

DIESEL *international*

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DIESEL
international

November 2013

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Vado e Torno publishing group at a glance. Our passions: trucks, bus&coach, tractors, engines. This is how Diesel International was born

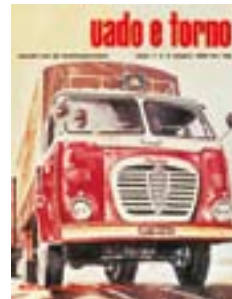
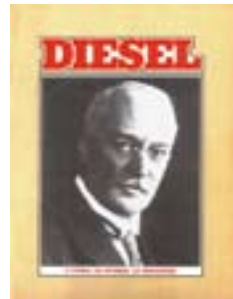


The Tractor of the Year® is an international award that, yearly, a group of European journalists, specialized in agricultural machinery, gives to the best tractor of the year. Twenty independent technical magazines are members of the jury and valuate open field tractors, specialized tractors (orchard/wineyard) and the design of both categories. Before including each tractor in the final shortlist of the nominees, the jury members must have had the opportunity to evaluate it under field conditions. The prize was an idea of TRATTORI

The winners:

1998 Fendt Vario
1999 Fendt Favorit 700 Vario
2000 Case IH Magnum Mx
2001 Case IH Cvx
2002 John Deere 8020 series
2003 New Holland Tm 190
2004 Fendt 930 Vario Tms
2005 MF 8480 Dyna-Vt
2006 McCormick Xtx 215
2007 John Deere 8530
2008 New Holland T 7060
2009 Massey Ferguson 8690
2010 NH T 7070
2011 Fendt 828 Vario
2012 John Deere 7280 R
2013 Deutz Agrotion 7250 Ttv

www.tractoroftheyear.com



Development, manufacturing, use and applications of the diesel engines are the main themes of Diesel. Published for the first time in 1986, Diesel stems from the experience of the Vado e Torno magazine. A mass-media style for a very specific group of readers: engine designers and specialists, engine application experts and retailers. A balance of text and photos, Diesel puts the emphasis on the aesthetic side of the engine and at the same time on the high-tech side. Pictures of engines and applications are enhanced by graphs, tables and Diesel own tech indexes. Diesel's documentations on many segments of the market, both Italian and foreign, are essential for the professional readers.

When Alfa Romeo introduced the 'Mille' model and the 'millepiedi' truck and trailer, Vado e Torno was already a well established magazine. When in 1962 the first trucker's union was founded, Vado e Torno was in print. A long time has passed, since trucks were naphtha run, the steering wheel was on the right side and there where two drivers in the cab. Since then, in the past 50 years, Vado e Torno punctually recorded the technical evolution of trucks and trailers: a field in which Italy is still today one of the most important European countries. Vado e Torno is on the top of editorial sector media with news about technical, economical and legislative evolution of goods transport by road. The main topics are the review of the technical improvements of trucks and trailers.

Born in 1975, in the middle of the fuel crisis, Autobus was at first a special issue dealing with the Italian big buses plan. Immediately afterwards it became bi-monthly and by 1991 monthly. For the bus world it was an exceptional period: in the whole of Europe buses were thought to be the only way to resolve the problems of the big cities urban traffic and pollution. But it only lasted a short time: in 1994 the biggest crisis in the history of buses sales began. But Autobus keeps growing steadily: each year more complete, with more pages, news, road tests. Autobus remains nowadays the only monthly magazine in Italy. Readers are private and public bus operators. Autobus is a totally independent magazine and it covers all international show.

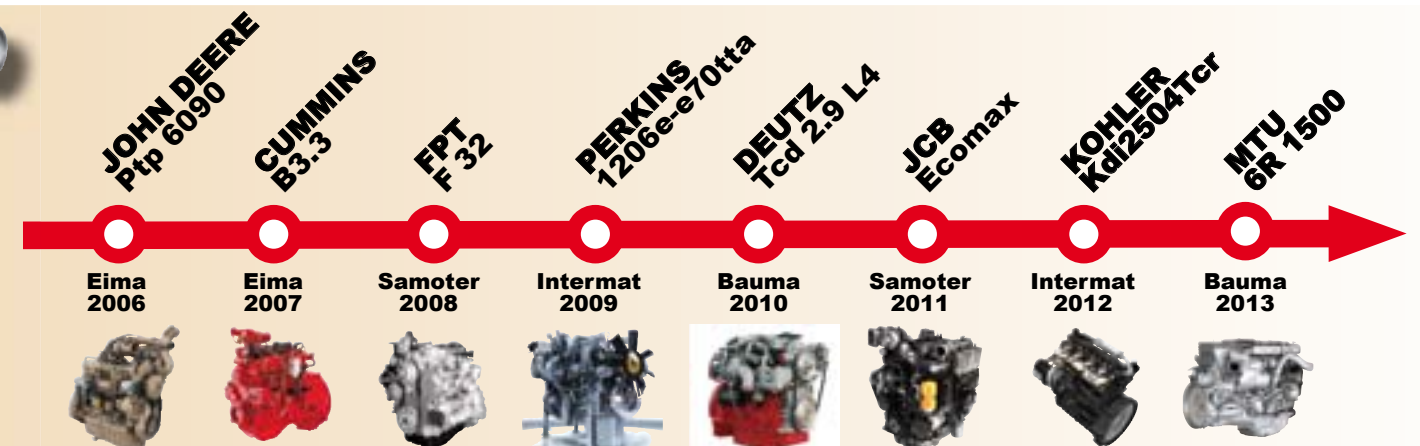
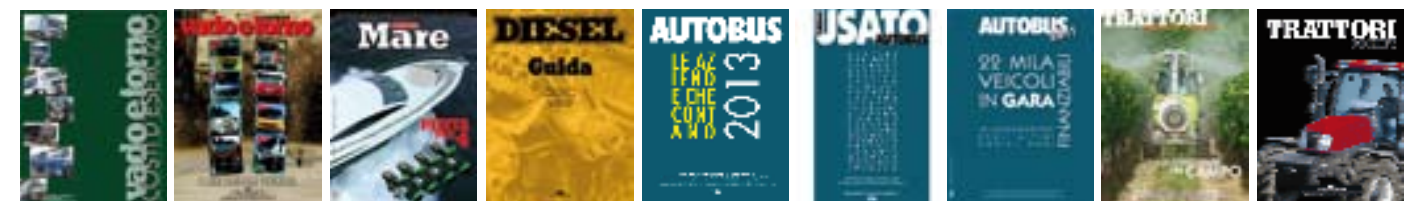
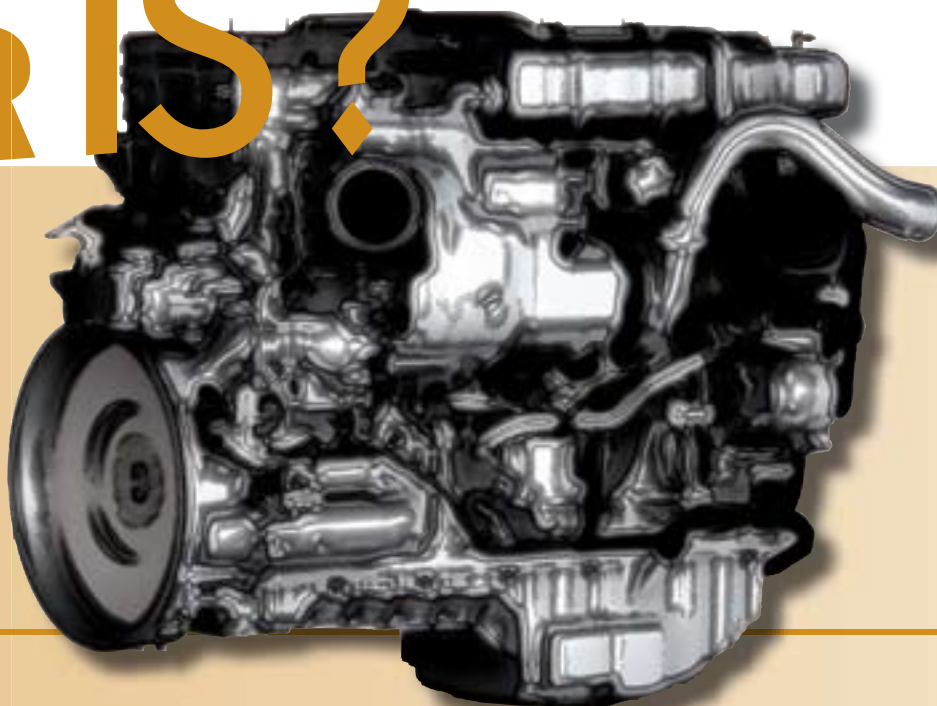
When Trattori came to light, more than 100 magazines where already published in the Italian market: some were and are very authoritative, but none of them was centered on the tech side of the machines. Trattori was the first, then other followed in Europe. But Trattori remains with a strong leadership, due to a very important factor: the technical know-how in all kind of machines. Tractors and all agricultural machines, used on a daily basis by land owners, are introduced in articles featuring images, graphs, tables and operative costs. Comparisons between similar models of different brands, market analysis and the most complete price lists of every model on sale in Italy give to Trattori a sure leadership in the editorial agricultural field.

