the Danfoss Series 45 open-circuit axial piston pumps and fully compliant with PLUS+1 microcontrollers and DP700 PLUS+1 mobile machine displays. This makes the RDM ideal for fan drive systems in Stage IV/Tier 4F and eventually Stage V/Tier 5 agriculture equipment with their unique cooling requirements.

Regulations and cost savings continue to drive the demand for more-efficient machines. The RDM provides simplified energy and cost-saving solutions to ensure the fan drive system is effectively managing the cooling system requirements while keeping the machine on the job. **IVT**

Dieter Könemann is manager of Medium Power Sales in Europe for Danfoss Power Solutions







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Mix masters

November 8-14 Hanover, Germany Hall 17 Stand B52

EFFICIENT AND RELIABLE TRANSMISSIONS FOR FEED MIXERS HAVE NEVER BEEN IN GREATER DEMAND, AS THE NEED FOR HIGHER PERFORMANCE CONTINUES APACE

Forage mixing and processing machinery requires increased output capacity, boosted efficiency and load-sensitive operation to ensure high performance. Most modern feed mixers feature two or three augers, so intensive use of these machines requires the design of increasingly efficient solutions to reduce fuel consumption and enhance reliability.

Comer Industries has a proven 25-year track record in the design and manufacture of power transmissions for feed mixers and offers a wide product range of highly personalized, versatile and complete solutions including rigid and steering axles, a professional range of driveshafts and safety devices, heavy-duty speed change gears, planetary gearboxes, and track and wheel drives.

Systems for vertical feed mixers

A prime solution consists of an A-613 gearbox with electric actuator for integration with a tractor's ISObus system and is fitted with gear-engaged position sensors, a PGA-4203 VM modular gearbox for up to 26m³ single-auger feed mixer machines, and a PGA-2102 VM for auger activation on trailed and stationary vertical feed mixers. The A-613 gearbox is a parallel axis unit with low-noise helical gear transmission, an internal preload mechanism enabling gear change and automatic re-engagement, and an integrated fitting for pump coupling. It is available in a 2-speed version (1:1 and 1.8:1), with a transmittable power of 245hp at 1,000rpm, and is suitable for mixers with two or three augers, with capacities starting at 30m³.

The transmission was presented within the Mix tractor project developed by IDEAgri (www.ideagri. net), a network of Italian companies, including Comer Industries, that manufactures integrated systems pursuant to the ISObus standard (find out more at Agritechnica: Hall 15, Stand H44). Thanks to the electrically actuated gear change system and the implementation of the ISObus torque sensor, the IDEAgri solution allows for the monitoring of power absorption and automating gear change stages based on the progress of the mixing process.

Efficiency is ensured by high-quality gear manufacturing and by the ISObus smart system that optimizes operations.

The extremely compact and high-performance PGA-2102 VM model offers enhanced load capacity and torque output (continuous torque: 2,100daNm; maximum torque: 4,700daNm), combined with increased reliability and greater resistance under





overload conditions. These results were achieved by adopting design and technology solutions that had been already implemented by Comer Industries on wind-turbine applications.

Its main design and process innovation features are: • The forged carrier with a specific suspended configuration (patent pending);

• Higher-precision and capacity gearing that is made possible by the special shot peening and finish machining on the teeth.

The company also recently developed the PGA-4203, the largest planetary gear for feed mixers available on the market which is purpose built for up to 26m³ single-auger machines. This features heavy load peak resistance (maximum torque: 14,200daNm, input speed: 1,000rpm) and long-life component design for extended machine-life performances.

A world-class approach

High-quality product and service performances are enabled by the advanced production and assembly

LEFT: Assembly lines at the new Comer Industries facility in Reggiolo. The plant is organized according to World Class Manufacturing methodology

systems at Comer Industries' Reggiolo plant in Italy. The firm is committed to the pursuit of excellence and competitiveness in the global market through the application of World Class Manufacturing (WCM).

"We introduced the methodology of World Class Manufacturing to boost our performances and assure our customers excellent products and services," says president and CEO Fabio Storchi. "Through the application of WCM in our plants, we've standardized work methods, reduced waste and increased employee involvement for continuous improvement."

