

# DIESEL

INTERNATIONAL



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ECCLECTIC

2020  
**DIESEL**  
OF THE YEAR

Fpt Industrial F28 Diesel of the year 2020 - Briggs&Stratton -

Comparisons: 2-2.5 liters - Interviews: Cummins - Deere - MTU - Perkins

JCB&Cummins - Conexpo&Off-Road - MEE Dubai&PG - Europe&China

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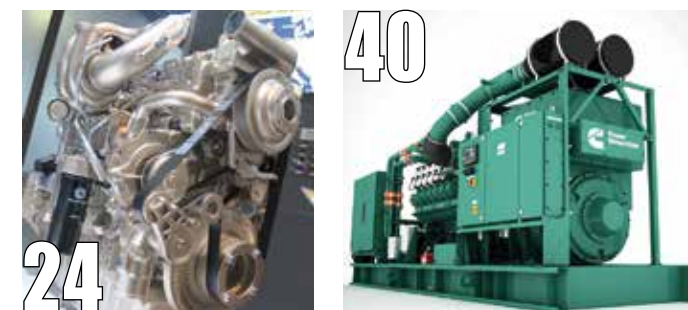


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## DOTY

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FPT Industrial F28

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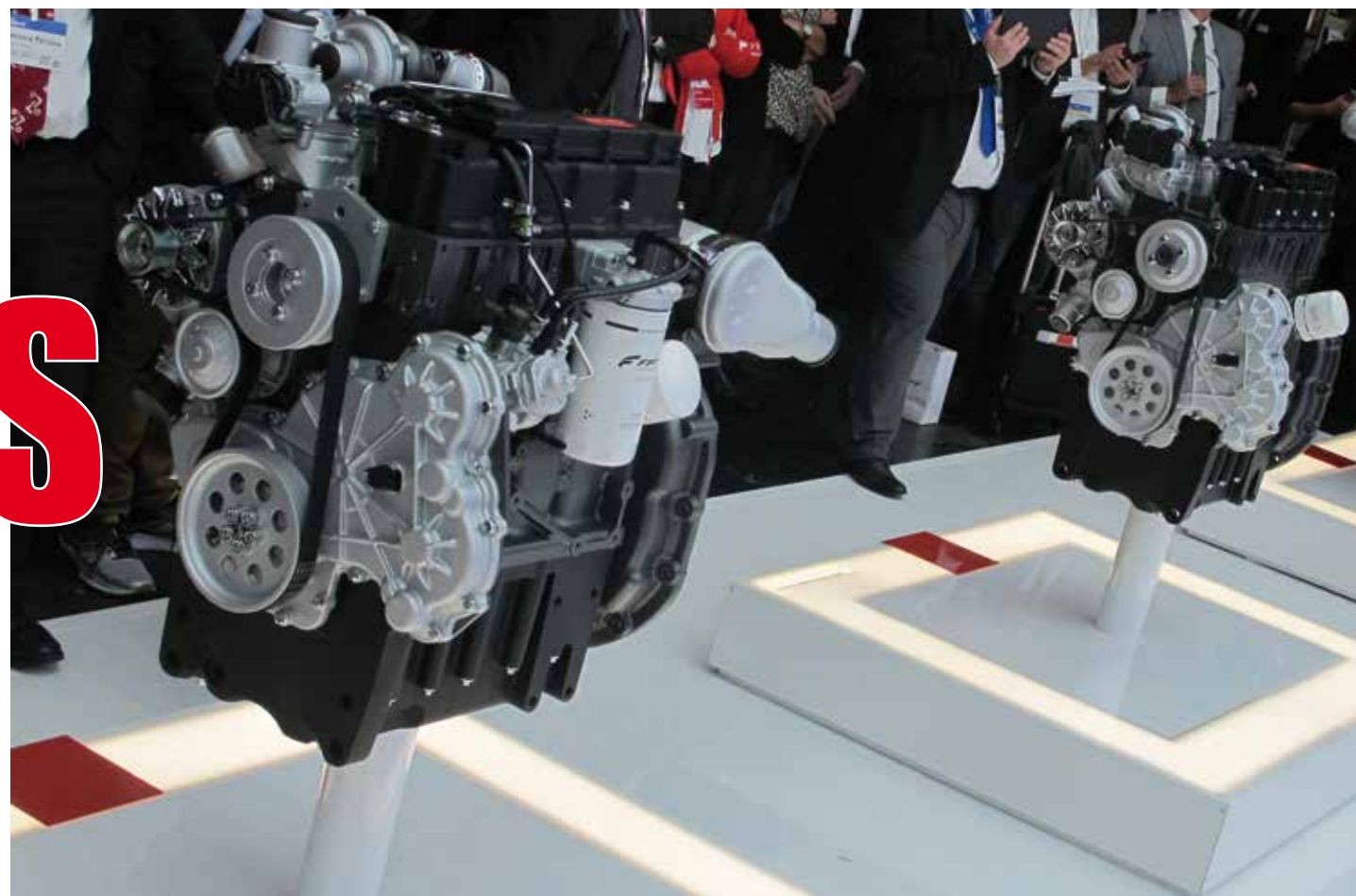
### FPT Industrial F28: Diesel of the year 2020

«A particularly innovative feature of the 4-cylinder engine is the eclectic nature of the F28. The diesel unit was unveiled together with its natural gas twin, in search of modularity»



FPT INDUSTRIAL F28

# THREE TIMES WINNER



**W**hen the F28 was unveiled at Agritechnica 2019 we discovered not just one but two engines. The FPT Industrial 2.8-liter, Bosch 1,600 bar common rail for fueling the combustion chambers with diesel was showed alongside its gas twin. These were the reasons to reward the FPT 4 cylinder. A baptism that in our eyes is already a consecration. We don't dare to compare it to the Cursor X project, but we can define it as a sort of multitasking engine embryo. Just like starting from scratch and drawing at the same time a frankly industrial engine featuring a highly appreciable torque curve (with 375 Newtonmeter it's at the top in its displacement class, as you can check on the first 2020 Diesel International issue) and another one featuring the

Its name is F28, it's the super-compact that Fpt Industrial officially introduced at Agritechnica and it's the Diesel of the year 2020. Compactness and maximum torque are not the only reasons that motivated our choice. This engine, in fact, comes in dual diesel and gas version and is a candidate for the role of 'multitasking' engine

injection coils as original equipment. The running-in of the gas version is imminent - probably next summer we will know more - with a view to the much talked circular economy (the perimeter is that of the zero-km, in the context of a farm the winning card is biomethane).

Here are some excerpts from the conversation with Pierpaolo Biffali, Vice President Product Engineering, which we met shortly after the presentation of the engine in Hanover: «The search for compactness (for example, the bridge- that is the distance between the cylinders - has been reduced) and simple engineering have not affected performances, which are suitable to satisfy the most demanding applications. Uniflow architecture, with intake and exhaust on the same side.

## F5: DOTY 2008

From DIESEL magazine, March 2008:

«The F5 are semi-uniflow with 5-gear front distribution. Filters are grouped on the injection pump side and have an anti-drain valve and a by-pass. EGR is an FPT project, external water-cooled on the top of the range only. In both cases, EGR 'works' on the intake. A manifold sends exhaust gases to the cooler which cools and then sends them to the 'Reed valve' and the Air mixer (the latter acting as a mixer). At low loads, when recirculation is unnecessary, the system is disabled by the 'On-off' valve. Mechanical engines with external EGR feature an electronic control unit (as big as a pack of cigarettes) which manages the entire gas recycling process».

External cooled EGR: compared to the F5 channel and cooler positions have changed. The cooling is outside but the pipes are integrated. The oil

sump is structural, with a single base for industrial and agricultural use, while the lower part of the sump is different. The configuration of the com-

## CURSOR 16: DOTY 2014

From DIESEL magazine, May 2014:

«The single-stage power range starts from 515 kW and raises up to 570, delivering a torque that starts from 2,990 and reaches 3,220 Nm. The power density and the containment of the overall dimensions are the keys to understand the specificity of the 6 cylinder. Although stroke has increased by 6 mm, the limited length makes it a narrow motor that fits perfectly on the overhang of combines and forage harvesters where it will be used in the first instance. In fact there are several applications in the future of 15.9 liters, in the wake of FPT Industrial tradition. Plenty of space to take off in a marinized version, for prime and stand-by PG and for construction machinery. The identikit is completed by HI-SCR, 2,200 bar common rail, overhead camshaft, blow by and ball bearings instead of oil bearings, which reduces the tolerance between turbine and casing while improving response time».

Fabio Rigon, Vice President FPT Industrial Europe, said: «We believe that the small and powerful F28 can further drive agricultural development in the years to come».

bustion chamber, featuring two oversized valves on one side and injector on the other, provides an excellent response to loads while maintaining torque and machine speed. The gas version was born from the perspective of an agricultural circular economy to neutralize CO2 in farming operations while reaching diesel-like performances and lower operating costs. It is possible to give value to the use of biomethane in the wine sector, for example, or in all those food segments most sensitive to environmental sustainability».

This is certainly not the first time for FPT Industrial - quite the opposite - as we tell in the boxes, where we report our impressions at the time of the award ceremony of the F32, in 2008, and the Cursor 16, in 2014.



KOHLER MUSEUM

# GALLERY OF ENGINES



The refurbishment of the spaces of the Kohler engines facility in Reggio Emilia - Italy - is the work of architect Naomi Hasuike. Here both products and people can find their place

There is no future for those who do not remember their own history. And it is in this article that we talk about both the past and the future: a past celebrated in a museum; a future recently presented at Agritechnica made of apps, digitization and remote control. A virtual circle that closes practically at the same time, as if to seal the undeniable bond that binds Kohler to its Italian and European history and its future development. This is Kohler Gallery. The Kohler Check App has been launched simultaneously with an event

that aims to celebrate the past of a company that has made the history of national and international motoring, as well as reaching the seal of a very important cycle, that of the complete restructuring of the company facilities in Reggio Emilia, a process that began in 2015. We are talking about the inauguration of the new Gallery of Engines museum, which for the occasion will host the exhibition **'Fatto con cura. The engine told by people' and will be accompanied by a book** that traces the entire exhibition. *«The opening of the new museum is an important event and full of many meanings,»* explains Tommaso Maria Vezzosi, Communication Specialist at Kohler who, together with Elena Marverti, coordinated the various operational phases. *«As a museum, it is part of a historical trend of Lombardini's own: since the construction of the factory, called Gardenia after the name of the neighborhood on the outskirts of Reggio Emilia where it stood, there has always been an exhibition space. Conceived as a showroom rather than a museum, it collected the company's*

*models, but without a reasoned or explanatory path. In 2018 this tradition brought us about fifty engines as a dowry, among which it seemed right to put some order into. We then examined this heritage and chose some models that, due to their history and technology, were representative of a particular era or business moment. We have added the most important Kohler units to these and together they will represent the heart of the new museum».*

At the end of the gallery you will find, of course, KDI engines. And before that? An anthology from the origins to today: from LDO horizontal-engines, LDR, ACME, Slanzi, to FOCS and CHD engines.



## VOLVO D16: A ROCK'N'ROLL ENGINE

Volvo Penta D16 engines will deliver the power to light Sweden Rock. The majority of the generators hired by Sweden Rock use Volvo Penta engines. Pelle Åberg is responsible for the planning and rental for almost everything at the festival site. *«We only get one chance when doing a show. We can't take a risk that equipment will break, fail or become unstable. That's why we use these generators and engines. They are a great combination».*



## PISTONS' SOUND

FPT AND MORODER DESIGN THE HEARTBEAT OF THE ENGINE

FPT Industrial remarked its presence at CES Las Vegas for two reasons. The first is the Cursor X, concept that *«can run on full battery electric. So you have a 200 km autonomy, in an urban delivery mission. It can also be a natural gas plug-in hybrid powertrain, so you can count on 400 km autonomy, ideal for medium range transportation. Do you want to go further? With the hydrogen fuel cell you have 800 km autonomy for long haul heavy-duty missions».* The second is 'Preludio - The Sound of the Future', by Giorgio Moroder, that will become the soundscape for FPT Industrial engines. The company



and Giorgio Moroder have released a special playlist, available on Spotify, which includes the above mentioned 'Preludio' (Prelude). For FPT Industrial, it cues a musical performance before the engine performance begins. A part of Preludio will be implemented as a welcome turn-key sound in all the vehicles powered by the next-generation of innovative and sustainable engines.

## John Deere for marine hybrid applications

To help customers meet hybrid emissions regulations, John Deere has announced the upcoming release of a PowerTech™ 6090SFM85 rating for hybrid vessels. The variable speed rating will be 242 kW at 2000 rpm will meet EPA Marine Tier 3 and IMO Tier 2 emissions standards, and will be certified to E3 propulsion test cycle for commercial applications used with variable pitch or electronically coupled propellers.

## DIEMAX

The Dutch manufacturer Diemax truly played home-field at METS 2019. Already two years ago we saw the 12-cylinder with ratings from 388 kW at 4,000 rpm and 447 kW at 4,500 rpm, designed specifically for marine applications. During last year's edition, while waiting for the orange engines to really face the European market, there were two models on display. In addition to the already mentioned 12-cylinder, here is also the in-line 6-cylinder, available in the same engine block with three different displacements, from 147, 169 and 198 kW at 4,000 rpm.