Diesel of the year 2014 at Samoter

AND THE WINNER IS?

One more step towards Diesel of the Year's tenth anniversary. The award ceremony will take place in Verona at Samoter 2014 from 8th - 11th May. Who will be the new Doty?

Samoter will host the ninth Diesel of the Year prize. The successor of the Mtu 6 R 1500, which has won the award during the last edition of Bauma, will be officially announced in Verona. The Diesel of the Year prize awards the engine that has stood out for innovation, technological content and overall project. Considering the location, the next winner will be as usual an all-rounder in off-road applications but with a special focus on the construction industry. Or maybe it is going to be a derivation from automotive industry, an area in which trucks are hungry for power density and reliability.



The Hla (Hydraulic lash adjuster) is a system developed by Eaton corporation, specifically designed for use in medium and heavy duty engines to improve packaging, installation and deliver costs. It's installed between the camshaft and the engine valve, controlling valve opening and closing processes.



Eaton corporation and Hla system

EFFICIENCY IS BETTER

Less fuel consumption, less noise, no need to adjust the valves, reduced engine assembly time and maintenance cost. These are the main advantages granted by the Hydraulic lash adjuster system developed by Eaton

Hla (Hydraulic lash adjuster) is installed between the camshaft and engine valve, controlling valve opening and closing processes. It consists of a plunger sliding inside a cylindrical body filled with engine oil, and a spring to maintain contact with the camshaft, compensating all gaps within the valve train. When the engine valve is closed the system is fed with engine oil, expanding the whole piston to compensate for any clear-

ance. As the turning camshaft exerts a high force on the Hla, a ball check valve blocks the oil feed.

The smart leak

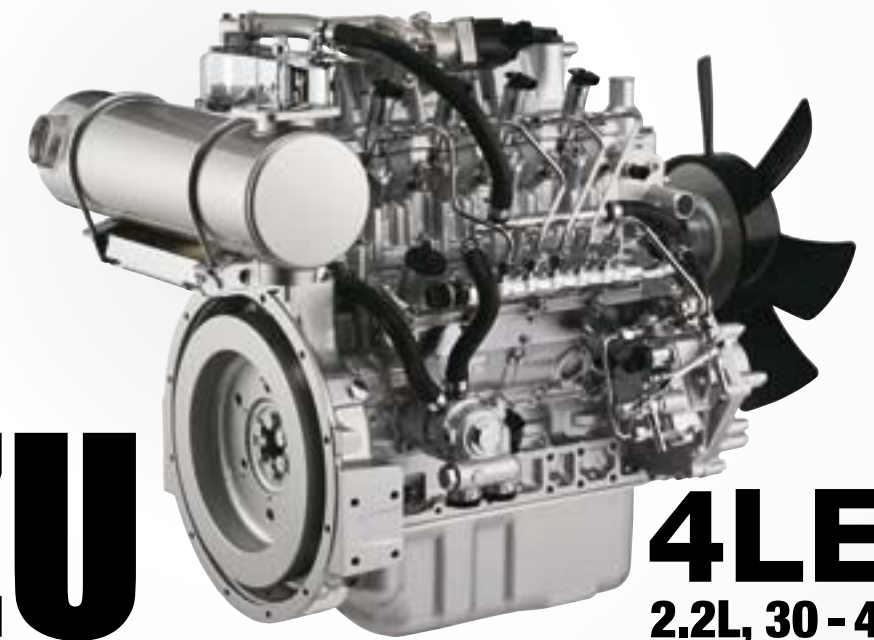
The Hla leaks oil only in very small and tightly controlled quantities, creating a temporarily solid Hla acting on the valve and controlling its motion. Balancing the amount of oil leaking out during valve lift and the amount of oil replenished once the valve is closed,

the Hla compensates for thermal elongations created in the valvetrain so that gas exchange happens as intended through the entire lifetime of the engine. According to Eaton the Hydraulic lash adjuster is also an answer to the increasingly strict emission requirements for truck and industrial diesel engines. Today's newly required and increasingly complex exhaust gas after-treatment systems are frequently installed on top of the engine. This set-up complica-

tes service access to valvetrain components and makes the manual valve adjustment even more time and cost intensive. The Hla eliminates the need to adjust the valve, reducing both the engine assembly effort for the vehicle manufacturer and the maintenance cost and vehicle downtime for the operator.

How to reduce costs

It reduces engine assembly costs because no initial valve lash setting is needed, and it improves packaging flexibility as the need for service access is eliminated. Furthermore, the device reduces truck downtime as well as maintenance costs by eliminating the need to periodically adjust the valves, thus lowering the cost of ownership. In addition, by compensating for thermal elongation and wear rate, the Hla ensures a precise valve event independent of engine temperature delivering more consistent engine performance and combustion. Additionally, it improves noise, vibration and harshness (Nvh) characteristics by reducing noise levels thanks to smoother and better controlled valve closing.



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A SHOW IN THE SHOW

Zf will be showing its latest innovations: an increased power density and the gear spread extended will allow the vehicles equipped with Zf components to work even more efficiently and more economically

As one of the world's technological leaders, Zf is continuously working on the expansion of its range of products. The German brand will therefore introduce at Agritechnica several new developments which will offer the user a wide range of possible combinations and can be integrated into existing tractors without any problem. Transmission variants within a performance category from synchromesh or powershift transmission through

to continuously variable transmission are intended to meet the increased demands from users and vehicle manufacturers, providing optimum power transfer, easy operability, long service life and low installation space requirements. Among the most interesting new products we picked up the new Terramatic continuously variable transaxles and the Irs - Intelligent range shift system. With the two new variants of the continuously variable tran-

saxles Tmt 09 and Tmt 11 Zf is rounding off its very wide power range at the bottom end.

Terramatic transaxles

For this purpose a completely new transmission concept has been produced which takes into account the factors of reasonable production costs and high efficiency. Consequently, continuously variable driving is now also possible in the power range from 47 kW (65 hp) to 80 kW (110 hp) without having

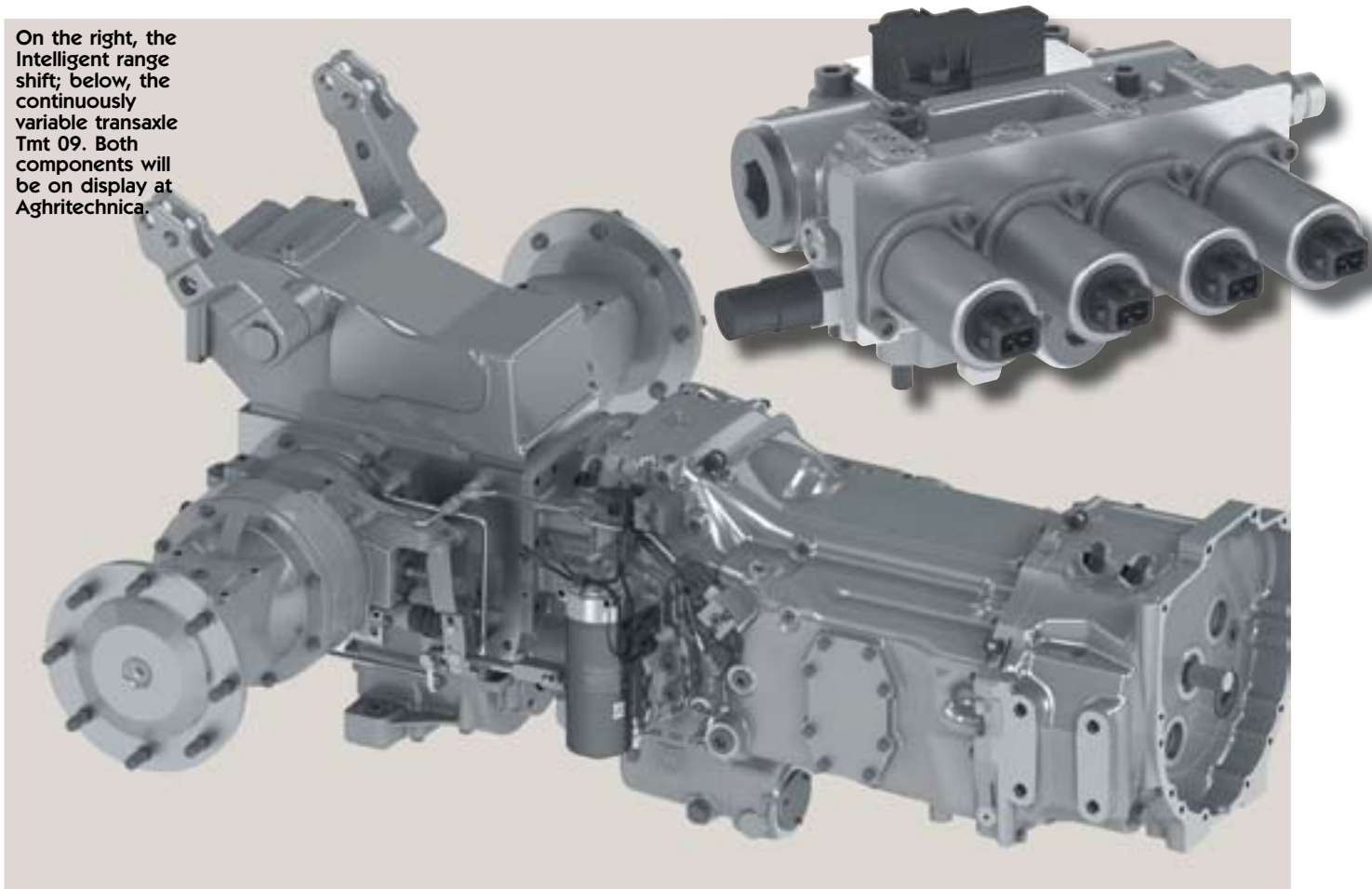
to dispense with the familiar strong points such as the power shuttle, the standstill control, or the continuously variable acceleration from standstill to maximum speed without interruption in the power flow.