The manufacturing facility, rebuilt after the earthquake of 2012, with an investment of over \in 12m, now extends over a surface area of around 20,000m²: the gearbox assembly department for the Agri division, an innovative painting system and the shipping department have been integrated according to the most advanced technologies for energy efficiency. Much focus has been placed on cutting consumption levels, with the installation of heat pumps and floor heating, as well as on environmental impact, with the introduction of photovoltaic panels producing a quantity of energy equal to 38% of the facility's expected yearly consumption. **i**VT

Mario Arata is product line director planetary drives at Comer Industries, where he has worked since 2000



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Performance art

THIS BRAND-NEW QUIET AND HIGHLY EFFICIENT HYDROSTATIC TRANSMISSION IS WELL WORTH A CLOSER LOOK – AND WITH FUEL SAVINGS OF 15-30%, IT'S REALLY USEFUL TOO...

Poclain Hydraulics will be launching its High Performance transmission systems range at Agritechnica, showcasing the benefits it brings to a variety of machines, including self-propelled sprayers.

During the development of this new range, to demonstrate the potential gains for its customers, Poclain Hydraulics performed extensive testing. Two machines with identical configurations – aside from their transmission system – were selected: one was fitted with a Poclain Hydraulics High Performance hydrostatic transmission; the other with technology based around four axial piston motors and a gearbox.

The machines were put through the same two cycles: a testing cycle in field mode (up to 30km/h) on a circuit of 1km and a testing cycle in road mode (up to 60km/h) on a 14km circuit.

The results revealed a great deal: the use of hydraulic wheel motors with cams and radial pistons from the new High Performance range delivered an average fuel saving in the order of 15%, compared with transmissions based on axial piston motors and planetary reducers. The saving increases to 30% upon application of EcoDrive electronic management (see below). These savings have a direct impact on the TCO of the machine.

In terms of comfort, the cam motor technology more than holds its own, and is quieter than the other solutions. Indeed, while the rotational speed of the cam motors is equal to that of the wheel (ranging from 150-200rpm), that of competing hydraulic motors can exceed 4,000rpm.

A further observation was that the closed hydraulic loop fitted with the high-performance transmission registered a temperature 10°C lower than the circuit that was equipped with motors and gearboxes.

Efficiency boost

Poclain Hydraulics owes all these fine results to the development work that has made it possible to considerably reduce losses in each of the components and thereby increase their efficiency. Thus the High Performance system was born. This system comprises the new PW pumps, which were specially designed for the most demanding applications and stand out for their reliability, precision and performance. Available with integrated electronics, the PW can work under pressures of 500 bar (7,252psi).

Thanks to its two pumps, the TwinDrive solution provides an instantaneous and automatic traction





TOP: A complete High Performance system featuring the new Twindrive dual pumps circuit for efficient traction control

ABOVE: The High Performance hydrostatic transmission will improve sprayer comfort and TCO

control solution, without sacrificing the overall transmission efficiency. The new MHP motors with cams and radial pistons from the High Performance range will be officially presented at the Agritechnica show, with models ranging from 1430-3500cc.

However, an electronic layer is required for the components' excellent performance to be completely revealed. Having gained a better knowledge of each component's efficiency points, the R&D office has developed software capable of exploiting them in the most effective manner possible, and only when necessary. This is the logic behind EcoDrive system management.

The principle is relatively straightforward: the EcoDrive software automatically adjusts (with no particular action required from the operator) the diesel engine speed, while guaranteeing the machine's speed of travel by adapting the displacement of the pump or of the wheel motors. The hydraulic motors' high displacement ratio of 4 enables high road

speeds while maintaining diesel engine speed at a low level – its optimum fuel consumption point. At the slightest increase in demand for power, the diesel automatically revs up again.

Oil-immersed brake technology absorbs the large amounts of braking energy created by the machine while being mounted close to the wheel, the safest option on the market.

In addition, the new line of motors features the novel 'boosted brake' option that more than doubles the hydrostatic braking force while avoiding any extra 'driving' load on the engine during the deceleration.