MERCEDES GOES HYBRID

# THE 'ECLECTIC' STAR



Dieter Zetsche: «We must do everything we can to further reduce CO2 emissions. That's why efficient combustion engines will be an important part of the solution for a transitional period».

The marriage between hybrid technology and diesel is a perfect one; Dieseltgate, however, has put a shackle on Diesel cycle's legitimate ambitions. In Stuttgart, though, they still think otherwise. The maximum load that can be hauled by the GLE 350de reaches 3,500 kg, far surpassing E 300de sedan's former record of 2,100 kg.

The crown jewels of this plug-in hybrid system - born from the EM-motive joint-venture between Mercedes and Bosch - are still the 9G-Tronic transmission and the four-cylinder diesel engine OM654 in a 194 hp and 400 Nm version with Euro 6d TEMP emissions. The vehicle's electric portion features a couple of third-generation innovations: the permanently excited synchronous motor now gets more powerful with 100 kW (10 more than its predecessor) with the same torque output of 440 Nm; plus, its newly-developed

battery pack has a capacity of 31.2 kW as compared to the 13.5 kW of the previous generation. All of which results in a plug-in hybrid that needs less than 30 minutes to recharge at a DC charging station, can speed up

Mercedes' faith in diesel-electric is still strong. One more proof of that is its GLE 350DE, a plug-in hybrid equipped with a 194hp, 400 Nm OM654 engine paired with a 100 kW synchronous motor and a 31.2 kWh battery pack. Charging time: less than half an hour

to 160 km/h in purely electric mode and features an electric-only range touching 100km on the WLTP cycle, correlated to NEDC values.

Notwithstanding an empty weight of over 2,200 kg, teamwork with the OM654 grants the GLE 350de a 0-100 km/h time of 6.8 sec. by virtue of a 320 hp, 700 Nm combined (diesel+electric) output, basically the same as that of a conventional 6-cylinder diesel engine. Yet this hybrid can boast 29g/km CO2 emissions and a fuel consumption of 1.1 l/100 km in hybrid mode with a 25.4 kWh/100km power consumption.

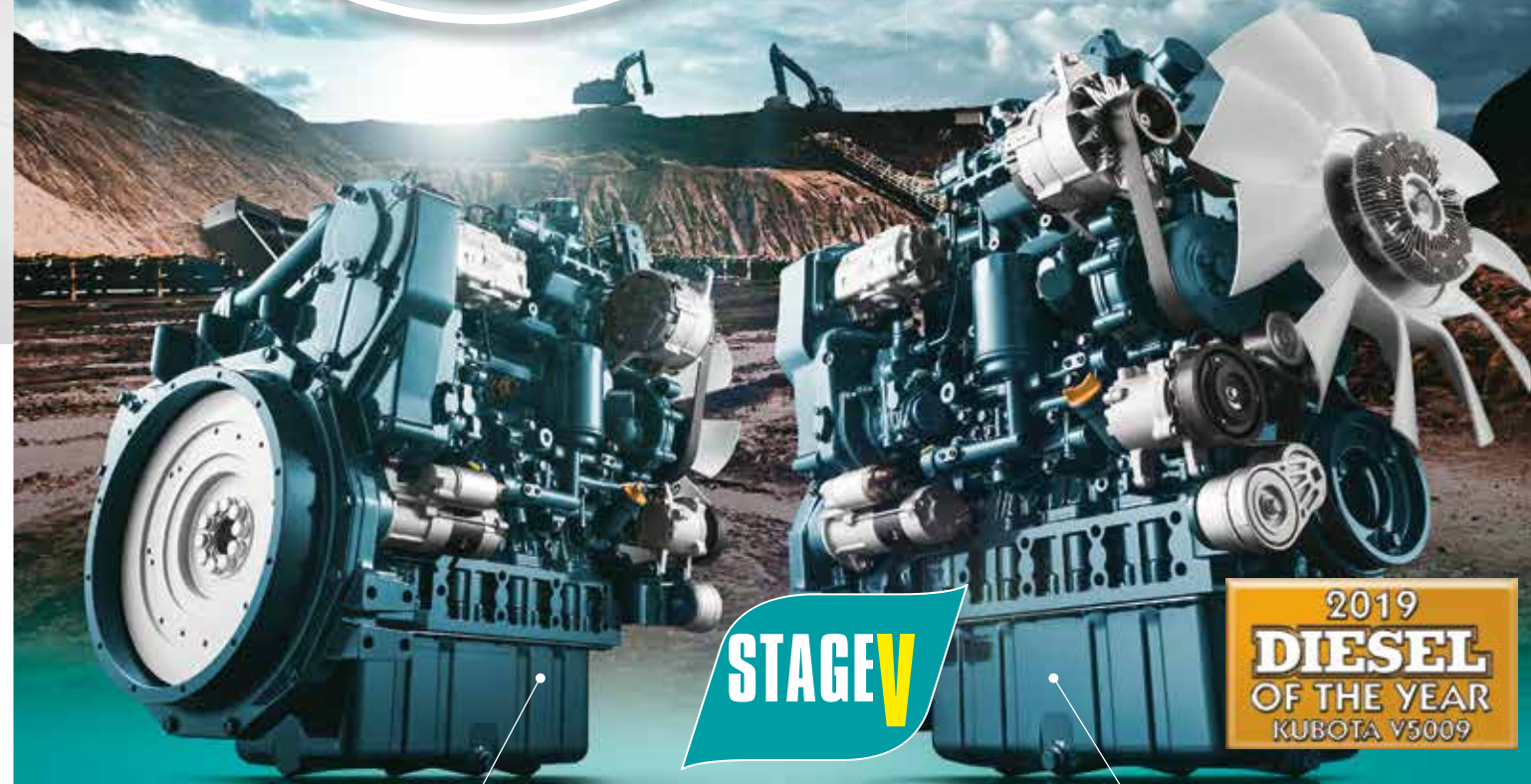
Adding a touch of hi-tech to the final picture, the 48 V onboard electrical system by Bosch does not only power the transmission and brake pump, but also the refrigerant compressor as well as the auxiliary heater included in the air-conditioning system, thus offering zero-emission winter pre-heating and summer pre-cooling of the cabin as a standard feature.

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VANGUARD 2019/2020

# ENGINES & BATTERY POWER



**V**anguard Engines & Battery Power, in other words single and twin cylinders, as well as an integrated lithium-ion battery system: basically the Milwaukee industrial bouquet completely renewed, enhanced and updated to the new electric vague. The Vanguard 200cc and 400cc and the Vanguard V-Twin EFI (Electronic Fuel Injection) were unveiled at the Vanguard Engines & Battery Power 2019/2020. Let's start with single cylinders. There are two drivers of innovation: the optimization of operating costs and application flexibility. To work even at strong inclinations there is a system available on request that enables the engine to operate up to 45° without loss of power, fluids contamination, engine failure, smoke or flooding.

Machine manufacturers can therefore offer more versatile equipment that can work where others can't. When we speak of operating costs we obviously refer to the so-called TCO

**Briggs & Stratton 'Vanguard Engines&Battery power 2019/20' scored a hat-trick: the Vanguard 200cc and 400cc and the Vanguard V-Twin EFI marry the 5 and 10 kWh battery packs, which we speak of in the box**

which on the Vanguard 200cc and 400cc is significantly reduced due to a series of solutions. The design of the new oil management system allows operators to halve the intervals, from 6 to 3 air filters and from 20 to 10 oil changes every 1,200 hours. The completely cyclonic air filtering system reduces downtime.

Act number two, like the cylinders of the Vanguard V-Twin EFI that justify the conversion to electronic injection in the first place with fuel savings, which on variable speed machines is estimated up to a quarter compared to mechanics. And we're certainly not done yet: petrol is less prone to degradation, the rpm regulator provides a satisfactory response to demanding loads and therefore supports the engine in the timely reaction to sudden

load variations.

Electronics also provide easy start-up and constant performance even at high altitudes, that is without having to run into any performance degradation. On some Vanguard vertical shaft engines it is possible to install the Oil Guard system, consisting of an external high-capacity oil tank, which guarantees lower engine and lubricant temperatures and allows the engine to work at 45° inclination in all directions. The exclusive dry sump system ensures constant lubrication and minimizes the thermal degradation of the

The Vanguard 23.0 powers Multiquip's new Whiteman LD6d, launched at World of Concrete. «We developed the new internal spline crank shaft to increase ease of use,» said Mike Braun, B&S product manager

## BATTERY PACK. ELECTRIC MILWAUKEE

Vanguard commercial battery system includes a 5 or 10 kilowatt battery pack, built directly in the Milwaukee plant, a controller and a charger. The Battery management system (basically an electronic card), the control module for vehicle management and the battery charger provide efficient performance, while the modular and easy-to-install batteries guarantee a power boost. BMS allows customization based on the method of use; optimize performance; monitors the entire system; detects any errors and protects the battery from tampering. The modular design of the system (the battery is in fact made up of small modules, similar to stylus batteries) allows a certified technician to easily remove and replace the cell module when needed. The battery packs are installed inside an IP66 certified protective case and further protected by a metal case featuring a cage design that facilitates transport and installation. The battery charger can provide 1050 W charging power from a 110 or 230 V source. The standard charging time for the 5 kWh battery is 6 hours, while the 10 kWh battery requires 12 hours. The battery charger can also be configured in quick charge mode to reduce the charging time to two hours. Applications? Aerial platforms, forklifts, floor washers, light towers and small machines for gardening and construction sites.



oil. The cap designed to facilitate filling and the integrated oil filter make changing the oil easier, cleaner and faster; in addition, its 500-hour maintenance interval provides a net 60 percent saving on oil maintenance. EFI twin cylinders maintain the same characteristics as their predecessors: overhead valves (OhvHV); aluminum bases with cast iron cylinders designed for greater resistance; automotive-derived alloy pistons designed for long life, optimal combustion control and a reduction of CO2 and NOX emissions; dynamically balanced steel crankshafts and oversized connecting rods to provide longer lifetime. Finally, we report a brief speech by Patrick Limberg, Director of Sales Commercial Engines Emea at Briggs&Statton, which we met at the

end of the presentation.

### Will Briggs & Stratton relaunch its presence in construction?

*Construction has always been a strategic market for Briggs & Stratton. The name of Wacker Neuson, who uses the Vanguard V-Twin in his Milwaukee plant, or the deal with Ammann and Boels would be enough, but other agreements are in the pipeline. We are appreciated by rental, which appreciates the TCO of our systems.*

### Will you enter the battery market?

*There is a gap in the supply of medium power batteries, which we have closed. Last November we introduced at a fair in the USA the first OEM that asked us the battery pack, Argo, an ATV player for military use.*



PERKINS' VIEW ON HYBRIDS

# THREE FOR THE HYBRID

PART  
II



**P**erkins is going to offer hybrid and electric technologies across its power range from 6 to 597 kW.

In the last issue of *Diesel International*, we published the first part of the interview with Ajay Prasher, Product marketing manager at Perkins, who talked about the efforts made by the company to help customers make the right choice between three technologies, hybrid-electric, hybrid-mechanical and hybrid-hydraulic. All these technologies complement indeed the existing range of 0.5-18 litre diesel engines. Here's the second and last part of our interview.

**How do you achieve maximum energy recovery through the alternator/generator system?**

*As part of the hybrid system optimisa-*

*tion, the energy management technology is required to ensure that the engine operates in a narrow engine speed band to deliver the lowest fuel consumption. As the engine speed increases beyond*

**In the second and last part of his interview, Ajay Prasher focuses his attention on the energy management system, critical to maintain the long-term performance, reliability and safe operation of the machines**

*the target engine speed, the hybrid controller recovers the excess energy and as the speed drops under the target engine speed, the hybrid controller returns energy back to the engine. Through data analysis, Perkins can ensure the optimum system is used.*

**What are the benefits of the kinetic storage system?**

*The kinetic hybrid system stores the recovered energy in the form of kinetic energy. The nature of the kinetic system ensures that energy can be captured and stored quickly and released over a short period of time. For OEMs with unpredictable and variable speed duty cycles, the kinetic hybrid system can be used to provide an additional 30 percent of engine power when required, helping OEMs deliver considerable fuel savin-*

*gs and engine downsizing capabilities. Products in scope here would include crushers and wheeled loaders which have unpredictable and fluctuating duty cycles.*

**What are the benefits of the hydraulic storage system?**

*The hydraulic hybrid stores recovered energy in the form of hydraulic pressure in an accumulator. The nature of the hydraulic storage system ensures that energy can be captured and stored quickly and released over a short period. For OEMs with unpredictable and variable speed duty cycles, the hydraulic hybrid can be used to provide an additional 30 percent of engine power when required, helping OEMs deliver considerable fuel savings and engine downsizing capabilities.*

## PILLER AND THE KINETIC ENERGY

The years are 111, to be precise. It was 1909 when engineer Anton Piller founded the company named **Piller**. Today, the German company is quite a benchmark in the field of rotary UPS, employs currently about 1,000 people worldwide and has its headquarters in the city of Osterode, near Hanover, as well as subsidiaries throughout Europe, America, Asia and Oceania.

UPS systems are continuous power supplies that, instead of using batteries (but there are also those in the catalog) ensure continuity to the network by skillfully coupling rotary masses and motor alternators. In this way, in the event of a power failure, the power supply can be guaranteed for a minute or so without any interruption. Just enough time to allow the generators or other systems to intervene.