Intelligent range shift

Along with a wide range of further developments on the Zf powershift transmissions an important innovation has to be mentioned. This is the Irs (Intelligent range shift) for automated synchronous group shifting.

With the aid of an electro-hydraulic valve block and a specially developed software module for the Zf transmission control it is possible to control the synchronized group transmission of the T-7000 range and the follow-on Terrapower generation fully automatically. Of course, semiautomatic shifting or a manual mode at the press of a button (shift by wire) is possible. At 800 ms, the short shifting duration of the Zf Irs gives the driver the impression of a full powershift. The pure gear shift will happen twice as fast as when compared with a manual shifting operation.

On the right, the Intelligent range shift; below, the continuously variable transaxle Tmt 09. Both components will be on display at Agritechnica.



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WASTE TURNS ON THE LIGHT

Two units manufactured by Tessari transform organic waste into energy at Villa Bartolomea, near Verona, Italy. Each unit is divided into three 12-cylinder Man E28, producing a total of 999 kW per each one

At Villa Bartolomea, a few kilometers from the city of Romeo and Juliet, separate waste collection is producing energy and heat. Powered by two separate plants, each one divided into three units, the biogas plant is equipped with 12 cylinder V engine Man E2842 Le322. Developed for biogas treatment and assembled by Tessari from Padua, the plants deliver a nominal power of 360 kilowatts, scaled down to 333 kW (1,500 rpm, 50 Hz) to comply with the regulations. The Italian Government has in fact granted until December 31 2012 the so-called green certificates for plants under 1 megawatt. Dating back to 2009 and December of 2012, each of the two groups divides the production into three different units to make the operating cycle more flexible in case of maintenance, anomalies and specific needs. During the preparatory phase



the waste is treated to sift and discard extraneous inert materials. The process starts from the ramp and continues in the pre - treatment unit. The organic fraction is converted into a kind of mush to help the bacteria in the digester, which is loaded at average intervals of one hour and is controlled

via a plc. From the storage tank the process involves cleaning and desulphurisation. The gas coming from the gasometer (from the storage tank) retains - after a washing with water and caustic soda a certain humidity percentage at a temperature of 35-40 °C. At this point, a heat

THE ENGINE

Brand- Model	Man E2842 Le 322
I.D.	
B x S mm - S/B	128x142 - 1,11
N.cil.- dm³	12- 333
Maximum power kW/rpm	333/1.500
Piston speed m/s	7,1
RULES AND BALANCE	
Dry weight kg	1.420
L * W * H mm	1.142*1.570*1.155
Mass/power kg/kW	4,26
SPECIFICATIONS	
Compression ratio	12:1
Lube oil consumption up to kg/h	0,2
Lube oil filling quantity min./max. l	60-90
Coolant temperature min. - max. °C	80 - 88
Max. suction pressure mbar	15
Max. exhaust back pressure mbar	40
Mechanical efficiency %	38
Thermal efficiency %	51,6



Developed for biogas treatment and assembled by Tessari from Padua, the plants deliver a nominal power of 360 kilowatts per each engine, scaled down to 333 kW (1,500 rpm, 50 Hz) to comply with the Italian regulations.





Once in the containers, the 12-cylinder starts to produce energy: a 30 per cent is used by the system, the remaining 70 percent is sold to Gse (the Italian authority for energy services management).



exchanger brings down the humidity, bringing the temperature to 5 °C. The blower takes the gas and blows it into a duct at a constant pressure of 100 millibars. The Dungs unit filters the gas through a filter equipped with double solenoid valve, which then passes to a flame trap and a stabilizer. At this point, once in the containers, the 12-cylinder starts to produce energy: a 30 per cent is used by the system, the remaining 70 percent is sold to Gse (the Italian authority for energy services management). Above the containers are placed the heat sink, which cools the dynamic part of the

mixture (i.e. the water used by the aftercooler to compress the gas coming from the turbine) and the intercooler that dissipates the excess heat even under the blazing sun.

Controlling all parameters

The control panels made by Tessari monitor all operating parameters: voltage, frequency, power, temperature, timing. An emergency torch placed outside is ready to burn the gas in case of system failure. Even routine maintenance is guaranteed by Tessari, which by the way provides oil change: the estimated consumption is 90 liters per unit every 20 days.

FERTILIA

Based in Legnago, in the province of Verona, Fertitalia deals with composting and plants engineering, producing bio-stimulants and acidifiers. The Villa Bartolomea (Verona) plant manages organic waste from separate waste collection. The plant stores and processes annually approximately 20/22 thousand tons of organic waste. The waste comes from all over Northern Italy, in particular from Veneto and Trentino, secondarily from Lombardy and Emilia-Romagna. The solid part ends up in the composting plant, where it undergoes processing and is partly transformed into fertilizer. The wastewater ends up in the purification plant where it integrates the moisture of the mounds, replacing the groundwater, to drain the drying of organic materials.



TESSARI

Surviving in the jungle of energy production and power generator manufacturers requires passion. That's what Tessari, an Italian company based in Padua, puts in since 1950, from Om diesel transformed to eight cycle to convert natural gas buses and Snam compressor groups to the current biogas plants, in which Man is the favourite engine partner. There are about 60 plants installed by Tessari that run on syngas. Generators equipped with exhaust exchanger for steam production, compressor units, dual-fuel (natural gas and biogas) and Lpg. Among the so-called alternative energy, Tessari also processes biomasses (such as wood chips and agricultural/livestock waste) and vegetable oils.

MOTORTECH AND COILS

Motortech ignition coils are installed over Man cylinders. Among the available

applications, the German company is specialized in lean burn stationary gas engines, namely with a combustion rich in oxygen to homogenize the fire point. Equipped with corrosion proof mounting racket, standard female connection and fiber-reinforced housing, the 06:50 type features a secondary service voltage of 45 kV and a

spark duration of 800 µs; the model used with cogeneration units installed in Villa Bartolomea is fully programmable (the proprietary system is identified as Most, Motortech output internship technology). The unit installed in 2009 features instead the 06:50.007 model. Each cylinder features a dedicated coil.



MARELLI MOTORI GOES FORCE 400

The alternator installed on Tessari plant dated December 2012 is provided by Marelli Motori and features horizontal axis, brushless construction, a x i a l self-cool-

ing and bidirectional working mode. The allowable speed for the 50 Hz standard has a tolerance 1.5 times higher than the conventional. Among the avail-

able options, the alternator can be equipped with single or double bearing, vibration sensors, nominal voltage from 380 to 15,000 volts.