Poclain Hydraulics will unveil further details of this High Performance hydrostatic transmission in Hanover. **iVT**

Yannick Seeleuthner is marketing manager for Poclain Hydraulics, which he joined in 2007



ROBERT LUONG

PRODUCTS & SERVICES

Locked and loaded

ADVANCED POSITION SENSORS HAVE ENABLED INNOVATIVE FUNCTIONALITY FOR FENDT'S CARGOPROFI FRONT LOADER, INCLUDING THRESHOLD VALUES, HYDRAULIC WEIGHING AND END POSITION DAMPING

Front-loading agricultural machines play an important role in the daily business of most farmers. Using modern front-loading mechanisms, it is possible for a broad range of different types of produce and materials to be efficiently transported from one place to another. Currently, front loader development mainly focuses on ensuring ease of use – thereby facilitating the completion of frequently recurring work sequences and increasing productivity. Maximizing the operational longevity of such equipment is, of course, among any OEM's key considerations. And, in addition, extending the functionality supported is also desirable.

Fendt is one of the world's largest producers of vehicles for use in agriculture, with many thousands of its tractors and harvesters being employed in countries all around the world. In late 2013, the company embarked on development of the CargoProfi smart front loader for its 500/700 Vario tractor series. This semi-automated front loader, which is now on the market and proving highly popular, has a built-in weighing function and mechanical parallel guidance. The CargoProfi's swing arms incorporate a variety of leading-edge sensor technologies, with length measurement sensors and encoders determining the relative position of the front loader. Tilt and pressure sensors are also present, to collect information for hydraulic weighing, as well as implementation of additional functions.

Positional sense

A useful feature that the company wanted to bring to the front loader was the capacity for swing and tool positions to be stored. This would mean that, through semi-automated movements, the vehicle operator could immediately and accurately access a specific position for recurring processes. It would thereby simplify and streamline the loading, with the operator able to execute two individual movements from just one single command. It was critical that positions could be correctly set across the entire motion range (from one extreme to the other).

Also, as a safeguard in workplaces where the available space was limited, there was a need to put threshold values in place. Once activated, it would not be possible to exceed those by either the front loader or any tool attached to it. By way of example,



ABOVE: Fendt's CargoProfi smart front loader

RIGHT: MTS Sensors' Temposonics technology

OPPOSITE PAGE, TOP: **Principles** of Temposonics magnetostrictive technology

OPPOSITE PAGE, BELOW: Intuitive user interface of CargoProfi









the lift height limit could be accordingly defined when working in barns with low headroom, or alternatively the lower blade function could be fixed when moving above ground. This function would protect against potential damage to the equipment, as well as to the environment in which it works.

Electronic end position damping was also required to be a valuable function of CargoProfi. Here the swing of the loader would be automatically slowed when reaching the mechanical and electrical end positions, thereby smoothing out rapid movements. In addition, end position damping would help to minimize the trickle of loose cargo, such as earth and crops, as well as reducing wear and tear of the swing and tool parts. To ensure compliance with these numerous exacting design, criteria reliable and precise position sensing technology would be required.

Through a combination of pressure and position sensors, hydraulic weighing would be made possible in all swing positions. The current swing position could be exactly determined and then added to the calculation of the load weight. The CargoProfi system was developed so that it would be able to control the weight of each shovel load, as well as the total cargo and target weight. In addition, it would be possible for the weight of all loads to be added together until a specified target weight was reached. The operator would receive a warning if overloading occurred. Through this innovative technology, the optimum utilization of the loading capacity could be ensured and time savings could be achieved. It was specified that the weight of the shovel content would be measurable to an accuracy of $\pm 2\%$.

Sophisticated sensor technology

Many of the CargoProfi functions have been made possible through the use of sophisticated sensor technology. This is the result of Fendt's engagement with position-sensing devices from MTS Sensors. For the accurate position detection of the tool, the company's MH4 magnetostrictive position sensor with analog output was specified. Each of these units was then integrated into a KMF tilt cylinder. The magnetostrictive sensor device is able to provide absolute position data by using a non-contact methodology that makes its impervious to the effects of mechanical stress, elevated temperatures and high pressures. It offers an industry-leading operational lifespan and eliminates the need for recalibration.

However, this position sensor offers further advantages. Even if the driver activates the shaking function of the front loader, the vibration and shockresistance properties of the sensor allow it to deliver a high-quality raw signal that only records positioning related signals and does not need to be amplified or conditioned in any way.