And it is done by exploiting the kinetic energy (like the Perkins hybrid) of masses kept in rotation. Reliability is paramount, always higher than 97-98% as it is, with a bit of maintenance, the duration in time.

The systems provided range from 150 kVA to 50 MVA, powers obtained by combining individual machines of smaller size.

The Critical Power Module (CPM) oversees the operation, in a combination of nearly infinite operating modes.

Hybrid-electric, hybrid-hydraulic and hybrid-mechanical are the three key technologies for Perkins R&D in terms of hybrid engines.

*Products in scope here would include hydraulic excavators and wheeled loaders which have unpredictable and fluctuating duty cycles with a machine hydraulic system.*

**How do you control the power output of the hydraulic hybrid system?**

*Perkins has developed a number of hydraulic hybrid systems and has been able to demonstrate significant improvements in fuel consumption, whilst optimising the transition between diesel-only power and hybrid power.*

*Through machine duty cycle analysis, Perkins can assess the amount of energy recovery and boost required to ensure optimum sizing.*

*An under-sized system will mean machines may not have enough power for hill climbs where an over-sized system*

*will increase machine weight or reduce system efficiency.*

**What are the key features of the energy management system?**

*The energy management system is critical to maintain the long-term performance and reliability of the OEM machine. Perkins has been developing electric hybrid systems for over 10 years and understands the optimum window to ensure optimum performance and safe operation.*

**Do you plan to offer greater than 48V systems?**

*Perkins is considering higher voltage systems for hybrid applications to help OEMs where they may wish to support higher power machine systems.*

**Alberto Scalchi**



DANA INCORPORATED

# OVER THE OCEANS

PART I



**D**ana has taken on the role of game changer. The expansionary policy of the last few years goes in the direction of legitimizing herself as a full provider, both for ICE applications and in the frontier of electrification. We asked Dino Tarolli, Vice President and General Manager of EU Mobile Operations, to accompany us on a journey into the recent past and the near future of Dana Inc. In the next *Diesel International* issue you will find the second, and more comprehensive, part of this interview.

**Dana's M&A policies led to triangulation with Brevini, with the Drive Systems segment of Oerlikon Graziano and the SME**

**Group. What are the strategic coordinates of each of these operations? What are the synergies between these three groups and the parent company?**

*These three acquisitions illustrate how Dana is executing our en-*

Some 'key words' to understand the Dana Inc. strategy? Leveraging the core, driving customer centricity, expanding global markets, delivering innovative solutions, leading in electric propulsion

*terprise strategy in five primary dimensions: leveraging the core, driving customer centricity, expanding global markets, delivering innovative solutions, and leading in electric propulsion. Each one these acquisitions supports the enterprise strategy in a specific way.*

*The Brevini acquisition immediately expanded our product portfolio and established Dana as the only solutions provider that can manage power conveyance to move machines and also perform the work functions of the machine. It also increased Dana's addressable market for off-highway driveline systems by providing access to tracked vehicles and significantly broadening our opportunities in industrial markets. Finally, it accelerated our hybridiza-*

*tion and electrification initiatives. Our acquisition of the Drive Systems segment of the Oerlikon Group extended our current technology portfolio, especially in the area of high-precision helical gears, shifting solutions, and planetary hub drives for wheeled and tracked*



**Dana Incorporated Reports 2019 Financial Results,** MAUMEE, Ohio, Feb. 13, 2020: «Record sales of \$8.6 billion, an increase of \$477 million, or growth of 6 percent, compared with 2018»

## DANA INC. @ EXCON 2019

Dana attended the 10th Edition of Excon - Exhibition on Construction Equipment & Construction Technology, from 10 to 14 December 2019, at Bangalore International Exhibition Centre. It is the largest construction equipment exhibition in South Asia, with 1250 exhibitors.

About the Dana presence in India, Dino Tarolli said: «India is a growth market for Dana, and our customers have responded well to the technologies we presented at Excon, including complete drive and motion solutions for compactors, aerial work platforms (AWPs), wheel loaders, and self-loading mixers. We have been a leading supplier to vehicle manufacturers in India for more than 50 years, and we continue to expand our capabilities in the region. Our recent acquisitions have added significant Asian manufacturing capacity, supplemented local engineering and customer support, and fortified our expertise in managing complex global development programs. Today, more than 5,000 employees work at our 17 facilities in India, including two global technology centers».

*vehicles. It grew our electronic controls capability for transmissions and drivelines and expanded our portfolio of electric motor technologies by adding products from Ashwoods Technologies. And it also optimized our global manufacturing presence to be closer to customers in key growth markets such as China and India, as well as the United States.*

*Finally, the addition of SME's low-voltage motors and inverters significantly expanded our electrified product portfolio while also increasing the potential for incremental content per vehicle.*

*It is important to note that these acquisitions have also had a tremendous impact on Dana's offerings for the light- and commercial-vehicle*

*markets, especially in the way they have immediately positioned us as a global leader in electrification.*

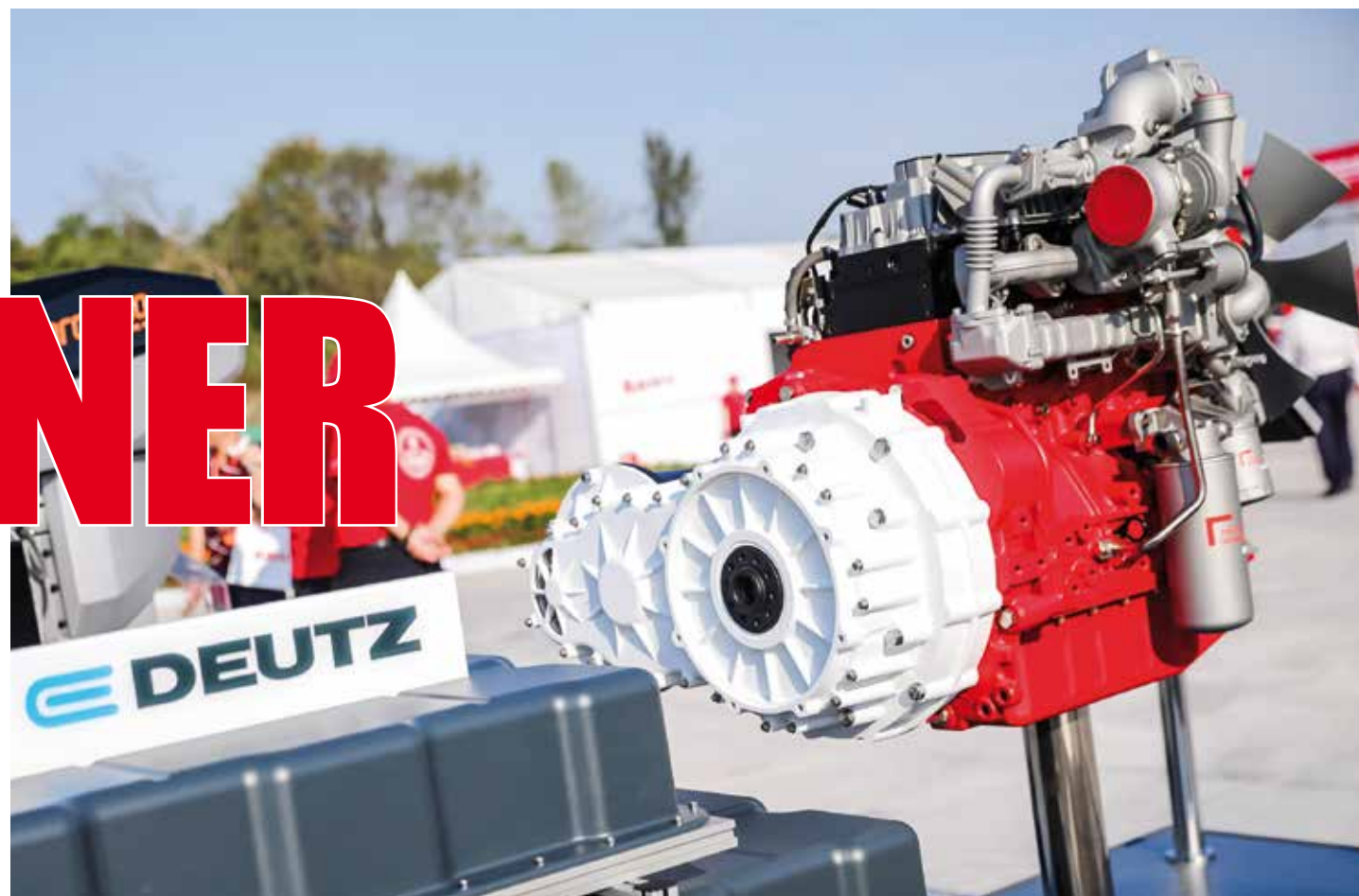
**Is SiC technology available to industrial applications?**

*SiC technology is a new frontier in improving the efficiency of producing and manufacturing inverter modules, and we are actively identifying opportunities to leverage SiC technology, gallium nitride, and other advanced elements that can be used in industrial applications. This area demonstrates the value of expanding our electrification capabilities through acquisitions, allowing us to rapidly add the engineering expertise we need to fully determine how the theoretical advantages of SiC can be realized in the field.*



DEUTZ AND SANY

# THE CLEANER CHINA



China is going to change deeply in the next few years, putting important efforts in order to make air cleaner. With such a background, Chinese primary CE equipment manufacturer **Sany** and **Deutz** have indeed signed an agreement that will lead to a shared engine production in China.

Let's start from the background. There's been so much talk about the well-known Made in China 2025 Plan issued by the government and aimed at turning the Chinese industry upside down. With relevant side effects for the world economy, we might say.

At the same time, in the next few years there will be quite a rapid tightening of Chinese emissions regulations, for either the off-road and the on-road sectors. Talking about the

off-road emissions legislation, the keyword seems to be China IV, expected to be in place by the end of the current year, which will bring a significant reduction compared to the

The application of China IV emission standard is getting closer, paving the way to the promotion of a more sustainable mobility all over China. OEMs and engine manufacturers need to be ready to face such a big change

previous standard, China III. Some figures help us be a bit clearer. Using the example of the 130 to 560 kW power range, China IV should set the limit of 2 g/kWh as for the NOx and 0.025 g/kWh in terms of particle mass (PM). Something clearly different compared to China III, which had a limit of 4 g/kWh for the NOx and 1 g/kWh about particle mass.

Then, what is it about to change for OEMs and engine manufacturers? Like the EU Stage V legislation, the use of a diesel particulate filter will be required, for example. Highly advanced drive systems will lead the way towards sustainable mobility in China: clean diesel, electric mobility and alternative fuels will be more and more familiar for the Red Dragon. All this represents, at the same time,

a huge challenge for Chinese vehicle and engine manufacturers and, for experienced manufacturers, also an interesting opportunity to offer their technology expertise by promoting clean and sustainable transport solutions.

These are among the main reasons that lie behind the above-mentioned agreement. In the box above, we report the details of a partnership that has been in the news for some months now and that was officially established only at the beginning of this year. Here, it's enough to say that, according to the official statements, the joint venture is supposed to lead to the construction of a brand-new production site in China with the target to significantly increase the supply of Deutz engines in the Eastern

Asian country to 75,000 engines only for Sany machines by 2022. Here we quote the words spoken by Dr. Frank Hiller, Chairman of the Deutz Board of Management, about the ongoing partnership. «We expect demand to continue rising in China. We will also be able to use the joint venture to provide a local supply for other customers. The Chinese government is promoting the development of cleaner diesel engines while at the same time pressing ahead with alternative drive technologies such as electrification, sustainable fuels and hydrogen drives. At Deutz, we embrace new technologies in all these areas, which puts us in a strong position to compete in the Chinese market».

It is quite important to remind that, only last year, Deutz acquired Futa-

vis, a development service provider for battery management hardware and software and, a couple of years before, Torquedo, a primary brand in electric and hybrid drives for boats. Finally, about the use of alternative fuels and hydrogen in combustion engines, there's an ongoing collaboration with a Munich-based start-up by the name of Keyou.

This broad range of technologies is in great demand in China's booming economy and will open many doors. The joint venture between Deutz and Sany is part of Sany's intelligent heavy truck project, a big-ticket project that forms part of a digitalization strategy. It involves Deutz taking over engine manufacture in the area of heavy trucks for Sany, in addition to various non-road applications.