MARELLI

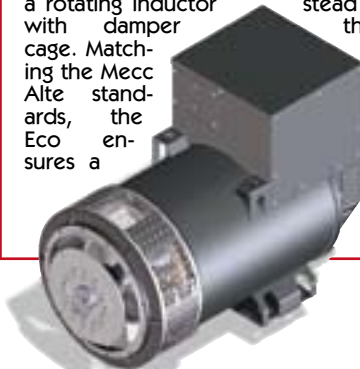
Model	Mjb 355 Sa 4
Power	510 kVA
Rpm	1.500
Voltage	400 V
Frequency	50 Hz

THE EC(H)O FROM MECC ALTE

Specifically designed for cogeneration, the Eco alternators feature a fixed stator with skewed slots and a rotating inductor with damper cage. Matching the Mecc Alte standards, the Eco ensures a

permanent short circuit current above or equal to three times the nominal current. New features instead for the lids,

which have been redesigned to ease the coupling to engine and ventilation, and terminal boxes, which ease the connection of electric cables.



MECC ALTE

Model	Eco
2 poles	8 - 114 kVA
4 poles	6,5 - 4.000 kVA
Materials	steel - cast-iron
Frequency	50 Hz



Facts, figures, balance sheets

IS 13 A LUCKY NUMBER?

The first half of the current year viewed the engines industry affected by various factors. On the positive side one could count the Yen devaluation and the rebound of the Chinese market. Weakening yen propelled Japanese export as well the domestic demand

Chinese domestic demand rebounds with heavy-duty truck industry posting an year-on-year growth of 8.4 per cent. The recovery of the heavy-duty truck market was primarily attributable to three factors: Firstly, the recovery of fixed asset investments which drove the demand for new purchases of heavy duty trucks. Secondly, the growth driven by the anticipated implementation of the China IV emission standards, which drove to early utilization, and third the emerging of a robust replacement of old vehicles. Buses benefitted from the development of municipal transportation, allowing a year-on-year growth of 12.7 per cent. School-buses, gas-fuelled passenger vehicles and those passenger vehicles using new energy modes reported excellent performance.

During the period, the construction machinery market of China reported a total sales of 401,200 units, representing a year-on-

year drop of 1.3 per cent. Agricultural equipment rose thanks to increased government support to farmers income.

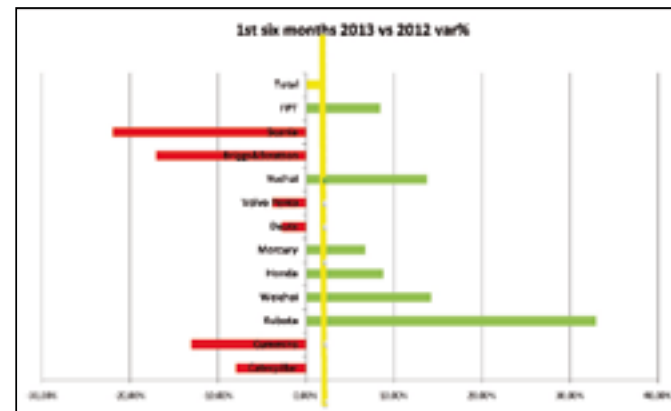
On the negative side a persistently weak demand stays in Europe; North America seems to perform better, some encouraging signal on the road to recovery appears but not strong enough to compensate Europe. Here the demand seems to remain weak without hope of a turning point at near horizon.

Increase for the quoted

Coming to the numbers our sample of the industry, constituted by 12 companies quoted in various stock exchanges, shows in the first half of the current year an increase of 1.55 per cent over the first half of 2012. The final result sums up two quarter with quite a different behavior: the first quarter had a worst performance than the same period of the previous year - 2,8 per cent, while the second quarter delivered a + 3,2

Chinese domestic demand rebounds with heavy-duty truck industry posting an year-on-year growth of 8.4 per cent. Construction dropped 1.3 per cent





per cent. Comparing the result of the last 12 months with the 2012 closing result, the sign is positive by 2.2 per cent. In summary a first plus mark after 12 months declines in this first half thanks to a quite strong second quarter.

Companies one by one

The performance of the single companies is heavily bound to their actual positioning in the global market. Having seen the factors shaping the period, isn't a rocket science exercise to predict the Japanese and Chinese companies performing better than the industry average, while their European and North American competitors are on the worse performers side. Two notable exceptions to the general picture should be mentioned: Fpt and Brunswick-Mercury.

BRIGGS&STRATTON: decrease in net sales by 17 per cent was driven by reduced shipments of engines used on walk and riding lawnmowers, pressure washers and snow throwers in North American and European markets. Oems,

customers, retailers and dealers took actions to reduce channel inventories coming off a historic drought during last season in North America and a late start to warmer spring weather this season in both North America and Europe.

BRUNSWICK

corporation, owner of the Mercury branded outboard and stern drive, benefitted of the increase in demand particularly in US, with a mix awarding the engine with power of more than 110 kW (150 hp). This allows an increase of sales of 9 per cent in North America and 4 per cent in Europe.

CAT and CUMMINS

sales, affected by low demand in North American markets, declined by 8 and 13 per cent respectively. Power generation, mining, and heavy duty truck pulled the reduction.

DEUTZ

total sales had a modest decline of 2,8 per cent, with a second quarter signing a relevant increase. The order book is even more promising with a 20,3 per cent

A persistently weak demand stays in Europe. North America seems to perform better, but not enough to compensate the Old continent





The small increase in the first half of the year allows a quite positive outlook. In particular the second quarter was good for all manufacturer

increase over the previous year thanks to a strong increase in demand for agricultural machinery application and Chinese jv.

FPT INDUSTRIAL

better than average performance, seems driven by the strong demand from Cnh, the agricultural and construction branch of the Fiat Industrial group, absorbing 6,6 per cent more than the same period of the previous year; jv consumption grew by 17,4 per cent 'fueled' by the strong demand of the Chinese market were the jv operates; third party demand was also growing, the truck and bus segment was the only segment scoring a reduction of the 4,4 per cent decrease.

HONDA

power products posted an increase of 9 per cent thanks to increased sales of Gv 160/190 in US and Europe, plus the good performance of lawn mowers in North America.

KUBOTA

is the best performer of the first half overall. The revenues of the farm and construction division grew by 36,5 per cent compared with the previous year, the engine sales remained constant on the European and North American market while the sales of tractors and construction equipment increased by 49,2 per cent in the export markets and 8,3 per cent in the domestic.

VOLVO PENTA

experienced a reduction of 3,8 per cent, demand for industrial engines remained weak. The North American market for mari-

ne engines has slightly recovered somewhat but demand in southern Europe remained weak.

SCANIA

sales went down by more than 20 per cent. Engine deliveries fell by 19 per cent during the first half. Second quarter deliveries performed slightly better falling by 16 per cent.

The downturn was mainly attributable to Great Britain and the Nordic countries.

WEICHAI YUCHAI

the two biggest players in Chinese market, posted a more than 10 per cent increase in sales thanks to the domestic market rebound.

2013 ends with two 13

According the several traditional semi-kabalistic book used by the story tellers to translate in number every dream or event to be played in the lotteries, diverging interpretation are given for this number. For some trusted author is one of luckiest number for others, trusted as the formers, is the dome of disasters. The 13th year after the third millennium starts, leaving the dilemma unchanged.

Back to seriousness, looking to numbers the first half of the years posted a small but not negligible increase in comparison with the 2012, thanks to a quite strong second quarter, remarkably better than the first for all manufacturer.

This result could be quite an encouraging signal for the end of the year result, if North American market will rebound in the second half, and European demand will start to leave the bottom in the fourth quarter.

Vincenzo Ziliotti



PR CHINA: PRODUCTION AND SALES OF DIESEL ENGINES IN AUGUST

In August 2013 the production and sales volume of engines were 1,540,910 units and 1,589,300 units respectively. Up to August, the total production and sales volume are 12,960,227 units and 12,926,279 units, up by 12.22 percent and 11.38 percent respectively. Growth rates of the two are stable



Sales of top 10 engine manufacturers in August 2013 (Units, %)

In August, the production and sales volume of diesel engines are 252,683 units and 250,343 units. Till August, the production and sales volume accumulates to 2,347,093 units and 2,360,677 units, up by 5.85% and 2.81% respectively.

Top 10 diesel engine manu-

facturers are: Guangxi Yuchai, Weichai Power, Anhui Quanchai, Faw, Jmc, Kunming Yunnei, Dongfeng, Shandong Huayuan Laidong, Foton and Dongfeng Chaochai Diesel with their respective sales being: 382,183 units, 344,252 units, 326,895 units, 284,094 units, 148,999 units, 142,168 units, 118,815 units, 110,362 units, 101,130 units and 89,889 units. Seen from ac-

cumulative growth, Guangxi Yuchai, Kunming Yunnei and Dongfeng Chaochai witness negative growth, -15.90%, -4.43% and -10.18% respectively; Weichai, Quanchai, Faw, Jmc Dongfeng, Shandong Huayuan Laidong and Foton enjoy positive growth with respective growth rate of 24.31%, 16.98%, 8.64%, 8.71%, 6.50%, 14.62% and 21.45%.