The MH4 sensor is based around proprietary Temposonics magnetrostrictive technology from MTS Sensors, which enables precision measurement in even the most demanding of operational settings. Temposonics sensors are able to accurately determine position via the momentary interaction between two magnetic fields. One of these fields comes from a movable permanent magnet that passes along the outside of the sensor, while the other originates from the current pulse that is applied to a ferromagnetic waveguide running parallel to the direction that the permanent magnet traverses. Whenever these two magnetic fields interact with one another, a sonic torsion pulse is created. This passes through the waveguide and is detected by the sensing element. By precise measurement of the time period between the current pulse being applied and the torsion pulse being received, it is possible to derive an exact value of the distance to the movable magnet.

"The measurements of the robust MTS sensor devices have a very high accuracy," explains Andreas Kämmerer, senior hydraulics engineer at Fendt. "For two years, the Fendt design team has worked closely together with engineers from MTS Sensors and from the cylinder supplier KMF so that the new functions envisaged for the CargoProfi front loader could be fully realized, with precision-fit cylinders and integrated high-performance sensors." **iVT**

Robert Luong is technical marketing manager at MTS Sensors, where he has worked for three years





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Think bike

TELEHANDLERS AND OTHER OFF-HIGHWAY EQUIPMENT COULD HARDLY BE MORE DIFFERENT FROM TOP-END MOTORCYCLES, BUT THE TECHNOLOGY THAT HELPED TO DEVELOP KAWASAKI'S NINJA H2R ALSO HAD A ROLE TO PLAY IN ITS NEW VARIABLE-DISPLACEMENT PUMPS

The recent release of the supercharged Kawasaki Ninja H2R not only introduced the world's most powerful and fastest accelerating production motorcycle, but also demonstrated what the combined engineering resources of the various Kawasaki divisions could achieve. Drawing on the expertise of the Kawasaki technology center, the Ninja H2R project showcases an entirely in-house designed and manufactured supercharger unit. It was also able to harness Kawasaki Heavy Industry technologies developed for disciplines such as aerospace and gas turbine applications to achieve its outstanding styling approach, build quality and performance credentials. In a similar way, the new K3VLS series hydraulic pump from Kawasaki's precision machinery division is also a result of the combined efforts of the group's engineers.

The company has a long experience of developing hydraulic pumps and systems for very demanding applications – most notably in the field of construction machinery – and has used this experience to develop the K3VLS series variable-displacement axial piston pumps to meet the needs of agricultural machinery.

Change of address

When the K3VLS development project began, it was clear that Kawasaki needed to address the requirement for hydraulic systems and components to deliver real improvements in efficiency, and make a considerable contribution to overall machine fuel efficiency. This meant that the company needed not only to provide the most efficient pump, but also to make it as light and compact as possible.

The other major consideration during development of the pump was cost. Kawasaki never compromises on quality, so it was important to come up with a design that could be manufactured in the most costeffective way.

The group's innovations in the fields of marine technology, aerospace, gas turbines and hydraulics have resulted in world-leading expertise in fluid modeling and computational fluid dynamics, which was invaluable in developing the K3VLS series. Using these methods, its engineers were able to calculate the optimum geometry for the rotating parts of the pump to achieve best-in-class efficiency. Most variable-displacement axial piston pumps undergo a



and efficiency benefits for machines such as telehandlers

dramatic drop in efficiency at lower pressures and displacements below maximum. The K3VLS, by comparison, demonstrates improved efficiency across the full operating range.

The design of the rotating parts of the K3VLS have an added benefit in that the pump requires greatly reduced input torque to maintain self-lubrication in the unloaded or standby condition. This gives a fuel efficiency benefit for machines with only intermittent use of the working hydraulics.

In the frame

The K3VLS range of pumps will be launched at Agritechnica, and will initially be available in frame sizes 65, 85 and 105cc/rev. A further three sizes – 50, 125 and 150cc/rev – will be launched in early 2016.

The maximum operating pressure of the K3VLS series is 280 bar for all sizes, with a peak pressure rating of 350 bar. The pumps have SAE mounting flanges and splined shafts and are available with various through-drive options.