## SHARED ENGINE PRODUCTION

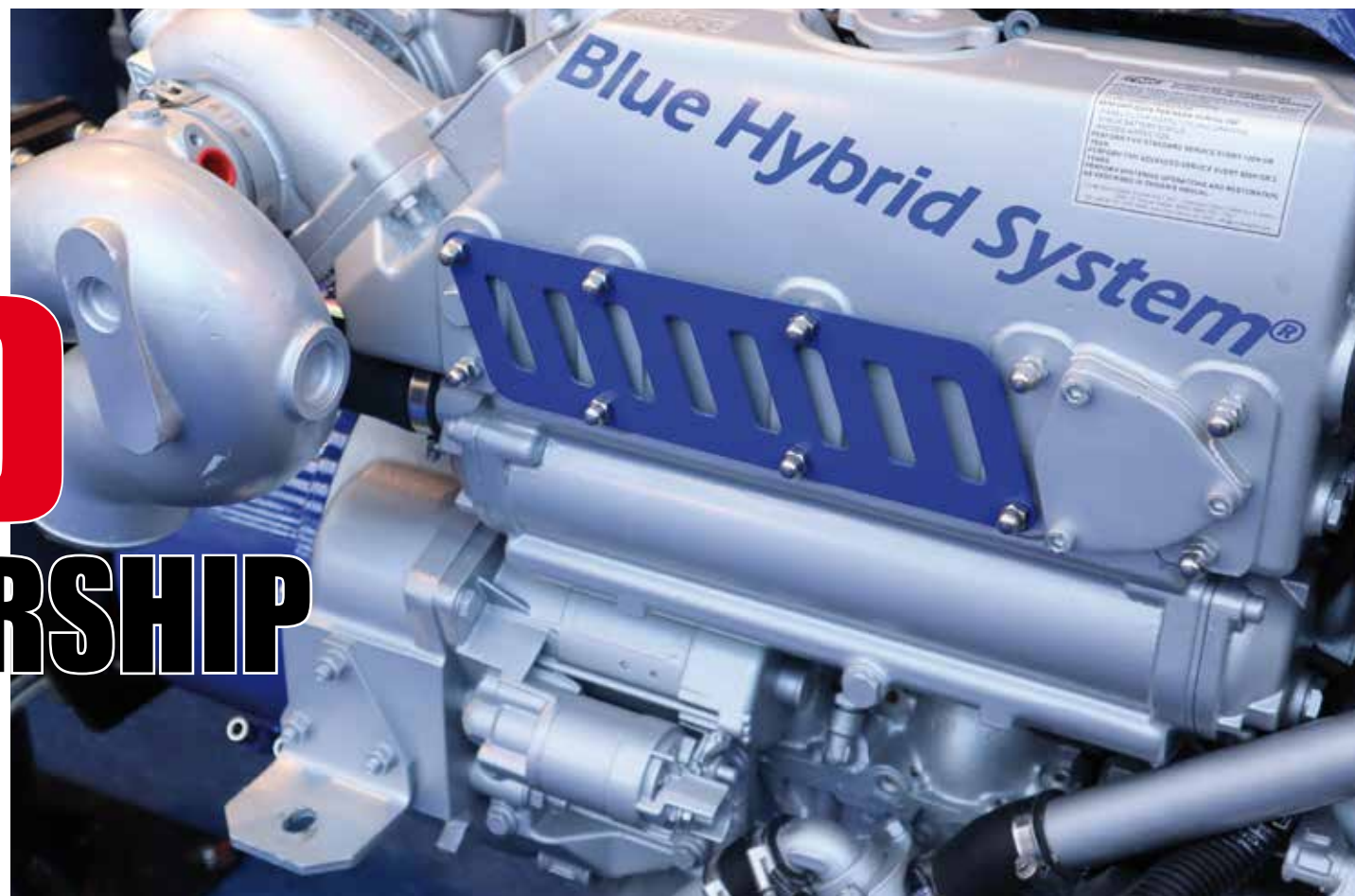
The agreement between **Deutz** and **Sany** to establish shared engine production in China was signed in September 2019 but was subject to the necessary approvals being granted by the relevant competition authorities. These were all granted at the end of the year, so it came into effect right at the end of 2019. In details, «as well as various off-highway applications, Deutz is also taking over the manufacture of heavy-truck engines for Sany. In the initial stage, the plan is to build around 75,000 new engines in 2022 at a new factory in Changsha, capital of the province of Hunan. Production is scheduled to start in 2021. The province of Hunan supports the setting up of the joint venture and is contributing several tens of millions of US dollars in additional funding to the project», says the official statement.

Frank Hiller, Chairman of the DEUTZ Board of Management:  
«With our advanced drive systems, we are ideally placed to support China in this aim and to contribute to sustainability at both local and global level»



CMD AND LONCIN

# IT'S A GOOD PARTNERSHIP



In January 2017 66 percent of the CMD group was acquired by Loncin in order to expand its market share in the avionics sector, also involving CMD Engine, FNM Marine and Eco20X branches. We met Francesco Iantorno, Director of marine division, and Giorgio Negri, Sales manager.

#### Let's start with the marine hybrid.

The hybrid was born in 2010 as a prototype idea and materialized in 2011, tested on a lagoon taxi in Venice. We stopped the project because the market was not ready and restarted it in 2016, when the hybrid won the Innovation prize at the SMAU in Milan, pushing us to resume its development. The collaboration with a

shipyard for a hybrid hull dates back to the following year and materialized in 2018, when we won a tender for the Carabinieri patrol boats in Venice. Do you know what the most

CMD Group, which also includes FNM marine engines among its assets, has been acquired by Loncin. An acquisition that boosts the ambitions of its flagships, such as the Blue Hybrid system and the Eco20X

innovative idea was? Integrating all the components under a single control that interfaces with the base engine, so as to make the system an integral part of it.

#### Who are you working with?

The Blue Hybrid System is a turnkey package, extremely compact, featuring a display customized by Simrad, a customized battery and charger, interfaced in canbus with the central control system entirely developed by CMD. We see some excitement about hybridization with requests also from Germany, Holland and India. The electric motor is controlled by the original endothermic instrumentation: basically we interface with the original controls, harmonizing the

system with obvious advantages for the shipowner. The axial extension is 230 mm. In our programs, the Blue Hybrid System on the BHS20 model is the first element of a full range. The system designed for the Carabinieri delivers 20 kWe, which provides an autonomy of two hours at 5 km/h with standard battery. We have in mind a 10 kW and a 30-35 kW version too.

#### What is your concept of hybrid?

Providing low-speed electric navigation in displacement, in sensitive areas such as the Canal Grande in the Venice Lagoon or the Grotta Azzurra in Capri. In practice, it clearly depends on the type of boat but the principle does not change: when cruising in endothermic mode the batte-

ries are recharged for the next cycle in electric mode, depending on customer needs. As an option, autonomous selection, with the possibility of geolocalizing the boat and automatically cruise in electric mode using the GPS signal. It is the consecration of the smart boat concept, which allows extreme flexibility in customization based on the type of application and the owner needs. The collaboration with Simrad is preparatory to autonomous driving and allows the boat to assimilate the best route. To give you an example of customization, beyond the usual parameters of autonomy, power and speed, try to imagine recharging without penalizing the planing phase, for example at cruising speed, optimizing the routes and stability of the boat.

#### ECO20X AND THE PYROGASIFICATION

The CMD ECO20x micro-cogenerator delivers up to 20 electric kW and 40 thermal kW generated by residual wooden materials, a process that converts solid biomass into a synthesis gas (syngas), essentially a mixture of carbon monoxide, hydrogen and methane. The machine has an average consumption of 25 kg/hour for an overall operation of up to 7500 hours/year, using class A1 wood chips. From a technical point of view it could be used in clusters. Compared to conventional fossil fuels such as methane syngas is prone to produce deposits such as tar, dusts and condensates. CMD has therefore developed a compound that allows to extend the continuous operation time of the engine. One of the main characteristics of ECO20x is that of having a specific maintenance plan, calibrated according to the operating hours, it is in fact possible to closely correlate the type of maintenance to the machine's operating hours.

CMD's diversification strategy is implemented by 4 Business Units: Machining, Marine Engines, Avio Engines, Micro CHP systems.

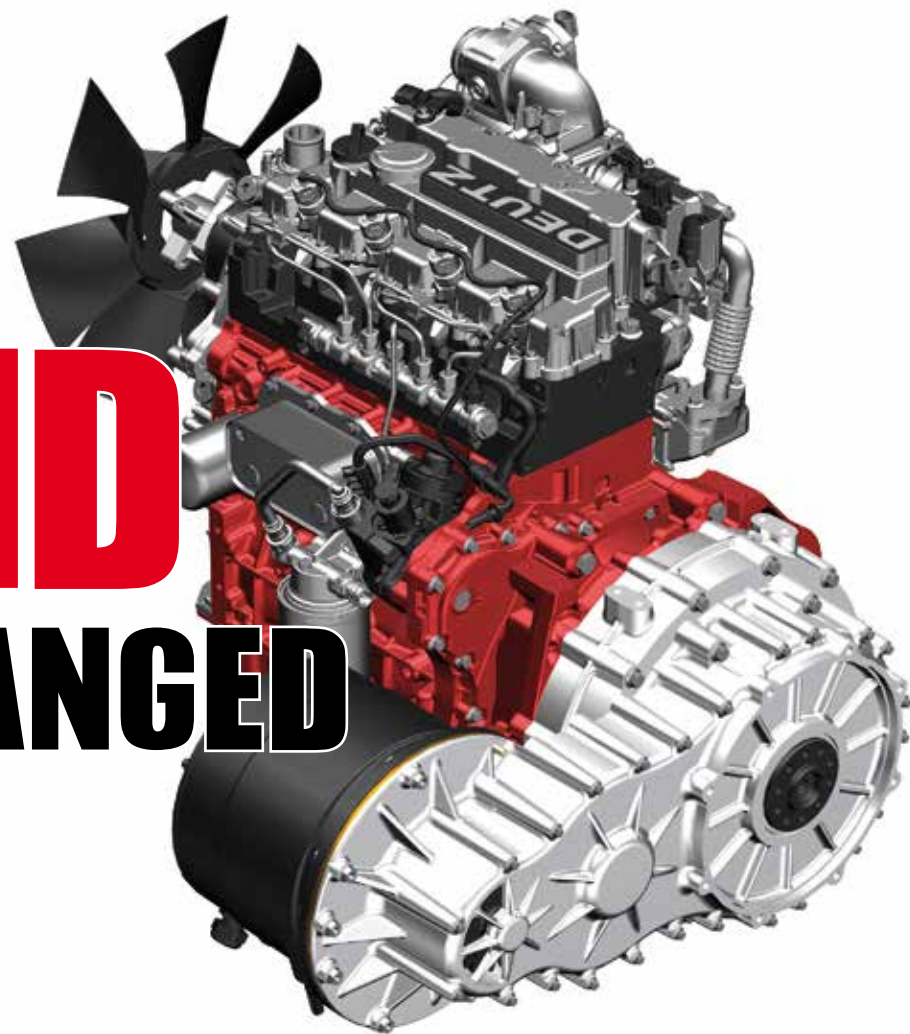
#### Let's take stock of FNM...

We convert to marine applications GM, FCA and FPT Industrial common rail engines. We start from the Multijet FCA, from 40 to 110 HP, continue with the 2-liter, 4-cylinder, in the 140 - 200 HP range, the 4-cylinder by Sofim, from 180 to 250 HP, and the VM Motori-based 6-cylinder, a 4.2-liters, 330 HP, RCD2 certified with our control unit. We might raise raise the power threshold in the future, perhaps within a hybrid package. FNM is not limited to a simple marine conversion. The added value lies in its know-how, software and hardware are patented: our control unit controls the hardware of the marinized engines. CMD also has an electronic department in charge of control unit engineering.



CONEXPO-CON/AGG 2020

# THE WIND HAS CHANGED



**W**hat are we going to find soon under the American hoods? Given the few previews available, the feeling is that we will witness in Las Vegas a partial turn towards partial or total electrification of the powertrain. However, in the range from 56 to 129 kW, from 2 to 4.5 liters, so to speak, we could see the relaunch of hybrids, therefore the partial redemption of diesel. Waiting for the manufacturers to unveil their plans, the trace of what we're going to see is written on Bauma and Agritechnica reportages, starting from **John Deere**. Also in Vegas the Deere 13.6 liter, 510 kW, now ready to go off the production lines, and the electric driveline will be the stars. A taste of it was seen in Hannover, with inverters and Internal permanent magnet. **FPT**

**Industrial** will show again the Cursor X, which returns to Las Vegas after being introduced at CES accompanied by Giorgio Moroder's 'Preludio' (The sound of the future), together with the

Just a few previews and some expectations about hybrid and electric solutions. By the way, for sure we'll see Deutz D-1.2-hybrid. Meanwhile, Kohler unveiled the Command PRO EFI propane engine and the dual-fuel Command PRO CH440D at WoC

F34 and Cursor 9 PowerPack. The F28, Diesel of the year 2020, will be the star attraction.

**MTU** also replicates what was seen in Hannover, featuring 1000, 1300 and 1500 Tier 4 Final - Stage V compliant series, and the microgrid demonstrator. They will also focus on the certification for on-highway use, that's a very crucial point in particular for some applications, such as cement trucks. The German team also includes Hatz and Deutz.

**Hatz** latest generation of engines with E1 technology received their EPA Tier 4 final emission certificates. What better reference for the American market? For its part, **Deutz** will highlight D-1.2 hybrid engine, a compact 3-cylinder engine with a capacity of 1.2 liters plus a 48 volt electric motor for low-load applications. In 2019 Deutz purchased



## CONEXPO 2017: WHAT ABOUT ENGINES?

2017 was a golden year for the booths of industrial engine manufacturers at ConExpo. Kubota announced here the V5009, the 5-liter, 4-cylinder (BxS 110 x 132 mm), delivering 157.3 kW, which was going to win the Diesel of the year 2019. FPT also used Las Vegas as a launch base for its V20. Eight V-cylinders, 2.5-liter cylinder (BxS 145x152 mm), 2,200 bar Bosch common rail and Hi-eSCR, delivering 669 kW at 1,800 rpm and 4,100 Nm at 1,500.