Source: www.chinatrucks.com





Agritechnica 2013: close to the final era

A ROAR IN THE BACK YARD

Man's revelations regarding the off road in the final version and the units for cogeneration and biogas are being awaited with anticipation. Not much is transpiring from the Japanese manufacturers, meanwhile, Italy gives signs of dynamism especially with the Fpt Industrial 3 cylinder engine. Perkins and Deutz introduce enhanced compacts, 90 and 97 kilowatts

The German showcase is notoriously not for engines: it shares with Bau- ma its biennial occurrence and the hosting language, however Hannover is far from Monaco, and not only in kilometres. The withdrawal of both Yanmar, which has built its fortune on low and medium agricultural powers, and of its compatriot Honda, the queen of the garden, are a strong sign in this regard.

These companies and many more will be under the spotlight of Eima next year. Yet, the coming year, that will see the implementation of the Tier 4 final, has prompted many manufacturers to not show up em-



pty handed. The main protagonist should be Man, presenting its full final line, with a range of in-line engines, which should use a vgt, designed for agricultural applications. The V8 gas engines with 350 kW calibration will also be on the agenda, as well as the adopted biogas cogeneration strategies. No in-

formation is leaking from Nuremberg, however the feeling is that, at least on the over ten litres, the answer will be a two litre swept volume: the dual-stage to hyper-stimulate performances, with a fixed turbine geometry at the onset of the process, and vgt to follow, integrated with filter and AdBlue.

The volumes of the D08 (4 and 6 cylinders in line) may be simplified here.

Unless the Lion decides to expose itself on a completely new stage in a sector where, unlike its popularity on the road, it has always been trailing behind. Man's technological partner is Liebherr, whose final range was revealed at



The main actor should be Man, presenting its full final line, with a range of in-line engines, which should carry a vgt, designed for agricultural applications. In agenda also the V8 platform for biogas cogeneration plants.

the Bauma: six variations, from 4 to 12 cylinders. It is the father of the aftertreatment with urea, and of the three swept volumes on the catalogue (the opening ones are BxS 122x150 and 130x150) and it shares with Man the two litre swept volume (BxS 128x157) on the 12 and 24 cylinder engines.

While considering the large calibres, Volvo Penta, another undisputed big on the road, has brought forward the Final arrangements to Bauma: 5.1 and 7.7 litres 'made in Eicher' replace Deutz, with no complications on the main bearings (a simple turbine) and special attention to the NOx, with egr and scr. No news about the other Swedish manufacturer, Scania, with a portfolio that introduces it to the production sector and to big harvesting machinery, by relieving its units from the burden of the dpf.

AdBlue is a Star

A common thread amongst the contestants to the final summit is their interest towards the AdBlue. Several participants will exorcise the ghost of the soot regeneration, but only a limited number will be able to afford the absence of the scr: Mitsubishi, on its 4Eg, is amongst these, but the rest of the catalogue remains obscure. As is often the case, little is known about what the East is up to: Yanmar is absent, Isuzu inscrutable (the sequel of the Tier 4f series aroused curiosity: the 4 cylinder seen at Bauma has shown good performances), and

the same goes for the princess Kubota. The sparse available information is about the program already witnessed at the Intermat and Eima: double the number of valves for the top positions and, at variance with the competitor Kohler, the use of the filter. The Americans concentrate on the 100 kW, scheduled for 2014. The Kdi range is by now at full operating speed and the agreement with Jcb for the Teketruk 35D 4x4 supply constitutes a very positive sign. The announcement was formally given at the recent Lombardini 80-year anniversary celebration. Everything is known about Doosan Infracore: the D24 and D34 products are open to make contacts with European oems. While at these latitudes too the 3 cylinders are being anticipated, the Korean provide 4 cylinder with 600 and 850 cc swept volume: for the 3.4 cylinder the solution is the scr, coupled with doc and egr, while these two alone are in charge on the 2.4 litre engine.

Deutz and Perkins

Several features have been touched up, mainly power extension: both Deutz and Perkins have enhanced the compacts. Manufacturers are introducing calibrations that aim at the 100 kW quota: the range from Cologne, for a long time now projected towards the final, expands with the addition of the Tcd 3.6, with 97 kW and 500 Nm; Perkins, on the other hand, reaches 90 kW, with a torque that is right behind that of the German 3.6: 390 Nm. The British manufactu-



**The Tractor of the Year
was awarded for the first
time in 1998.**



rer too gets rid of the dpf. On the Italian 'stand', Fpt Industrial places under the spotlight the 3 cylinder, which symbolises the come back of the odd numbers and challenges John Deere, predecessor of the 3 litre compact engine 'revival'. The origin of the three cylinder from Turin is Vm, with which the partnership is getting stronger (we are expecting the official communication of the acquisition of the remaining fifty per cent by Fiat Group).

Same and Farmotion

Same follows the scr supporters for the final version of its newly generated Kd, which will be strengthened with the 6 cylinder engine. Of the two Farmotion on the catalogue, the 3 cylinder now reaches 75 kW and 409 Nm, and the 4 cylinder 100 and 543 respectively. Same will not rely only on self-sufficiency, and will continue its collaboration with Deutz, despite having completely abandoned the shareholdings. In Germany, Mtu enjoys the restyling of the 2000 series emissioned, like the full series, with

a special focus on technological contents and power density.

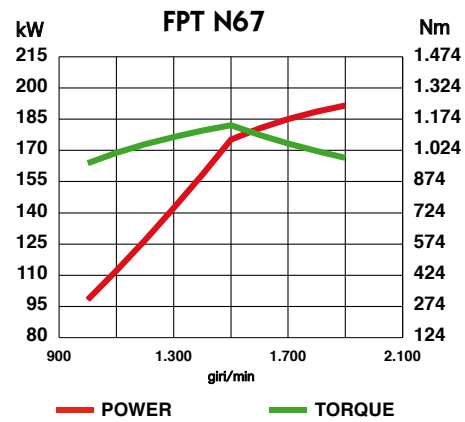
Hatz and the H series

Hatz, on the contrary, has only just officially introduced its H series in Ruhstorf, which at the moment relies on a super-compact 4 cylinder 2 litre engine (BxS 84x88 mm), and, by remaining under 56 kW, does not require post-treatment: common rail, waste gate, egr and doc are highly competent in their function. Hatz is equipped with a device to reduce the temperature at the opening of the egr valve, manufactured by Hjs. News from overseas: back from the pompous Bauma, Cummins, having dismissed the B3.3, has found its final best piece with the Osf 3.8, a 98 kW 488 Nm compact engine designed in collaboration with Foton. For John Deere what is done is done: all is ready for 2014, with a proposal that takes into account the volumes and their relative applications: waste gate, vgt and two-stage. Powertech Plus employs egr, doc, dpf and scr, depending on the series.

John Collins

Claas & Fpt Industrial

EVOLVED SPECIES

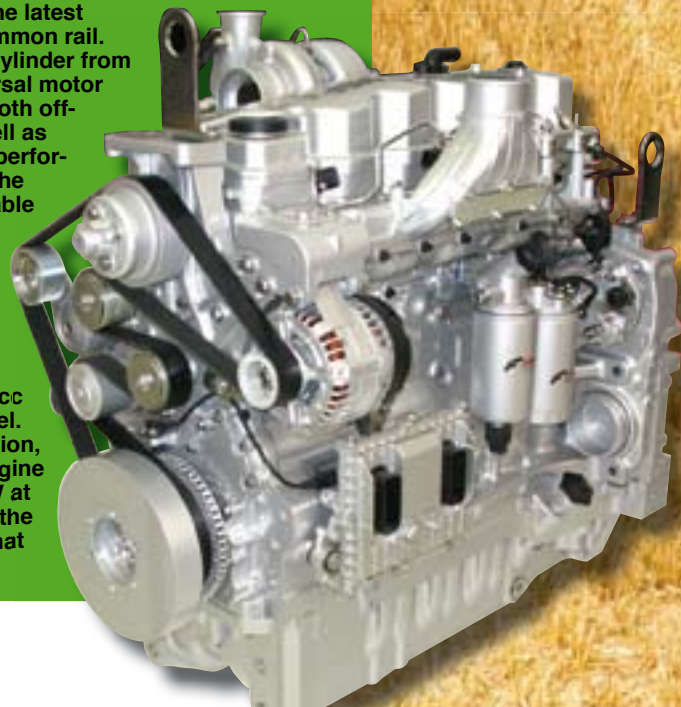


Brand and model	Fpt Industrial N67
Bore - stroke mm	104 - 132
Cylinder - displacement	6 - 6,72
Maximum rating kW - rpm	194 - 1.900
Maximum torque Nm - rpm	1.130 - 1.500
Specific power kW/l	28,8
Specific torque Nm/l	167,9
Torque at max power Nm	980
Torque rise %	0,15
Power a Nm max % (kW)	91,6 (177)
Mep bar	18,6
Velocità pistone m/s	8,4
Weight kg	520
Weight/power kg/kW	2,7
Volume m³	0,74
Power density kW/m³	262,1
Injection	common rail
Specifications	4V egr. scr doc
Emissions	Stage III B/Tier4f
Diesel Index	5,57

FPT INDUSTRIAL

A top class Euro VI

The Class Axion 850 is powered by a Fpt Industrial 6-cylinder 6.7 liter. The main engine features are the four valves per cylinder operated by pushrods and rockers, the turbo intercooler and the latest generation of common rail. The 1.1 liter per cylinder from Turin is an universal motor able to support both off-road needs as well as specific on road performances. In fact, the N67 is also available with the same architecture in Euro VI version, which is employed in both truck and bus&coach markets, where it replaced the 900 cc per cylinder model. In its marine version, the very same engine can reach 420 kW at 3,000 rpm, being the best in class in that market.