In addition to the standard load-sensing and pressure cut-off controls, the K3VLS will be available with electronic displacement control, torque-limiting control and variable torque-limiting control in which the maximum torque setting can be varied by means of an electric or hydraulic signal.

The K3VLS is one of a number of new products being launched by Kawasaki this year, all of which are set to bring major improvements in efficiency and controllability to agricultural and construction machinery. At Agritechnica, the company will also be showing the K8V closed-circuit hydraulic pump and M7V high-speed axial piston motor, which together provide highly efficient hydrostatic transmission solutions. Combining K3VLS with K8V, M7V, the new KLSV load-sensing valve and ERU electronic joysticks enables Kawasaki to provide complete systems for machines such as telehandlers. **iVT**

John Boote is the business development manager for Kawasaki Precision Machinery UK







Beauty in the beet

AT 15M LONG AND 33 METRIC TONS, ROPA'S TIGER 5 IS ALREADY PRETTY SPECTACULAR. BUT FACTOR IN ITS INNOVATIVE CONTINUOUSLY VARIABLE DRIVE AND HYDRAULIC SLOPE COMPENSATION, AND ITS PERFORMANCE BECOMES LEGENDARY

With a dead weight of 33 metric tons and more than 30 metric tons of beet load capacity, the Tiger 5 is the premium model in Ropa's range of beet harvesters. Its 617hp and 15.6 liters displacement enable this 15m giant to reach speeds of 40km/h when unloaded, via a continuously variable drivetrain, while its automatic hydraulic slope compensation ensures a safe working position is always enabled.

These features – exceptional among triaxial beet harvesters – obviously impressed the experts too: the harvester was elected 'Machine of the Year 2015' at the French Sima exhibition this February.

The engine's 617hp is transferred by a continuously variable drive, jointly developed by Ropa, Omsi Trasmissioni and Bosch Rexroth. Michael Gruber, headof Ropa's sugar beet technology department, states, "We wanted to outdo any competitor. We have succeeded in doing just that thanks to a powerful trio of three notable companies."

The rough concept of the drive technology was completed just four weeks after the common kick-off meeting. The Constant Variable Ropa Gearbox (CVR) consists of three hydraulic motors in a powershift summation gearbox, positioned between the motor compartment and the third axle. The special feature here is the interconnection of two variable- and one fixed-displacement motors. On startup, all three are commonly activated for maximum traction force. To increase the travel speed, the variable motor at the large gear ratio is stroked towards zero in a first step. Having reached zero, the motor has obtained its speed limit and is disconnected via a multiple-plate clutch. Due to the fact that the motor is no longer rotating simultaneously, there is no power loss.

To increase the travel speed further, the second variable motor is also stroked towards zero, but remains connected. Only the constant motor actuates the drive at maximum travel speed. Its efficiency is higher due to the large stroke angle and the smaller flow losses, which leads to a reduction in fuel costs.

Such an efficient transmission of power has resulted in some surprising power values. While the Tiger is electronically limited to 18km/h in field mode, road travel at up to 40km/h is possible without any shifting or traction interruption. The Tiger 5 reaches its peak road speed at an economical 1,195rpm while harvesting work is carried out from 1,100rpm. The





design engineers intentionally recorded these low RPM levels in the product specifications, so as to deliver lower consumption data.

At the touch of a button, the Tiger 5 shifts fully automatically from travel mode into field mode. Its discharge conveyor, ring-type elevator, tank scroll and further assembly groups are folded out successively, monitored by sensors and hydraulically driven by Rexroth motors. Compared with the predecessor model, the time for this procedure has been halved.

Safe in any position

Ropa developed a hydraulic drive system with a floating front axle and two hydraulically balanced rear axles especially for the Tiger 5. Compared with conventional triaxial harvesters with a center axle screwed into the frame, the risk of unwanted movements of the machine is reduced by two-thirds.

ABOVE: Many new developments turn the Tiger 5 into a highly efficient working tool for sugar beet farmers and agricultural service companies LEFT: PTO gearbox with Rexroth pumps

This is ensured by the hydraulic connection of the stabilization cylinder at each side of the front and rear axles. By reducing the risk of unwanted movements, the row- and depth-guidance of the harvesting systems is also improved.