Another preview was John Deere's 13.6 liters, which still returns as a protagonist this year. At Liebherr's booth there was the 6 in-line D956 A7, 400 kW and 2,527 Nm, which went into production last year, in MAN's there was the D3876, Diesel of the year 2016. Volvo Penta used this showcase to announce Stage V showing the TAD1180-1182 VE, a 6 cylinder featuring EPG (non-refrigerated EGR) and EATS (a DOC, DPF and SCR single module).

Scania showed a trio, the 9, 13 and 16 liters. Cummins featured the Stage V series, EGR-free, back from the official launch at Bauma 2016, which introduced itself with the following credentials: the enhancement of some power levels, up to 13 percent reduction in the consumption of liquids and an extended 1,000 hours oil change intervals to 1,000 hours. Perkins showed the Syncro series to the American market, along with the powerful 9.3 liters from the 1700 series.

Deutz also featured a couple of American previews, the Liebherr-derived 9, 12 and 13.5 liters.

the battery-specialist Futavis. Under the spot also the Advanced Configurator.

**Liebherr** is betting on its component portfolio. For instance, they will introduce the DMVA D 165-165 hydraulic double motor, the DPVG 140 hydraulic pump as well as size 85 of the series 20 of the LH30VO medium pressure pump. On display also the 18-liter D976, with a power range from 469 to 843 hp (350 to 620 kW) in its standard version.

Speaking of hybrids, **Kohler** will probably re-propose the K-HEM solution, which applies to both the heirs of the

FOCS and the KDI. Certainly the Otto cycle engines will be the stars, aiming at the so-called 'alternative' market. In fact, the Command PRO EFI propane engine (Model PCV680LE) and the dual-fuel Command PRO CH440DF were unveiled at World of Concrete. A response to Briggs&Stratton's aggressive campaign, which recently launched the Vanguard 200cc and 400cc, the Vanguard V-Twin EFI and the Vanguard commercial battery system. In America, there are two other names along with John Deere that cannot be missed. One is **Caterpillar** which did not anticipate any news about its engines, available on site for both stationary and mobile, off-road and on-road applications, the other is **Cummins**. In this case, the Performance Series will surely end up in the spotlight and we

could perhaps expect the first results of Columbus' 'shopping campaign' in the world of electrification and alternative fuels: we refer to Hydrogenics, Efficient Drivetrains, Johnson Matthey Battery Systems and Brammo.

**Perkins** got back to the industrial sector as evidenced by the consensus gained in lifting applications by the Syncro series, in particular the 3.6-liter. Another hot topic, as we anticipated, is hybrid, on which Perkins has invested many resources that yielded the three hybrids showed at Bauma and Agritechnica. **Kubota** might draw from the experience of the German fairs the V5009, top of the range and Diesel of the year 2019, as well as dual-fuel. The prototype of a hybrid forklift truck was exhibited at Bauma. Will we see something similar also in Nevada?

«In addition to the record-setting 2800 exhibitors and the 2.6 million square feet of exhibit space, 150 education sessions will be held».



CUMMINS FOR AGRICULTURE

# STRUCTURAL FULL RANGE



«The 6.7 has a structural sump but not structural block, whereas both the F3.8 and F4.5 have a new structural block as well»

PERFORMANCE  
THAT YIELDS  
RESULTS.

ALWAYS ON

ALWAYS ON

CAN'T AFFORD  
TO STOP, WE'RE  
ALWAYS ON.

CUMMINS

**A**fter the 6-cylinder, Cummins' 4-cylinder version are now available in a structural version.

We asked Steven **Nendick**, Marketing Communications Director for Global Off-Highway to tell us about Cummins approach to AG engines.

«If you go back to thirty years ago, Cummins was a major supplier to Case. Our Darlington plant was delivering engines to Case's factory in Doncaster. These weren't structural engines like our new ones, they were standard ones built into frame tractors. Once Case became part of the CNH and Iveco conglomerate Cummins engines were gradually taken out. Since then we have been more successful in specialized and niche agriculture applications around the world (Argentina, US, Europe and others). More recently our solution for Stage V to

improve the after-treatment and remove EGR has drawn the attention of some manufacturers who perhaps would not

“We would like to have farmers using our structural and non-structural engines in all types of machines: telehandlers, tractors and combines. Now we have CLAAS with the non-structural 6.7 litre in their combine harvester”. 4 and 6 cylinders Cummins structural engines are available

have considered Cummins in the past. Coupled with this, we have taken the opportunity to invest in structural products. At Agritechnica 2017 we launched the 6.7 litre engine and this year we have debuted smaller structural engines – the F3.8 and F4.5. We have had several manufacturers interested in the B6.7, but they're looking to cover a wider range of tractors. With the big power increase of our 4-cylinder products at Stage V we decided to use it to extend the structural range. Our F3.8 engine is now structural as well, and we have pushed the capacity up to 4.5 litres. We will have the F3.8 on the lower end, with lower costs, and then, for higher power we developed the F4.5. So, customers can have the same structural external engine design from 67 to 129 kW with 3.8 litres and 149 kW with 4.5 litres».

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JOHN DEERE 13.6

# LOOKING AT OEMS



«Our worldwide service network of more than 4,000 locations, 1,500 of which are in Europe» Sandrine Couason, Manager EMEA, said.

**F**rom Vegas to... Las Vegas! Three years have passed from the official presentation and John Deere's 13.6 liters is approaching the serial production. We saw it in the Deere's natural habitat at the Agritechnica, and we talked with Patrick **Thil**, Manager, OEM Sales, EAME, Asia & Australia. The key words? Power density, serviceability and a genuine industrial vocation.

**We could start from the draft.** First of all, we increased the engine power, with the new 13.6 liters engine we can reach up to 510 kW, almost 700 hp. The engine block of the 13.6 liters has not dramatically changed, we modified the injection system to have higher fuel pressure and to achieve the right rating. Originally

the unit injector was inside the engine and we put the common rail outside the engine cover. And we took the be-

The 13.6 liters by John Deere is going to attend its second edition of ConExpo. It comes back to Las Vegas where it was launched in 2017. Compared to 13.5 liters engine, the US manufacturer improved performances, noise level and serviceability

nefits of that to change a bit the head of the engine, reducing the size and integrating some automatic valve lash adjustments. We improved the noise level and the serviceability as well. These are absolutely essential features for any OEM.

**And now please persuade me to purchase this engine!**

Fluid consumption is very, very important for us, even in Tier 4: when we adopted the SCR and DPF, the fluid consumption was from 2 to 4 percent compared to the 7-8 percent of some competitors. We've been using the DPF for many years and we manage perfectly the DPF's regeneration. We collected more than 1 billion hours of working on the fields with particulate filter.

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MTU AND MICROGRIDS

YES,  
I'M  
SMART



«There are two points of focus for microgrids: one is to become independent of the public grid, and the other is to feed into it».

**M**TU and microgrids. More than a challenge, in Friedrichshafen they believe it's a smart and available technology.

We asked all this to Armin Fürderer, Director Customer Solutions, Rolls-Royce, Business Unit Power Systems.

**What is the MTU approach to microgrids?**

Rolls-Royce wants to provide complete MTU energy solutions – from diesel and natural gas to solar, and battery storage offerings – all controlled and managed by our own management system which orchestrates an optimized mix of the various energy sources to harmonize ecology and economy.

**Are MTU systems engine-only, or do they also involve other technologies?**

*“I remember the discussion we had with people who said that ‘electrification is the only way to go with mobile applications’, but if you generate a certain percentage of electricity from coal, say, it makes no sense”. Quite the opposite, microgrids make sense because it’s an efficient technology*

*Our focus is on the solution, and that means we’re handling all the technology. Sure, our core natural gas and diesel tech is a big part of this, but our new products – such as the MTU Battery Solution and the MTU Microgrid Controller – are the key to a fully-integrated energy solution. The key is to manage all assets in the smartest, most effective way from the points of view of ecology and economy. That’s why we’re focusing on our own range of microgrid controllers.*

**What is your customers’ approach to choosing a diesel or gas engine?**

*One interesting development in future may well be microgrids fed by synthetic fuels as well as solar panels.*

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PERKINS SYNCRO 2.2

# TIGHT TURNING CIRCLE



«For the 2.2 engine, customers are particularly focused on having tight turning circles due to the limited space in an orchard or vineyard».

Looking at the attention that Perkins has been paying for the last five years at least to the industrial applications, we could say 'Perkins is back home', particularly at Agritechnica, where Peterborough joins its natural 'followers': the farmers.

With 55 kW and 270 Nm, the 2.2 liters engine is specifically designed for specialized tractors and meets both Stage V and Tier 4 Final requirements to accomplish the Syncro family's mission: to offer a wide range of structural engines.

We spoke to Perkins Syncro product marketing manager, Alex Eden.

«As the engine is part of the tractor structure, we've spent time understanding the twisting forces the ma-

chine will experience over uneven and often rugged terrain. We've also focused our attention on the growing

The 2.2 liter is offered as a turbo and also as turbocharged aftercooled and it completes the Perkins Syncro family for agricultural applications. Special attention to the turning radius for orchard and vineyard tractors. Focus also on the ground pressure

demand around ground pressure, so tractor manufacturers and farmers choosing Perkins Syncro engines will benefit from products which deliver all the strength required to perform, but which are also light and compact, thereby easier to fit into the machine».

Alex continued: «The Syncro 2.2 tractor engine is offered as a turbo and also as turbocharged aftercooled and joins the 3.6 tractor engine we announced at EIMA 2018. We have lead customers (AG OEMs) and they're going into production in the middle of 2020. We have a lead customer for the 2.2 liters engine, the Syncro 3.6 has been chosen by Lindner. Probably we will announce more businesses at next EIMA International in Bologna».

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SUPER-COMPACT ENGINES

# A WORLDWIDE MATCH



nists of the third decade of the century. ‘Small is beautiful’, especially in times of downsizing, and not only because of compatibility with hybrid systems. And this is how **Hatz** remains on top of the podium thanks to specific curves: the German 2-liter wins the primacy of power per liter while specific torque rewards **Doosan**, which switched from Delphi to Bosch in the transition from Stage IV to Stage V. Even torque at maximum power sees the central of the Korean G2 trio on top, along with Deutz and **Kohler**. Speaking of the Rising Sun, the string quartet appears here in full. Kubota, like **Yanmar**, in Stage V, while **Isuzu** and **Mitsubishi** as far as we know boast their Tier 4 Final and slightly leave

behind the other competitors. **Perkins** Syncro is the new name for this scenario (see the monographic article on this number). **Deutz** brings in its 2.2-liter that shares the same cylinder displacement of the TCD2.9, Diesel of the year 2010, equips the Carraro Agritalia Hybrid introduced at EIMA 2018 and is also available in a LPG version. **Kubota** is also familiar with the so-called alternative fuels, the dual fuel, featuring a balanced four-cylinder engine both for specific curves and mass-weight-power ratio. The only three cylinders in the comparison are the aforementioned Deutz, **VM** and **FPT**. Despite the fact that the parent company has oriented the

The DOC - DPF combination has also established itself here and helps combustion in applications that often avoid the most stressful profiles.

**C**ertainly pump injectors and rotary pump definitively belong to the past. In fact, even the super-compact ones need an efficient common rail to comply with Stage V regulations.

That’s why we excluded those mechanical units, such as the Kioti 4A220Lws, 2.2 liters (BxS 87x92.4 mm), which with its in-line pump, 33.6 kilowatts and 140 Nm is particularly suitable for stationary and semi-stationary applications. The DOC - DPF combination has also established itself here and helps combustion in applications that often avoid the most stressful profiles. Unburnt hydrocarbons and particulate are thus processed downstream of the combustion process. The heterogeneity of the selected engines remains intact, and although fal-

ling below the fateful threshold of 56 kilowatts they mainly differ in terms of specific performance. It couldn’t have been any different, since Hatz and Yanmar on one side and Kohler and Mitsubishi on the other - the two extremes in the eleven competitors - are divided by a 20% displacement gap.