Under the hood of the Axion 850 lies a 6-cylinder, 6.7 l Fpt Industrial N67 with fully integrated scr system and latest common rail technology, housed in a strong frame section which gives full access to the engine compartment and all maintenance points.

SCR

Stage IV at its best

The Axion 800 series has been completely redesigned, featuring engine outputs from 147 to 199 kW

The Axion 850 meets the Stage IV (Tier 4) emissions standard thanks to an urea – based solution with a fully integrated scr system. When designing the tractor, all the components required for exhaust after-treatment were in fact considered from the outset to guarantee full visibility and accessibility. So the diesel oxidation catalytic converter (doc) is positioned under the bonnet immediately behind the turbocharger because it needs high exhaust temperatures to produce an optimum reaction. The scr catalytic converter is an integral part of the exhaust system and is located on the right hand side of the tractor.



The Axion 850 is equipped with the Viscronic electronic fan engine, which precisely matches the fan speed with engine temperature and load, thus lowering the noise level.



Proactiv front axle suspension adjusts to tractor loading and automatically remains in the central position. Changes in load due to braking and turning manoeuvres are also compensated.



TOTAL CONTROL

In the new Axion 800 tractors Claas continues its concept of offering a Cis or a Cebis version of the simple, self-explanatory control system. Cis is the basic version with mechanical spool valves and the Claas Information System (Cis), and is ideal for customers who prefer to control the hydraulic spool valves by means of a lever. In the Cebis (Claas electronic on-board information system) version the tractors have electronic spool valves and the Cebis terminal is built into the armrest. The Cebis version offers every possible electronic means of further reducing the driver's workload and thereby improving operating efficiency. This system includes intelligent headland and implement management and every possible connection option for Isobus implements. Many implement functions can now be controlled using function keys in the armrest or via the Cmotion multifunction lever. The new Axion 800 can also be fitted with the Gps Pilot guidance system.



the choice of Cis or Cebis as equipment and control concepts, and the Hexashift transmission. Let's take a closer look to the 'big fellow' of this series, the Axion 850. The new Axion 850 is powered by a 6-cylinder, 6.7 l Fpt Industrial Nef 6 that meets the requirements of the Stage IV (Tier 4f) emissions standard by incorporating exhaust after-

treatment with urea, and uses the latest common rail 4-valve technology, charge-air cooling and a variable turbocharger.

Viscronic means cooling

Cooling is helped by Viscronic electronic fan engine, which precisely matches the fan speed with engine temperature and load, ensuring that the engine always runs at the optimum

temperature. The reduced fan speed lowers the noise level and saves fuel without impact on output, which can then be converted into tractive power. The engine is housed in a strong frame section with an integrated engine oil sump which absorbs all the forces associated with the front linkage and front chassis, allowing excellent steering lock

angle for maximum manoeuvrability and optimum access to the entire engine compartment and all maintenance points. Plus, the compact design combined with a long wheelbase has given the Axion 850 a weight distribution of 50 percent at the front and 50 at the rear.

The Fpt engine is coupled with a Hexashift 1545 Sps powershift transmission by Gima, which

CONTROL IN CMOTION



The Cmotion multifunction lever is a completely new concept from Claas which makes using the main functions of the Axion 850 more convenient and more efficient. Functions are controlled using thumb and forefingers, allowing the hand to stay in one place for the majority of time. The padded armrest can be adjusted for both height and position.

FLEXIBLE POWER

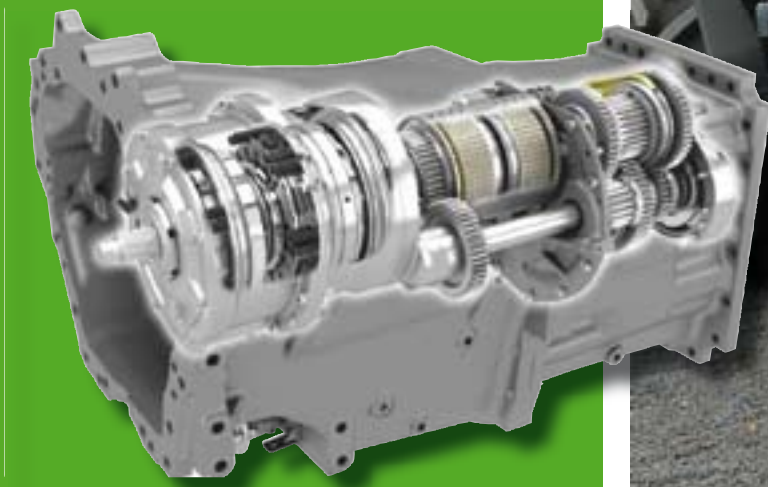
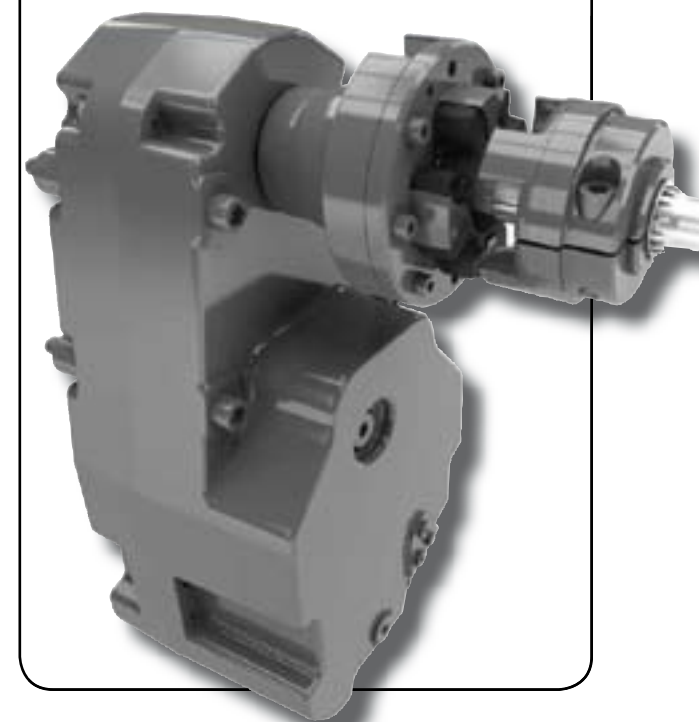
The Hexashift 1545 Sps powershift transmission by Gima is a key factor for the Axion 850, providing a series of important benefits: no more range shifting with the clutch, good gear shifting in all ranges, high efficiency in the field and on the road with low fuel consumption and, above all, fully automatic shifting operation thanks to the Hexactiv power shift unit, which can be set up with a wide range of functions according to driver preference and the job in hand. The operator can choose between three powershift unit modes via the Cebis or Cis: in fully automatic mode, the Hexactiv shifts for variations in engine speed depending on engine load, vehicle speed and the driver's preference and accelerator position; in pto mode, Hexactiv shifts in such a way as to ensure the engine speed/pto speed remain as constant as possible; in Manual mode, Hexactiv shifts according to a fixed engine speed which is programmable by the driver.