The beet harvester is perfectly suited to all working situations – even on difficult terrain. The whole vehicle is tilted by up to 10% when on a slope by means of six sensor-controlled hydraulic cylinders that keep it in a horizontal position. This terrain compensation, possible in both directions, offers several advantages – there is an additional level of comfort for the operator who now always sits upright, and the greater safety of the vehicle itself. The Tiger remains more stable – in spite of a taller beet hopper – in extreme terrain where other harvesters would tip over.

This host of new developments turns Ropa's Tiger 5 into a highly efficient tool for sugar beet farmers and agricultural contractors. Customers the world over are reporting reduced running costs and an increased daily capacity – a result of the well-proven interaction between Ropa, Omsi and Bosch Rexroth. **iVT**

Konrad Roßbach is a senior sales engineer at Bosch Rexroth and expert for hydrostatic and hydromechanical drives in off-highway applications



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Get the flow down

PRECISELY COVERING THE VOLUME FLOW RANGE REQUIRED FOR POSITIONING AND ACTUATOR FUNCTIONS, RIGHT THE WAY DOWN TO UNDER 1 L/MIN, THE NEW EDL VALVE IS A SECRET WORTH SHARING

From simple positioning or actuator functions to the complex control tasks in agricultural machinery, tailored hydraulic solutions assist offhighway engineers in developing the best machine that will help farmers maximize their crop yield.

The hydraulic consumers in agricultural machines need different levels of volume flow, varying from the single digit range up to 120 l/min, depending on the machine type. For values from less than 1 l/min up to 50 l/min, Germany-based Hawe Hydraulik now offers the cost-efficient proportional directional spool valve type EDL. This covers precisely the ideal volume flow range for positioning and actuator functions.

The job of this valve is to control both the direction of motion and the speed of several hydraulic consumers in parallel – but independently of each other. The volume flows can be set individually for each consumer, as required for the functions in combine harvesters, forage harvesters or root crop harvesters. A maximum flow of 50 l/min per consumer is possible. The spool pistons are available in several sizes, with the smallest spool size allowing a maximum volume flow of 3 l/min. This provides optimal resolution and the speeds of hydraulic motors in particular can be controlled exactly.

The EDL valve features a compact design that allows the hydraulic system to achieve high power density within a small space. It is actuated directly and is designed for a system pressure of up to 320 bar, providing it with higher compressive strength than comparable products on the market. With one of the lowest flow resistances available, the valve makes a positive contribution to the energy efficiency of the hydraulic system.

Should an agricultural vehicle require additional functions, the valve can be extended with sections of the proportional directional spool valve from the PSL series by means of flange-mounted blocks and intermediate plates. This valve type is piloted, and three sizes are available as required for volume flows up to 60, 120 and 240 l/min. All three sizes are equipped with twin solenoids, which means less work cabling the valves during installation.

Complete control

A special solution for combine harvesters, forage harvesters and root crop harvesters is created by using PSL valves and electroproportional seated valves, which allows very sensitive and exact control of the variator transmission and the contact weight of



the cutter. Thanks to the exact control of the contact weight, bumps in the ground are evened out and the harvested crop is always cut off at the ideal height, which assures the optimum yield.

The combination with directional seated valves has also proved effective for holding functions in loader wagons. In this application, a preselector valve ensures a proportional volume flow and specifies the direction. The seated valves hold the load, for example the front or rear wall, in position, with zero leakage. This saves the need for complicated readjustment while the truck is in motion. The preselector valve and seated valves are flange-mounted directly onto the valve bank consisting of proportional directional spool valves of type PSL. Separate piping is not necessary.

The practical solution consisting exclusively of PSL proportional directional spool valves is also ideal for

loader wagons and other trailed industrial machinery. This solution enables the farmer to choose between a constant-delivery or variable-displacement pump for supplying the hydraulic system of the work machine – depending on which pump is installed in the tractor. This is set by hand simply by means of a screw, via a valve or blocking of the circulation pressure balance. An electric version is also possible as an option.