Even this power range - like the one published in the last issue - (engines displacing between 2.8 and 3 liters) is a candidate to equip those hybrid machines which some consider a residual choice, some others see as the protago-

**We find 11 competitors in the 2 – 2.5 liter range. Hatz still shows the best specific curves**

	DEUTZ	DOOSAN	FPT INDUSTRIAL	HATZ	ISUZU	KOHLER	KUBOTA	MITSUBISHI	PERKINS	VM	YANMAR
<b>I. D.</b>											
B x S mm - S/B	92x110 - 1,20	90x94 - 1,04	94x107 - 1,14	84x88 - 1,05	85x96 - 1,13	88x102 - 1,16	87x102 - 1,18	86x95 - 1,10	84x100 - 1,19	94x107 - 1,14	86x90 - 1,05
N. cil. - dm³	4 - 2,92	4 - 2,39	3 - 2,22	4 - 1,95	4 - 2,17	4 - 2,48	4 - 2,43	4 - 2,20	4 - 2,21	3 - 2,22	4 - 2,09
Maximum power kW - rpm	<b>55,4</b> - 2.200	55 - 2.600	52 - 2.600	<b>55,4</b> - 2.800	43 - 2.200	55 - 2.600	55 - 2.700	44 - 2.500	55 - 2.800	52 - 2.600	44 - 3.000
Mep at max power bar	10,5	10,8	11	12,4	11	10,4	10,2	<b>9,8</b>	10,8	11	11
Piston speed m/s	8,1	8,1	9,3	8,2	<b>7</b>	8,8	9,2	7,9	9,3	9,3	9
Maximum torque Nm - rpm	300 - 1.600	320,5 - 1.600	249,9 - 1.800	240 - 1.600	215 - 1.600	299,9 - 1.500	249,9 - 1.600	220 - 1.600	270 - 1.800	249,9 - 1.800	215 - 1.600
Mep at max torque bar	13,2	17,2	14,4	15,8	<b>12,7</b>	15,5	13,2	12,8	15,6	14,4	25,1
% power at max torque (kW)	44,4	48,1	37,9	33,5	40,4	44,4	35,3	39,9	39	37,9	<b>74,4</b>
Torque at max power Nm	<b>235</b>	206	196	186	186	206	196	167	186	196	176
% power at max torque (kW)	90,8 (50)	97,70 (54)	90,60 (47)	72,60 (40)	83,80 (36)	85,70 (47)	76,20 (42)	83,80 (37)	92,60 (51)	90,60 (47)	127,00 (62)
<b>DETAILS</b>											
Specific power kW/dm³	18,8	23	23,4	<b>28,2</b>	19,5	22,2	22,6	19,9	24,8	23,4	21,1
Specific torque Nm/dm³	102,5	133,9	112,1	123	98,6	120,8	102,6	99,6	121,7	112,1	103,1
Areal spec. power kW/dm²	20,83	21,65	<b>25</b>	24,95	18,94	22,63	23,11	18,97	24,77	<b>25</b>	19
<b>RULES AND BALANCE</b>											
Dry weight kg	237	204	210	173	199	267	245	310	242	225	210
L x W x H mm	648x560x685	673x556x690	519x524x723	680x540x595	725x530x737	704x521x715	866x540x753	656x559x647	757x535x807	614x557x723	890x543x766
Volume m³	0,25	0,26	<b>0,20</b>	0,22	0,28	0,26	0,35	0,24	0,33	0,25	0,37
Weight/power kg/kW	4,3	3,7	4	<b>3,1</b>	4,6	4,9	4,5	7	4,4	4,3	4,8
Weight/displacement kg/dm³	<b>81</b>	85,3	94,3	88,7	91,3	107,6	100,6	140,5	109,2	101	100,4
Power density kW/m³	221,6	211,5	<b>260</b>	251,8	153,6	211,5	157,1	183,3	166,7	208	132,4
Total density t/m³	0,95	0,78	1,05	0,79	0,71	<b>1,03</b>	0,70	1,29	0,73	0,90	0,57
Displacement/volume dm³/m³	<b>11,70</b>	9,20	11,14	8,87	7,78	9,55	6,96	9,20	6,72	8,91	5,65





Deutz, Liebherr, Manitou

This trio was one of the first to convert operating machines with a hybrid or electric package. The preview of Deutz's collaboration with the two OEMs was unveiled at the Electrip in Cologne. From Deutz 3.6 to 2.2 liters. The ICE is integrated by a 20 kW synchronous electric generator that brings the total power to 75 kW of the diesel version. Also thanks to Torqeedo, whose contribution can be seen in several details: 48V, with the electric motor supporting the endothermic or in full electric mode, LiFePo or LiNMc batteries, sensors, IP67 casing, synchronous electric motor.

Italian plant towards automotive propulsion, the 3-liter is confirmed to be reliable, climbing to the top in all the indexes. Stage V was introduced at EIMA 2018. 1,600 bar common rail, single canning for DOC and DPF, easy maintenance thanks to the starter on the injection side and lateral PTO. Mirroring the R753 we find the FPT R22, which also follows the curves of its Italian twin, currently oriented towards the captive applications of the CNH group.

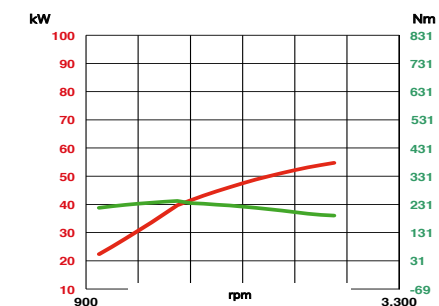
A final thought on the recirculation of exhaust gases: among the super-compact the EGR is still alive. ■

	DEUTZ	DOOSAN	FPT INDUSTRIAL	HATZ	ISUZU	KOHLER	KUBOTA	MITSUBISHI	PERKINS	VM	YANMAR
<b>INDEX</b>											
Torque	8	12,4	10,1	14	7,9	13,1	12,9	10,9	12,2	10,1	10,8
Performance	4,2	4,9	4,7	4,8	4	4,7	4,4	4,1	4,9	4,7	6,2
Stress	7,1	8,4	7,9	8	6,6	8,1	7,5	6,9	8,3	7,9	11
Lightness	9	9,2	10,8	9,8	10	12,2	11,6	15,8	12,3	11,8	10,4
Density	23,3	28,4	32,4	31,1	19,5	25,9	16,6	23,1	20,5	25,9	28,1
DIESEL INDEX	6,2	7,2	6,6	7,6	6,2	6,7	6,6	6	6,9	6,6	6,7

1 HATZ



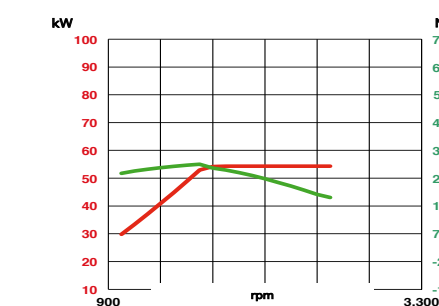
HATZ



2 DOOSAN



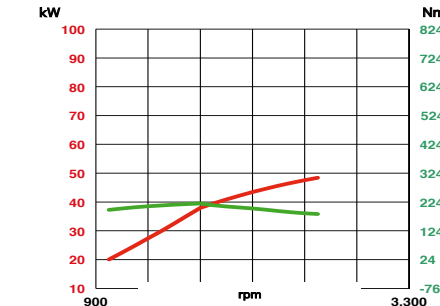
DOOSAN



3 YANMAR



YANMAR



~~AVOID~~  
ATTACK



It's time to defeat downtime. Our new KDI engines are loaded with maximum power and torque, **so you never have to stop.** They're also ultra compact and equipped with KOHLER® Flex technology — a suite of integrated engine systems that allows you to meet every emission standard on earth, including Stage V. The future of power is here. **BE UNSTOPPABLE.**

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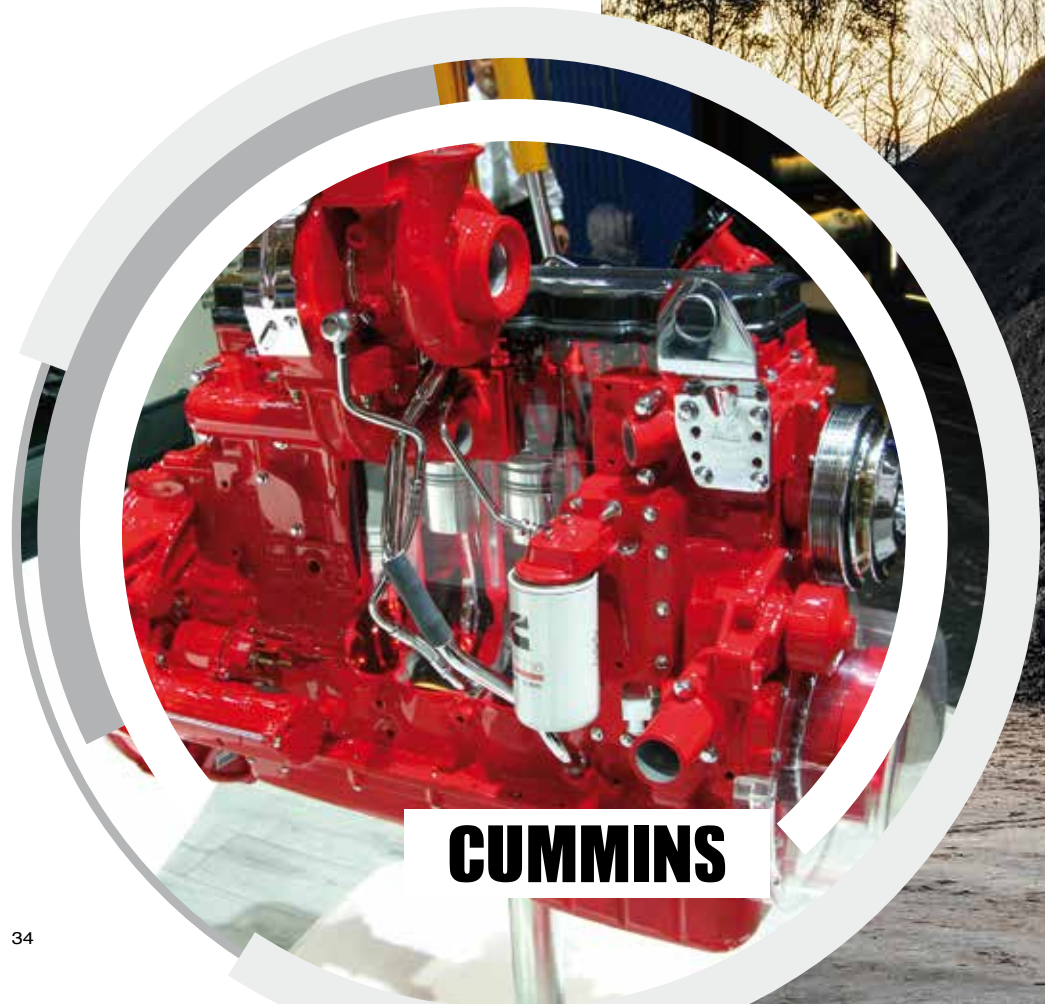


FISH-EYE

JCB 457 AND CUMMINS

# NOW EVEN SMARTER ON SITE

*The updated version of the well-known JCB 457 wheel loader features Cummins B6.7 Performance Series Stage V engine. This is not the only improvement made by the British manufacturer in search of higher efficiency, lower consumptions and reduced emissions*



**CUMMINS**



## Cummins B6

Cummins' Stage V 'recipe' applies from 3.8 to 15 litres, so also for the previous QSB6.7, now renamed B6.7. In fact, the muscles of the 6.7 litre Performance Series are there to push the new JCB 457 wheel loader, capable of ensuring 210 kilowatts of power and a torque equal to 1,350 Nm. Cummins decided to boost both the power and torque curves, especially the second one.

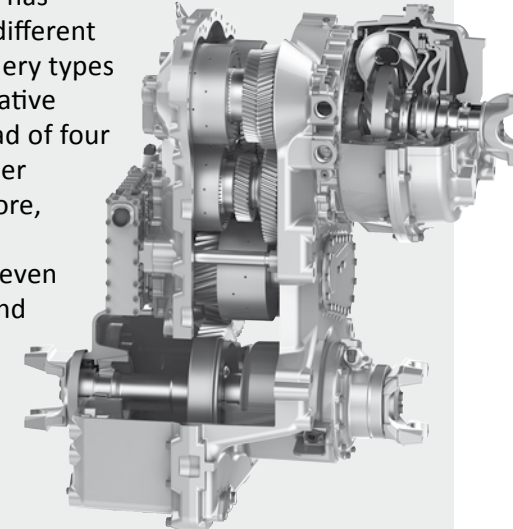
Such a power rating seems to fit perfectly the

requirements of this machine, facing stress-free work cycles with the demand for torque peaks when moving over rough terrain or material handling. Equipped with the VGT, like all Cummins Stage V engines, the B6.7 doesn't have any EGR.



## ZF 5-gear Ergopower transmission

According to ZF, the efficiency of a wheel loader is shown in the working cycle: an intelligent driveline system always makes the power available where it is needed. JCB 457 wheel loader relies on ZF Ergopower transmission, with 5 instead of the previously 4 gears. This proven and tested fully automatic powershift transmission system has been optimized for different construction machinery types and offers the innovative feature of five instead of four gears for wheel loader applications. Therefore, the noise-optimized transmission allows even more comfortable and easier handling, high shifting quality and flexibility. Moreover, the operating costs can be further reduced.



In this story, basically, we will not be talking about a new model. It's rather an update of a machine – the JCB 457 wheel loader – that the market has learned about in recent years and that is now also available in the Stage V version. What does that mean, then? It means that the British manufacturer has made some relevant important improvements on some specific parts of the machine, with the aim of reducing consumption and emissions. As well as to seek maximum efficiency in the daily use of the 457 on site.

The highlight of the new machine, even more so for a magazine like ours, is under the bonnet and is called B6.7 (see the dedicated box). We have spoken several times to Cummins managers and engineers about the new series of agricultural engines, which is the result of an innova-

**JCB turned to Cummins once again for the supply of engines, mainly for the peculiarities of the B6.7 Stage V model with SCR, DPF and ammonia slip catalyst (ASC). ZF's 5-speed transmission, provided as a standard, ensures improved acceleration and higher performances. Rexroth's A1V0 axial piston variable pumps enhance the machine's hydraulic system.**

tive approach to Stage V.

The need to meet the requirements of the upcoming Stage V emissions regulations, indeed, was the reason why JCB turned to Cummins engines once again, after working with MTU, which supplied the engines for the previous 457 series wheel loader.

The engine is equipped with single-module after-treatment system, with diesel oxidation catalyst, as well as SCR, ammonia slip catalyst (ASC) and the DPF.

According to JCB, «the DPF works in a consistent way during the machine operation; the request for regeneration occurs only when the machine is left with little load for quite long and the filter fails to work properly».