The Axion 850 has a wheelbase of 2.98 m, but its design makes it manoeuvrable in the field and easy to drive on the road. Additional front ballast is not needed for many tasks (particularly transport operations) as the long wheelbase and good weight distribution transfer the tractor's tractive power to the ground

INDEPENDENT PTO

The front pto drive on a tractor is permanently connected to the engine but only used occasionally. This means that the pto gearbox is running so requires energy to drive it even when the drive is not under load. Claas engineers have solved this problem with a new, patented clutch, a de-coupling system for the front pto. This new mechanical system fitted to the Axion 850 means that when the front pto is not required, the entire front pto transmission can be de-coupled from the engine, which will save 0.4 litres of diesel per hour, representing a considerable fuel and cost saving.



allows the user to shift effortlessly through all six powershift speeds and the four automatic ranges, or shift automatically using the Hexactiv powershift unit. Overlapping of the powershift speeds means that the full output potential of the engine can be utilized. When using the clutchless reverser, it is also possible to change gear automatically when the forward

speed has to be different from the reverse speed; at the headland, it is also possible to engage a pre-selected gear simply by pressing a button. Talking about hydraulics, the closed centre load sensing circuit features a variable displacement main pump provided by Bosch Rexroth with 110 l/min or 150 l/min output at 200 Bar. Cis version features four mechanical

spool valves operated from the right-side console and Electropilot controls for two electronic spool valves on the armrest, Cebis provides controls for up to seven electronic spool valves on the armrest. All five hydraulic couplings at the rear of the Axion 850 have release levers, so they can be connected and disconnected even under pressure. The coloured markings on the

inlet and outlet sides make it easier to attach implements correctly. Oil leakage lines collect the oil from the couplings when attaching and removing connectors. Power beyond connections are provided at the rear for implements which have their own control units. The Axion 850 features three front pto options: 540/1,000, 540/540 Eco/1,000 and 540 Eco/1,000/1,000 Eco.

The pto speed is easily pre-selected at the touch of a button; another button on the armrest activates the pto.

4-pillar cab

The Axion 850 features the new Claas 4-pillar cab, first introduced in the Axion 900, which provides optimum visibility and is fitted with a new armrest with integral Cmotion multifunction le-

ver. Four suspension points mean that the cab is fully isolated from the chassis, preventing impacts and vibration from reaching the driver. Longitudinal and lateral struts join the suspension points and keep the cab stable when turning corners or braking. An adjustable torsion strut makes it possible to choose between three different suspension hardnesses.

Mauro Rancati.

MULTIPLE COUPLINGS

All hydraulic couplings at the rear of the Axion 850 have release levers, so they can be connected and disconnected even under pressure. The coloured markings on the inlet and outlet sides make it easier to attach implements correctly

The closed centre load sensing circuit features a variable displacement main pump provided by Bosch Rexroth with 110 l/min or 150 l/min output at 200 bar



Seat options for the Axion 850 includes five Sears and Grammer seats, including a ventilated premium seat; active seat ventilation makes the seat feel good whatever the weather, while suspension automatically adjusts to the driver's weight.



The Axion 850 features three different pto options (540/1,000, 540/540 Eco/1,000, 540 Eco/1,000/1,000 Eco). The pto speed is easily pre-selected through a control panel in the cabin.



In the opening figure, a Fortis tractor by Same. The Italian firm has launched the Farmotion series, already in its final version. The in house strategy, however, does not exclude its collaboration with Deutz, despite Sdf having abandoned the shareholdings. In this page, a comparison between the 4 litre 4 cylinders by Deutz and Same, with powers of 115 and 110 kW.

FACE TO FACE

Brand Model	Deutz Tcd4.1 L4	Same Kd 4
I. D.		
B x S mm - S/B	101 x 126 - 1.25	103 x 115 - 1.12
N. cil. - dm³	4 - 4.03	4 - 3.85
Maximum power kW - rpm	115 - 2,400	100 - 2,000
Mep at max power bar	14.5	15.9
Piston speed m/s	10.1	7.7
Maximum torque Nm - rpm	608 - 1,600	539 - 1,600
Mep at max torque bar	19.3	18
Torque at max power Nm	461	480
% power at max torque (kW)	88.6 (102)	90.4 (90)
Work range rpm	1,400	1,000
DETAILS		
Specific power kW/dm³	28.4	25.9
Specific torque Nm/dm³	150.5	140
Areal spec. power kW/dm²	35.94	30.03
Areal spec. torque Nm/dm²	189.7	161.7
RULES AND BALANCE		
Dry weight kg	400	540
L x W x H mm	783x629x812	602x578x679
Volume m³	0.4	0.24
Weight/power kg/kW	3.5	5.4
Weight/displacement kg/dm³	99.1	140.3
Power density kW/m³	287.5	416.7
Total density t/m³	1	2.25
Displacement/volume dm³/m³	10.1	16.04
SPECIFICATION		
Emission level	tier 4f	tier 4f
Injection system	common rail	common rail
Valves - Air intake - Techno	4v egr scr	2v wg, doc, scr egr
INDEX		
Torque	19.3	15.1
Performance	1.6	1.6
Stress	117.5	101.9
Lightness	1.2	1.1
Density	3.2	4.5
Diesel Index	5.6	3.5

As it approached the IIIb, the 3.8 litre engine from Treviglio focused on simplifying its architecture ostracizing dpf and relying on egr and doc. At the final, it had to extend the antidotes against polluting agents to the indispensable scr.

Scr is the common way

This post-treatment is also available on the final version of Deutz, which has been defined in detail for some time, and it will cooperate, over 56 kW, with the catalytic exhaust pump, as an alternative to the particulate filter. Both share shaft, rocker arms and common rail, as well as the same injection expertise by Bosch. At Deutz they called it Dcr, and in Cologne they took credit for the injection pumps. Another common feature is recirculation, but with one profound difference: in the IIIb by Deutz with the egr comes necessarily the filter, engineered in collaboration with Eberspächer, whereas the Farmotion close the door on particulate re-

generation, relieving the engine control unit from the burden of the trigger. To maintain the performances, which feel the effects of the fuel mixture depauperation, no forcing of the technological asset is needed: waste gate and aftercooler are sufficient. When comparing their torque value curves, the differences amongst the two become clear: fifteen per cent of gap says a lot about the free spirit of the Tcd and about the captive origin of the Farmotion, which is open to venture to other brands in the future, may they be for earth-moving, specialised or within a genset. The difference in engine stress is substantial: 10.1 metres compared to 7.7. All the features described above stand against a slightly higher mep in the Italian engine. The four drive belt turns with automatic tensioning, functional to the management of the hydraulic pumps, serve as evidence for the agricultural calling of Same.

Corrado Bassoli

Deutz vs Same: from past to present

IT'S A BIG RESPONSIBILITY

At Same, Deutz will gradually be substituted by the Indian family, which will determine Same's comeback to motors. Free instinct for Deutz, captive vocation for Same

The 'de facto' separation that had been significantly hinted with the Kd range is finalised with Same's exit from the Deutz shareholding: evidence is not proof, but their investment in a domestic series strongly suggests a precise industrial strategy. Kd is the signature of the family of 3, 4 and 6 cylinders (available shortly) produced by Same in Renipet, India, which will bring the group from Treviglio back to a self-sufficient approach. An approach that was already present with Deutz, to the point that Same had become the key shareholder; however the so called Farmotion series puts into effect their return to the tradi-

tions, with the company brand. This strategy has allowed Same to generate some cash and invest in a project that will cover the entire series of implementations, without having to exclude the Cologne 'reds'.

Around 100 kilowatts

If we consider the highest range of the tractors' cinematic chain, the 4 cylinders remains stably around 100 kW, perfectly consistent in the Kd 4, while Tcd 4.1 bares 15 more, and capitalises on the almost 200 cc extra (one litre swept volume compared to 962 cc). One of the biggest differences is the aeration, which for Same is commissioned to the two valves, and to double

those for Deutz, even though in Cologne the four crown valves on the cylinder had never been the preferred choice. The bases of this difference are two pole-opposite approaches to the engine design: Deutz has conceived an engine that can be positioned transversally to the implementation, rendering it attractive also for the automotive sector. Same, on the contrary, has calibrated its Farmotion for house tractors, adjusting them to the already existing transmissions, without having to rethink curves and sizes. A well-balanced engine, it gives priority to its structural features rather than aiming at reaching amazing performances.



Fpt Industrial R22

COMPACT ITALIAN

Brand - Model	Fpt Industrial R22
I. D.	
B x S mm - S/B	94 x 107 - 1,14
N. cil. - dm³	3 - 2,22
Maximum power kW - rpm	52 - 2.600
Mep at max power bar	11
Piston speed m/s	9,3
Maximum torque Nm - rpm	249 - 1.800
Mep at max torque bar	14,4
% power at max torque (kW)	2,8
Torque at max power Nm	196
% power at max torque (kW)	90,6 (47)
Work range rpm	1.600
DETAILS	
Specific power kW/dm³	23,4
Specific torque Nm/dm³	112,1
Areal spec. power kW/dm²	25
Areal spec. torque Nm/dm²	120
RULES AND BALANCE	
Dry weight kg	210
L x W x H mm	519x524x723
Volume m3	0,2
Weight/power kg/kW	4
Weight/displacement kg/dm³	94,3
Power density kW/m³	260
Total density t/m³	1,05
Displacement/volume dm³/m³	11,14
SPECIFICATION	
Emission level	tier 4 f
Injection system	common rail
Valves - Air intake - Techno	2 wg, dpf doc egr

With a significant cut in millimetres, the 2.2 litre gets even more compact: the tunnel engine block abolishes the need for a structural oil sump. Power and torque values draw curves for 33 and 52 kW and 169 and 250 Nm.