The possibilities are almost unlimited. Last but not least, Hawe Hydraulik also offers proportional directional spool valves with CANbus interface for the most challenging control functions and high-tech agricultural machinery. **iVT**

Marcus Specks and Tobias Kohler are key market managers at Hawe Hydraulik. Ulrike Ballnath is corporate communications manager



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November 8-14 Hanover, Germany Hall 16 Stand E29

A different 'tune

THE AGRICULTURAL SECTOR HAS BEEN ONE OF THE FEW TO RESIST THE MANY ADVANTAGES OF FLAT-FACE COUPLINGS – BUT WITH THE DEVELOPMENT OF THE NEPTUNE CONCEPT, THAT'S ALL SET TO CHANGE

Stucchi has long distinguished itself in the market for the connection and control of hydraulic fluids with innovative product solutions that provide tangible value to end users. This especially applies to the ongoing development of flat-face quick couplings, one of the company's main product ranges, which prevent fluid loss during dis/connection.

Other features of these flat-face couplings include: easy-to-clean surfaces that prevent dirt from entering the circuit during connection; ease and safety of use; and minimum air inclusion during connection, which always guarantees the correct operation of the circuit. In addition, minimum pressure drop makes the system more efficient with less energy expended, while good resistance at impulse pressure ensures a longer product life.

These features have ensured flat-face couplings are among the most widely used and respected fittings in a variety of sectors such as construction machinery, hydraulic tools, industrial equipment, oil rigs and vehicles in general. However, the agriculture sector is an area where flat-face couplings are still rarely used. This is largely due to the type of connection between the manifold blocks at the rear of the tractor and the huge variety of equipment they use, such as plows, cultivators, trailers, or any other kind of hydraulic implement. A major obstacle in introducing flat-face couplings in this sector is the large number of traditional male valve couplings (ISO 7241-A size ½in) that have traditionally been installed over the decades.

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If OEMs were to install flat-face female couplings on the manifold blocks at rear of the tractor to allow the connection with male valves on equipment, this would force end users to install additional adaptors to be able to connect their existing hydraulic implements fitted with the old male counterpart. The addition of adapters in hydraulic connections, however, is strongly discouraged as there are many disadvantages created by doing so, including increased dimensions, increased pressure drop, increases in mechanical stress and the multiplication of potential leaking points, all of which can only create loss of efficiency and productivity problems for those who use them, as well as potential new failures.

Out of this world performance

To overcome these drawbacks, Stucchi has developed Neptune, an innovative connection solution. This comprises a versatile cast-iron manifold installed at the rear of the tractor. The big advantage of the



Neptune concept is the high flexibility of connection types and sizes to fit into the same single and unique cavity. The possibilities are as follows:

 \bullet Flat-face couplings interchangeable ISO 16028 size 1/2in and 5%in;

• Traditional valve couplings interchangeable ISO 7241-A size 1/2in and 3/4in.

This feature enables the manifold block to be configured according to the specific needs of the machinery, using the hydraulic system in the best possible conditions. It is well known that OEMs tend to make increasingly higher-performance machines with high flow rates, while seeking to make them as compact as possible, and with higher reliability.

Neptune ably meets these high requirements, as it provides the possibility to install couplings larger than 1/2in within the existing overall machine environment, making available reliable hydraulic connections for higher flow rates using flat-face technology, while improving reliability.

A particular innovation of Neptune flat-face quick couplings is represented by the front seal, which was specifically designed to avoid the need for the use of a protective cap. This ensures dirt does not enter the circuit during uncoupling, connection or when it is coupled. This feature is very important as it enables optimal cleanliness of the hydraulic circuit to be maintained, ensuring optimum machine operation and reduced maintenance interventions. The Neptune block has the same basic features of similar products currently on the market: the breakaway function to avoid breakage of the hoses; and the central lever to release residual pressure in the circuit and to allow easy and safe connection and disconnection. **IVT**

Gianmarco Gatti is a product specialist at Stucchi SpA



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For cold times' sake

WHEN SAME DEUTZ-FAHR'S AGROTRON TTV TRACTORS REQUIRED WINTERIZING, THE OEM TURNED TO AN HVAC SPECIALIST TO ENSURE OPERATORS COULD ENJOY PLEASANT TEMPERATURES, REGARDLESS OF ALTITUDE OR THE TIME OF YEAR