In addition, for the first time the Stage V version of the wheel loader is featured by an automatic engine stop and start, which can be adjusted by

the operator. The system – useful to face the effects of the unhealthy habit of leaving machines idle for long periods of time during work – makes it possible to save fuel, reduce emissions and extend service and maintenance intervals.

The matter of fuel consumption will inevitably affect the choice of components that are part of the JCB 457 driveline. Starting with ZF's 5-speed transmission, installed as a standard, with close gear ratios to ensure better

acceleration and uphill performances. Available as an option is the 5-speed gearbox, again with lock-up converter, which guarantees efficiency in second to fifth gears and, consequently, reduced consumption.

The axles are also supplied by ZF. Extremely sturdy, they have been re-proportioned for the new wheel loader version and have extremely long maintenance and oil replacement intervals.

The hydraulic system is serviced by

two Bosch Rexroth axial piston variable pumps that feed a Parker load-sensing closed control valve that is activated only on demand to get the highest possible hydraulic power and speed and ensure accurate and efficient control of the wheel loader.

The braking system is fully hydraulic dual-circuit with multiple oil-immersed discs to provide a virtually maintenance-free lifespan. In addition, the brakes are designed to operate at the same speed as the wheels, thus reducing overheating and resistance and also providing a positive effect in terms of fuel consumption.

With the idea of improving comfort and visibility, the positively pressurized JCB CommandPlus cab has been slightly improved with a high-quality KAB seat and with targeted interventions on the external manufacturing quality.





MIDDLE EAST ENERGY 2020

# NEW NAME, SAME STORY



**T**he acronym remains the same, MEE. What's new, compared to the previous 44 editions of the traditional Middle East exhibition, is the final 'E', now standing for 'Energy'. It may seem a little change indeed, however it is the sign of an evolution leading to, according to the official statement released by Informa Markets (organizers of MEE), «an energetic transformation which aims to keep the region's leading power industry event at the forefront of a rapidly-evolving sector».

Having a look at the MENA Power Industry Outlook, in fact, we see that Middle East Energy serves a region which is forecasted to require 109 billion US dollars in power infrastructure investments over the next

few years. In such a scenario, the word 'Electricity' was not enough anymore to represent the requirements of a sector that looks closely to a wider value chain. Not by chan-

Last year, among the keywords in Dubai were gas engines and Stage V. There will still be room for these topics, along with digitalization and renewable sources. Middle East Energy is ready to embrace an even broader sector

ce, keywords such as digital transformation or renewable sources will be widespread all over the Dubai halls and corridors as well the new customized Digitalization Zone, highlighting the latest technologies in digital transformation, or the Renewables sector, featuring the developments in alternative energy sources, from hydro to geothermal, up to solar and wind.

On the other hand, it is quite impossible not to mention the concerns about the Coronavirus, which is affecting not only China but the whole world. Some Far Eastern companies may be missing due to travel restrictions. The organizers are currently monitoring developments. We'll see. Indeed, like the latest years, Diesel International editorial staff will be in

Dubai to visit the exhibition. In the meantime, we've tried to ask some of the major engine manufacturers for a preview of what we are about to see at MEE.

**John Deere Power Systems** will showcase an updated range of generator drive engines. In particular, the updated range of non-certified engines, covering all the power nodes from 30 to 500 kVA and displacements from 2.9 liters to 13.6 liters. There will be also room for Stage V engines and the new 4.5 liters EWS generator drive engine, featuring an SCR catalyst with integrated DEF mixer resulting in more compact packaging, addressed to applications ranging between 80 and 100 kVA. Three generator engines will stand up at **FPT Industrial** booth, simi-

## EYES ON AFRICA

Same organizers, different locations. Informa Markets will try to reply the success of Middle East Energy in a very promising area of the world, the Eastern African continent. East and Central Africa Energy will take place on 1-3 September, 2020, in Nairobi, Kenya. The African event is expected to gather together manifold global energy companies interested in expanding their business into East African markets.

Kenya, in particular, has a market-based economy and is considered the economic, commercial, financial and logistics hub of East Africa. Each year, thousands of companies are investing and setting up local and regional operations to take advantage of Kenya's strategic location, diversified economy, entrepreneurial workforce. Kenya has promising potential for power generation from renewable energy sources. Besides, the government has prioritized the development of geothermal and wind energy plants as well as solar-fed mini-grids for rural electrification.

«The energy transition is already under way and digitalization is playing a key role», explained **Claudia Konieczna**, Exhibition Director, Middle East Energy

larly to what happened one year ago: the S8000 G-Drive, with 3 cylinders in-line and 2.9 liters displacement, designed for emergency and prime power applications. Then, something quite bigger: the N67 250 kVA for high power generators, with 6 cylinders in-line and 6.7 liters displacement. Finally, the award-winning Cursor 16 600 kVA with common rail fuel injection system, 15.9 liters and 6 cylinders in-line.

**Baudouin** has established itself as a leading manufacturer and will take part in MEE 2020 with the aim of introducing some new products as well as a new product range. We cannot say anything yet, but we are sure it will be worth waiting. Last year, **Perkins** focused its presence on the Stage V evolution of PG engines.

This year, the British manufacturer will be of course in Dubai. We'll pay a visit to them as well as to **Volvo Penta**, which are about to introduce a new primary release, improving an already comprehensive range of engines for gensets.

There will be something new at **Cummins** booth, too. Namely, the C25G gas generator series, featuring a power density of 500 kW (50 Hz) and 580 kW (60 Hz) from a 25-liter engine with reduced maintenance costs and enhanced fuel efficiency, and the QSB7 diesel generator set, a fully integrated system capable to operate even in hotter climates without compromising high performance. The US company celebrates this year an important anniversary, the 100th year of the Power Generation business.



CUMMINS C25G

# THAT'S WHAT WAS NEEDED



**C**ummins C25G: 500kWe at 50Hz & 580kWe at 60Hz available on continuous & island mode duty; Liebherr G9512, 25L, 12 cylinder ABB single turbo; 250 mg/Nm<sup>3</sup> (0.5g/hp-hr) without aftertreatment, compliant with EU Medium Combustion Plant Directive (MCP) and US EPA NSPS Stationary compliant capable, 2,000-hour minimum interval; 32,000-hour, mid-life overhaul; 64,000-hour full overhaul. This is the basic portrait of the gas generator, premiered in Ramsgate, UK. Following is a short Q&A. We'll tell you the rest in the next issue, after the official presentation at the MEE in Dubai.

**What are the technical details why you choose Liebherr?**

*This is also the result of a long collaboration with Liebherr. If you are able to talk to the market, and we are able to do so, you have to assume that the market is changing rapidly. We have therefore realised that Liebherr is the*

**It will be unveiled officially at MEE in Dubai. It's the Cummins G25G, a gas generator with 500 kWe @50 Hz (580 kWe @60 Hz) for CHP installations. We attended the preview in Ramsgate, UK**

*most suitable engine supplier for our needs, especially considering the importance of time-to-market.*

*It is a balance of understanding what power we had available and what the gap in our portfolio was; we had a gap between the QSK 19G and the QSK 60G.*

**What are the best applications, maybe microgrid?**

*Microgrid is one, but more CHP installations in general. It could be hospitals, universities, shopping malls, airports and wherever there are CHP requirements.*

**Is this engine ready for any kind of hybridization?**

*Potentially, one could speak as a storage-integrated hybrid. We are able*

*to meet the needs of our market, up to 500 kW; starting from this, it is certainly an interesting prospect to be able to integrate with new technologies, such as fuel cells with storage. We are currently in the exploratory phase, trying to understand what power is needed, 500 kW would probably be the optimal power. In any case we are talking about fixed speed, there are no variable rpm on schedule.*

**Alternative fuels?**

*We are talking about the potential gas fuels, such as landfill, waste water, digesters, etc. Anything is non natural gas, so gas taken from waste, in effect. However, I would like to notice that what we see is a lot of strange and unusual gases, so we can consider some of them if they meet some para-*

Chris Downs, Global Marketing Manager Prime Power Segment: «*What we see, in the long term, is that our range should satisfy most applications*»

## LIEBHERR AND THE FREE MARKET

The G9512, a 2-lier, 12 V 2-cylinder unit (BxS 130x157 mm), is another piece of the Liebherr mosaic that has made its way into the free market. Among mobile applications, Liebherr has risen to the headlines for the agreement with Deutz relating to 9, 12, 13.5 and 18 liters. In the power generation market, the company signed an agreement with Kohler SDMO which dates back to 2016. At that time, the cooperation involved two series of engines, the 135 and 175, which consisted of three units each, owe their name to the bore size and deliver from 709 to 3,608 mechanical kW in standby at 50 Hz and from 891 to 4,250 kWm, still in standby mode, at 60 Hz. The 135 and 175 series have made 50,000 hours of bench tests.



*meters, like the impact on emissions. There are also gases with which the engine cannot work, so we will be waiting to see what happens in the future.*

**Circular economy: an affordable goal?**

*We're working on an interesting waste recovery project for a chicken farm in Pakistan. Of course, you have to ask yourself how much waste is needed, because the technology is capable, but you have to understand what are the energy needs of the plant.*

**Why to choose a gas generator instead of a diesel one?**

*Cost of fuel is one reason, emissions are another one. Spark spread is a significant drive for some market where diesel prices are just too high and na-*

*tural gas would be the supplied choice.*

**So am I to assume that diesel engines in PG are going to disappear?**

*A large proportion of the market, the Middle East and Africa, have less stringent emission regulations, which still makes us appreciate the potential of diesel. The large primary power dimensions are still oriented towards diesel. However, it is true that a large part of the market will move towards gas because of fuel costs.*

**What are the best power ratings for gas applications?**

*It all depends on the customers. We can think about integrating existing technologies. So we position ourselves just where the market is moving.*



TRIGENERATION @LAMBORGHINI

# IT IS A LUXURY AWARD



**C**ogen Europe, Lamborghini and CPL. If we linked the three of them as in a dot-to-dot game, we'd get the picture of Automobili Lamborghini's trigeneration plant built in the historical company headquarters of Sant'Agata Bolognese. But how are they related? CPL Concordia was commissioned by the renowned car manufacturer to build the trigeneration plant that now contributes to lighting, heating and cooling what was once Ferruccio Lamborghini's dream, and now a prominent company belonging to the Volkswagen group. As for Cogen Europe, the European Association for the Promotion of Cogeneration chose CPL and Lamborghini as winners of the Recognition Award 2019 in the Market Development (organizations)

category. The awarding ceremony took place at Cogen Europe's annual conference titled 'Cogeneration: Efficient and Clean Heat and Power for Europe's Sustainable Energy Future'.

**Automobili Lamborghini and energy efficiency: a combo made possible by the Italian company CPL Concordia, providing the Sant'Agata Bolognese facilities with a 2.4 MW cogeneration plant that won the Cogen Europe Award**

A few facts on CPL. Established in 1899, this cooperative offers multiple services mainly dealing with the management of heat (global service and facility management) gas (building, maintenance and operation of LNG and methane grids) and district heating, as well as with the development/application of renewable energy sources. «We started our activities in cogeneration in the early '90s» they said «with methane, biogas and diesel-fuelled plants. For natural gas we used the Totem (editor's note: a pioneering cogenerator fitted with the same engine used on FIAT 127 cars – 903 cc, Over Head Valves) 15 Kw at 3000 rpm. Then we switched to bigger engines for landfill applications, all the way through to the current customized solutions reaching up to 100 Mw of power».

#### What are your engine suppliers?

*We choose what we believe to be the most effective and efficient solution for our customers, which is why we work with all major players/manufacturers on the market. At Lamborghini, for instance, we installed a MWM plant for which we provide servicing directly.*

He moves on to pinpoint the highlights of the award-winning plant. «The project that earned praise from Cogen Europe's jury is made up of two elements: a trigeneration plant including

*«In terms of CO2 emissions avoided, indeed the generation of energy as described earlier brings about savings totalling 1,640 tCO2/year»*

#### MILAN AND DISTRICT HEATING

'A Clean Planet for All' is the document that summarizes Europe's energy vision. District heating is reported to potentially account for up to 50% of the total heat demand, as against the current 10%. E.ON and CPL Concordia are moving in this direction, as testified by their agreement for the building of a high-efficiency cogen plant combinedly generating heat and power at the wastewater treatment plant located in Milan's northern suburban area.

The new cogeneration plant will mainly consist of a high-efficiency **2MW methane gas engine** and a heat recovery heater and it will guarantee efficient, competitive operation, thus bringing substantial cost and energy savings for CAP and NET (water service and district heating network operators, respectively) while at the same time reducing polluting emissions. Indeed, by producing heat and power simultaneously, the cogeneration units will increase fossil fuel efficiency up to 85% and beyond.

Plus, heat recovery by means of cogeneration will allow to produce thermal energy more efficiently and to feed it – in the form of hot water - to the district heating network managed by NET and serving the municipalities of Pero and Rho.

Every year, the cogeneration plant will provide the CAP and NET groups with some 13GWh of electrical power and about 13 GWh of heat. Commissioning is scheduled for late 2020.