When the Same Deutz-Fahr Group, a leading provider of agricultural vehicles, was searching for a solution to enhance the efficiency of its large tractors, even under extreme climatic conditions, it found a strategic partner and systems supplier in Webasto. All around the globe, the group delivers tractors, telehandlers, combine harvesters, forage crop technology and solutions for the precision farming industry. It must overcome a broad spectrum of technical challenges, for in their day-to-day work, agricultural utility vehicles must frequently withstand extreme stresses and strains. Even at temperatures well below zero, they must immediately deliver their full capacity out in the field or during transport – without having the engine wear out in the process.

To better winterize its 7210 and 7250 large tractors in the Agrotron TTV model range, Same Deutz-Fahr was seeking a partner for the individual integration of a water heater. Webasto proved to be the right choice – with its diverse range of highly specialized parking heaters and decades of experience in developing individual climate solutions, it is the ideal partner when precisely customized and efficient installations are called for.

"The integration of a water heater in a large tractor is a highly complex matter. Webasto developed an individual solution for us that allows for an installation on the assembly line that is as uniquely simple as it is time- and cost-saving," says Konrad Fischbach, project coordinator for development at Same Deutz-Fahr.

Following preliminary discussions at Agritechnica 2011, Webasto developed and tested the precisely adjusted installation kit for the Thermo Pro 90 water heater in close cooperation with Same Deutz-Fahr, from the initial prototype in 2012, up to series production readiness at the beginning of this year.

Webasto can also score points for its high-density worldwide service network. "Our customers should be able to rely on getting expert advice and support nearby if and when they encounter problems with the water heater," says Fischbach.

Comfort at extremely low temperatures

For Same Deutz-Fahr customers, having machines specially equipped with a Webasto Thermo Pro 90 water heater represents a big plus in terms of comfort and efficiency during their work in winter. Without a



parking heater, engines are cold before the start of work – and cold machines operate inefficiently, wear and tear increases, and service life drops. The result: increased costs due to higher fuel consumption and more frequent downtime.

The exceptionally rugged Thermo Pro 90 water heater, designed especially for professional use in industrial and special-purpose vehicles, is integrated into the coolant circuit of the engine and brings all fluids and components up to operating temperature before work begins. This not only increases the engine's efficiency, but also the comfort of the driver. In a pleasantly preheated cabin, high-consumption engine idling becomes superfluous. The engineindependent heating operation of the Thermo Pro 90 delivers up to 9.1kW heat output. The heater's low consumption and low-noise operation make a valuable contribution to both cost savings and environmental protection. Because water heaters do not require a 230V domestic power connection, and power is supplied by the vehicle battery, they are particularly well-suited for use in agricultural vehicles that often operate far away from any electrical connection.

Special functions of the Thermo Pro 90 mean farmers can use their large Same Deutz-Fahr tractors even in extreme climatic conditions. The Arctic-Start function facilitates rapid heat-up even at temperatures as low as -40°C. Anyone driving their tractor across mountainous terrain benefits from the automatic altitude adjustment up to 3,500m, as air pressure and temperature sensors in the Thermo Pro 90 regulate the adjustment of combustion in response to the increasingly thin air. The gradual regulation of heat output ensures a constant coolant water temperature of 80°C. This is not only required in extreme cold; when carrying out empty runs during transport applications, this also prevents the adverse effects of a dip in the engine temperature.

Heat via smartphone with ThermoCall

Same Deutz-Fahr customers who decide in favor of this special equipment also get to enjoy a very special Webasto innovation. With the ThermoCall facility, the parking heater can be very specifically operated at any time and from anywhere – with a phone call, text message or the appropriate smartphone app.

The ThermoCall control unit contains a SIM card and is installed in the tractor along with the water heater. As many as 15 people can register their phone numbers for the remote control of the parking heater, switching it on or off directly via cell phone, or even programming the starting time 24 hours in advance. This way, the driver arrives to find a pleasantly preheated vehicle with ice-free windows and a perfectly preheated engine. The ThermoCall also enables querying the device status of the Thermo Pro 90 and the current temperature via smartphone. **iVT**

Robert Lang is director special OE at Webasto







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