*two methane-fueled cogeneration units producing heat and power, coupled to two absorption chillers for cooling; plus a 6 km district heating network connecting the Lamborghini facilities to a biogas-to-energy cogeneration plant. Using the energy from the trigeneration plant and that recovered from the renewable-fuelled district heating grid, last year Automobili Lamborghini SpA managed to cover 34% of its own energy demand, saving a remarkable 1,4 Ktep of primary energy. Moreover, the fact that the company resorted to cogeneration was a major contributor to it being the first company in the world to be certified as carbon-neutral under the Dnv Gl 'Carbon Neutrality programme'».*

Now a couple of words about the plant in operation at Lamborghini.

#### What are the features of the engines installed?

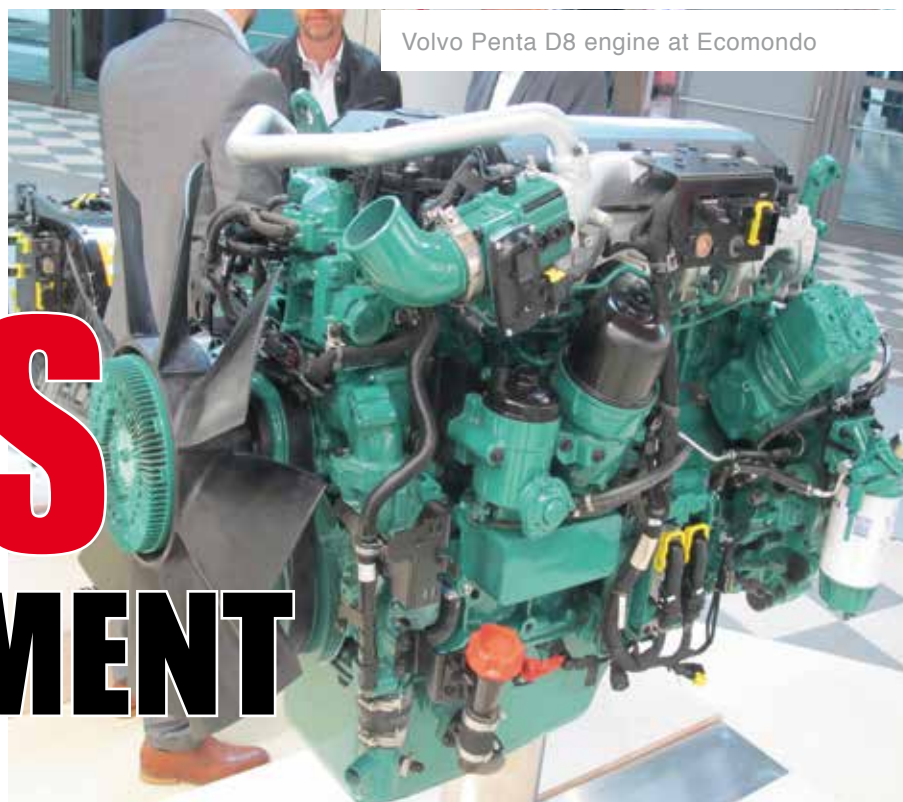
*The plant features two MWM cogen units with the same specifications and has a total electrical power output of 2.4 megawatts. Each year it generates approximately 20,000 MWhe.*

*Both units are fitted with a V12, the same as in the Aventador LP 700-4, a jewel of the Sant'Agata Bolognese car manufacturing facility and a benchmark in the luxury supersport segment. Our technical/engineering choices were based on an analysis of the plant's energy needs, to find a solution that could meet energy and environmental requirements alike by covering as much of the plant's energy demand as possible while contributing to a maximum reduction of the environmental impact on the local territory.*



VOLVO PENTA STAGE V RANGE

# EASIER EATS MANAGEMENT



Volvo Penta D8 engine at Ecomondo

**K**ristian Vekas is Product manager for genset engines at Volvo Penta. We had a chat with him about the new D8 and D13 engines introduced at Ecomondo, Rimini, at the end of 2019.

## What are the main features of the two new engines for Stage V?

The Stage V range is developed with ease of installation, operation and maintenance in mind. Both are dual speed engines. The D13, switchable between 1,500 and 1,800 rpm, delivers up to 345 kWm. The D8, also switchable between 1,500 and 1,800 rpm, delivers up to 218 kWm. In both cases, simplified maintenance and lower fuel consumption are ensured to deliver an improved total cost of ownership compared to what we had before the Stage V, which implied a major challenge in aftertreatment. Not surprisingly, the SCR or DPF had never before been used in gensets. Instead, the current one is a complete system where the

engine and after-treatment system fit together to work in full harmony.

## Talking about installation, is it available in different layouts?

For the D8 we offer a two-box solution: one part is the SCR and the other is the DPF. The reason why we have it is to be more flexible as for installa-

«We were looking for an engine that might be easy to install and quite simple to maintain. The result is a complete system where the engine and after-treatment system fit together and work in full harmony», says Kristian Vekas, PM for genset engines at Volvo Penta

tion requirements. Since we have this, maintenance on the DPF is a lot easier: the filters, which have to be cleaned every now and then, can be changed more quickly.

On the D13 we have a single box solution. The replacement of the DPF is very simple. It is enough to remove two clamps to extract and then replace the filter.

## What changes in terms of injection system?

We have introduced a fixed geometry turbo, for simplicity. The EGR was already on the Stage III, now we have uncooled EGR, that's better from a cooling perspective. The heat management is on the engine, there's no injector for fuel for the after treatment. It is a passive regeneration system. The fuel we burn is actually converted to energy, not wasted. Operational costs are more and more important for everyone and fuel is the biggest operational cost we have. We need more efficient systems.

ISOTTA FRASCHINI

# KEY WORD IFUTURE



«We have big projects to realize to make Isotta Fraschini more and more competitive.» Sergio Razeto said, President of Isotta Fraschini.

**I**future' - Isotta Fraschini Motori brand relaunch plan – is being steadily rolled out: that's the recent news from the company's headquarters in Bari, Southern Italy, right where we left off on June 11, when their 16V170C2ME diesel generator designed for the Italian Navy was officially presented. We asked Giovanni Bruni - Chief Operating Officer at Isotta Fraschini Motori – to take stock of what's been done thus far.

## Isotta Fraschini has set out on a path of adjustment to suit the new demands of customers.

The relaunch of Isotta Fraschini Motori stems from fresh ideas built on strongest pillars, in line with what we believe to be our customers' future demands. We carried out a review of the company's

internal processes to be able to offer our customers not only a product, but above all an increasingly quick-responding, flexible service.

Our aim is not so much to strengthen the customer-supplier relationship, but rather to build cooperation with our customers to lighten their tasks as they work with our engines.

## So you are working in line with the scenario Mr. Razeto has envisaged?

Totally. Our aim is to restore the brand's original excellence, orienting it towards

'Industrializing innovation' is the main goal of Isotta Fraschini

our customers' future needs. Our strategy does not only encompass product updates, but also product monitoring, to enable a predictive maintenance that's really fine-tuned to the engine's actual operating conditions. To reach this goal, it is vital that we use high performance data transfer systems to enable real-time data reception, as well as advanced cybersecurity systems.

## So it's time to step on the accelerator then...

If we wanted to sum up our mission with a slogan, that would be 'Industrializing innovation'. Isotta Fraschini's value added is its tailor-made approach. Our current customers are mainly from the Defense sector and as such they demand extreme attention to details and a painstaking strive for reliability.



PRINOTH SPECIAL MACHINES

# GLOBAL WITH ALL THE FLEET



«When we choose an engine, we look at the overall package. Especially for snow groomers, we are very careful to weight and high power and torque output, as the machine has to push up the snow»

**W**ith Andreas Muigg, Head of product management, and Martin Kirchmair, Head of research and development, we've talked about machines, engines and their integration.

**Which engines do you use on the machines? What's their displacement?**

Of course, they're all industrial engines with some adaptations to fit our needs. We use Caterpillar, MTU or Cummins. In particular, Caterpillar and MTU engines for snow groomers, Caterpillar and Cummins for vegetation management machines and Caterpillar for tracked vehicles. The engine features strongly depend on the vehicles they're mounted on. So to speak, the smallest one is a Caterpillar 3.6-litre and the bigger is an 18-litre, also from Caterpillar.

**We are talking about medium to heavy-duty machinery? What are the main features and the main differences between Prinoth machines?**

Different BUs have different require-

Specialized on special-purpose machines and with production sites in Italy, Germany and Canada, Prinoth's range is divided into 3 business units: snow groomers, tracked vehicles and machines for vegetation management

ments, of course. Common to all Prinoth products is high reliability and superior performance. Snow groomers need to be able to operate on ski slopes with inclinations of up to 45°, and are using the latest available technology. For utility vehicles, the key is on high payload and reliability. Customer orientation and total costs of ownership are other key requirements.

**What type of machine needs more torque for the implements?**

Snow groomers, for instance, where our strongest machine in the portfolio – the LEITWOLF – has 390 kW and 2,600 Nm, need a lot of power for both, tiller and winch. The vehicles are designed for fuel efficiency and therefore have their working speed around 1,300 to 1,500 rpm of the diesel engine. Our new

Stage V engines support this by having the peak torque in this range and a curve looking like a plateau.

**Stage V is a hot issue indeed for both OEMs and engine manufacturers. What's your approach, talking about after treatment or hydrostatic transmissions, in particular?**

It's not that dramatic anymore, since we have always followed emission regulations. The biggest step was from Tier 3 to Tier 4. Of course, now it's important to find a balance between the powertrain and the machine as a whole, but it's not that different compared to the previous stages. We also aim to squeeze all the efficiency we can in terms of hydraulics and hydrostatic transmission. The impact of the Stage V on transmissions has not been that relevant, though. We

are using the same transmissions we developed in the previous stages.

**Talking about alternative engines, CNG or LNG are really available solutions? Are you testing them?**

We are always in search of the so-called 'alternatives'. Compressed or liquefied natural gases or electrification are something we have in our radar, even though it's not always easy to use alternative fuels in some challenging environment that our machines have to face.

Let's think about working sites in the middle of nowhere or ski resorts up on the mountains. We are always searching for new options, technology as well as infrastructure conditions. Sustainable solutions are options we are definitely interested in.

**Full electric and hybrid. Are these only suggestions?**

Full electric is quite tricky for big snow groomers, for example, as big machines running in full power need battery weighing several tons, not to mention their possible cost. Our field is quite different compared to on-highway, where we see several electrification projects.

Hybrid solutions, on the other hand, might be achieved in the medium term. Efficiency might lead to downsizing of big engines. Back in 2009, we tested our first hybrid snow groomer, but it was definitely too early for the market. However, we are in close contact with some possible partners.

We don't have any hybrid machinery in our portfolio yet, but we are keeping our eyes open.





DANFOSS & EATON

# TAKE UP THE CHALLENGE

«Hydraulics is our core, and we have for years strengthened our Power Solutions business» says Eric Alström, President of Danfoss Power Solutions

Among the giants of hydraulics technology for mobile applications, Eaton is on of the most diversified company, actively working also in the automotive, aerospace and electrical sectors. Not an-

ymore, in the sense that Danfoss has officially absorbed Eaton's Hydraulics business for a cash purchase price of \$3.3 billion. While waiting to go into details of the operation and the implications it will have on the synergy between the two groups, also in terms of contribution to the electrification of the powertrain, we quote some statements. «Today, we take a significant and transformational step in creating a global leader in mobile and industrial hydraulics. It is a once-in-a-lifetime opportunity to combine our largely complementary portfolios and geographic footprints. Eaton Hydraulics is a highly respected player in the global industry, recognized for its dedicated people and strong

brands. With this agreement, we continue to invest in our core hydraulics business and digital solutions to stay a strong technology partner.» says Kim Fausing, Danfoss President and CEO. «When complete, this deal will bring together two talented teams with deep hydraulics knowledge and expertise. And Eaton's hydraulics team will be part of a company that is committed to becoming a global leader in mobile and industrial hydraulics. The combined business will also benefit customers and distributors by offering industry-leading technology and a much broader portfolio of hydraulic solutions» says Craig Arnold, Eaton Chairman and CEO. ■

## Bondioli & Pavesi Cardan SFT PRO Series

Bondioli & Pavesi renews the company's offer in the highly specialized range of Cardan joint drivelines by launching the new SFT PRO Series. The new SFT PRO Series is specifically designed for 1,000 rpm rotational applications for power up to 350 horsepower (257 kilowatts). The engineers' focus has been on reducing vibration and increasing the driveline's service life, which is over 2,000 hours at a 5-degree pivot angle, almost twice as long as a conventional Cardan joint driveline.



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tion System) harvesters with individual-wheel drive can now be fitted with a tire pressure control system that seamlessly integrates into the machine and is operated via the standard terminal. Controlling the tire pressure of harvesters has numerous advantages. In view of different vehicle handling characteristics on roads and on fields, fuel can be saved and driving stability can be increased at the same time.

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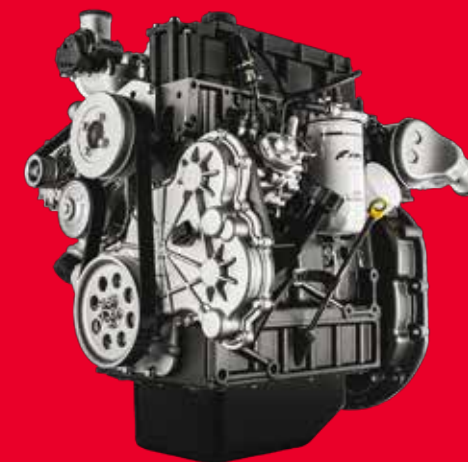
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