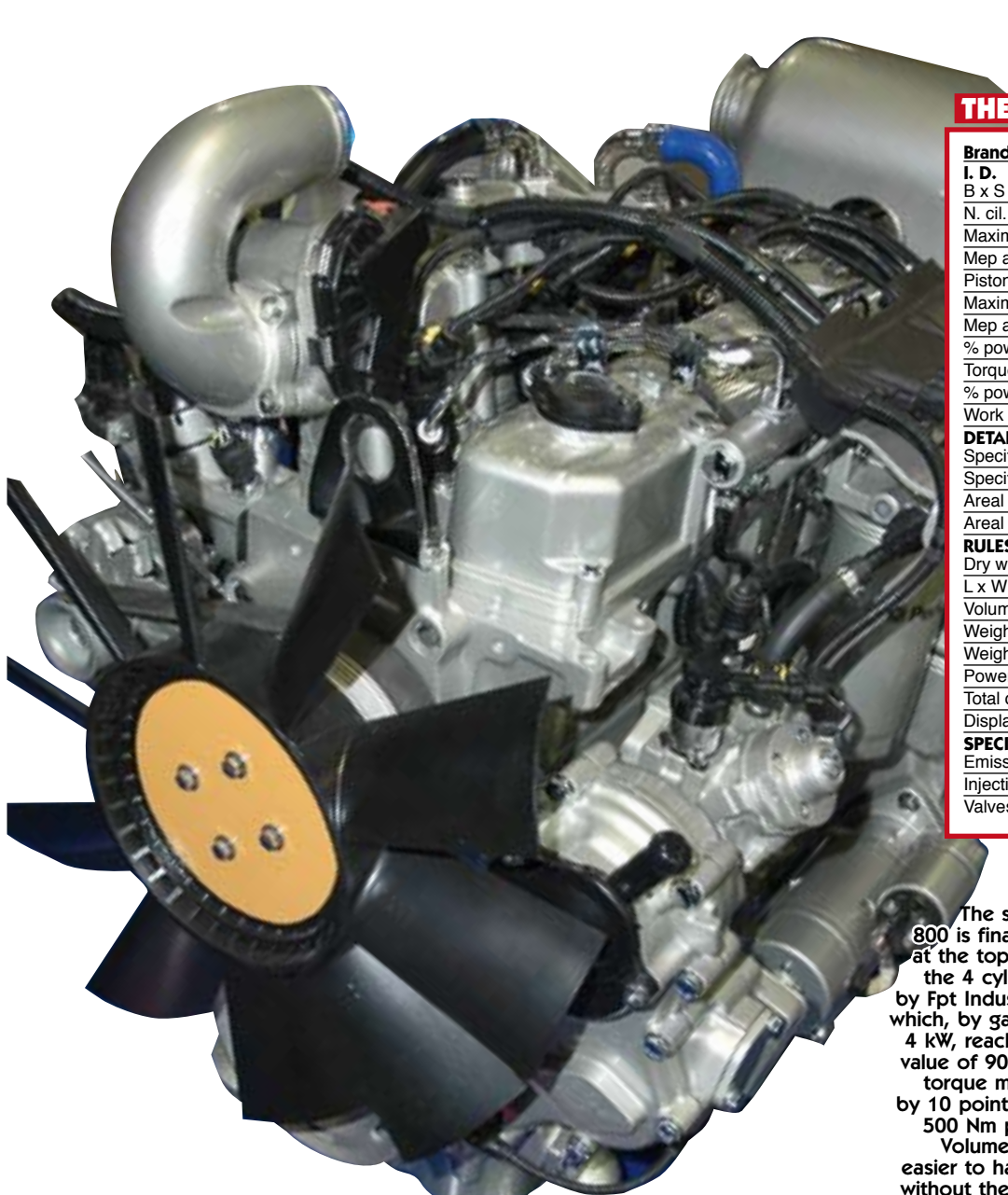
reduction of the wheelbase and turning radius. The technological approach is confirmed and it brings together the agricultural imprinting (for example the two valves per cylinder) with the kit for the electronic upgrade: Fpt Industrial's main ingredients are a high pressure common rail (1600 bar) and waste gate during the supercharge phase.

Egr, doc and dpf

The reduction in polluting agents is achieved through a simple egr and with a muffler that integrates catalyser and open dpf, which is sufficient for the workload it has to tolerate (under 56 kW), with the advantage of eliminating any maintenance duty. Therefore, contrarily to the Vm R 754 introduced at Eima, the second AdBlue tank is not required. To face the rigid continental climate, the engine employs cold start glow plugs. The uniflow head polarises on one side both the intake and exhaust manifolds: the maintenance times are shortened and the procedures are simplified thanks to the left side positioning.

From 1.6 to 3.1 tons

Towards simplifying is also the use of hydraulic tappets. The agricultural applications range from 1.6 and 3.1 tons, and include professional garden lawn tractors, equal wheels 4x4 tractors and orchard tractors.



Perkins 845F-E34Ta

THE MOST POWERFUL

Brand - Model	Perkins 854F-E34TA
I. D.	
B x S mm - S/B	99 x 110 - 1,11
N. cil. - dm³	4 - 3,38
Maximum power kW - rpm	90 - 2.200
Mep at max power bar	14,8
Piston speed m/s	8,1
Maximum torque Nm - rpm	490 - 1.400
Mep at max torque bar	18,6
% power at max torque (kW)	2,5
Torque at max power Nm	392
% power at max torque (kW)	79,9 (72)
Work range rpm	1.200
DETAILS	
Specific power kW/dm³	26,4
Specific torque Nm/dm³	144,6
Areal spec. power kW/dm²	29,22
Areal spec. torque Nm/dm²	159,1
RULES AND BALANCE	
Dry weight kg	270
L x W x H mm	747x662x882
Volume m³	0,44
Weight/power kg/kW	3
Weight/displacement kg/dm³	79,7
Power density kW/m³	204,6
Total density t/m³	0,61
Displacement/volume dm³/m³	7,7
SPECIFICATION	
Emission level	tier 4f
Injection system	common rail
Valves - Air intake - Techno	wg doc scr egr

The series 800 is finalised at the top with the 4 cylinder by Fpt Industrial, which, by gaining 4 kW, reaches a value of 90. The torque misses by 10 points the 500 Nm peak. Volumes are easier to handle without the dpf.

and a design that is aimed at harmonising the slightly artificial elements, compared to the traditional British silhouette, with a dimensional geometry that is well known to agricultural machinery. Their decision to avoid the particulate filter is aimed at preserving two milestones of the most conservative sectors: not to weigh on height and width with extra millimetres and not to negatively affect the specific consumption. An active regeneration, in fact, would have required either a post-injection of diesel or the use of a serpentine that anyway would have added to the energetic load.

1.800 bar common rail

To quieten the NOx, Perkins has relied on a pipe pressure of 1.800 bar, waste gate to go with it, and an efficient management of the combustion parameters. An additional tank in AdBlue reaches a compromise by drastically reducing the excess nitrogen oxides that are generated downstream by the high temperature turbulences in the combustion chamber. Both regular service intervals, scheduled at 500 hours, and Poly-V belt are confirmed. As it clearly appears by the comparison in this issue, the 3.4 litre is gaining ground in the similar size ranking: a 490 Nm torque leaves everyone amazed.

THE PERFECT NUMBER

The three cylinder from Turin originates, in fact, from a collaboration with Vm. 1600 bar common rail and waste gate. Egr, doc e dpf in charge of emissions. With the tunnel engine block the volumes are reduced to the minimum

Fpt Industrial celebrates the return of the odd numbers in collaboration with Vm. The 2.2 litre 3 cylinder, in fact, takes cues from the 750 cc cylinder swept volume of the

754 family, broadening the range of power values in the elastic off road series from Turin. Power and torque values draw curves for 33 and 52 kW and 169 and 250 Nm. With a signi-

ficant cut in millimetres, the 2.2 litre gets even more compact: the tunnel engine block abolishes the need for a structural oil sump, with a positive outcome for the oems in terms of

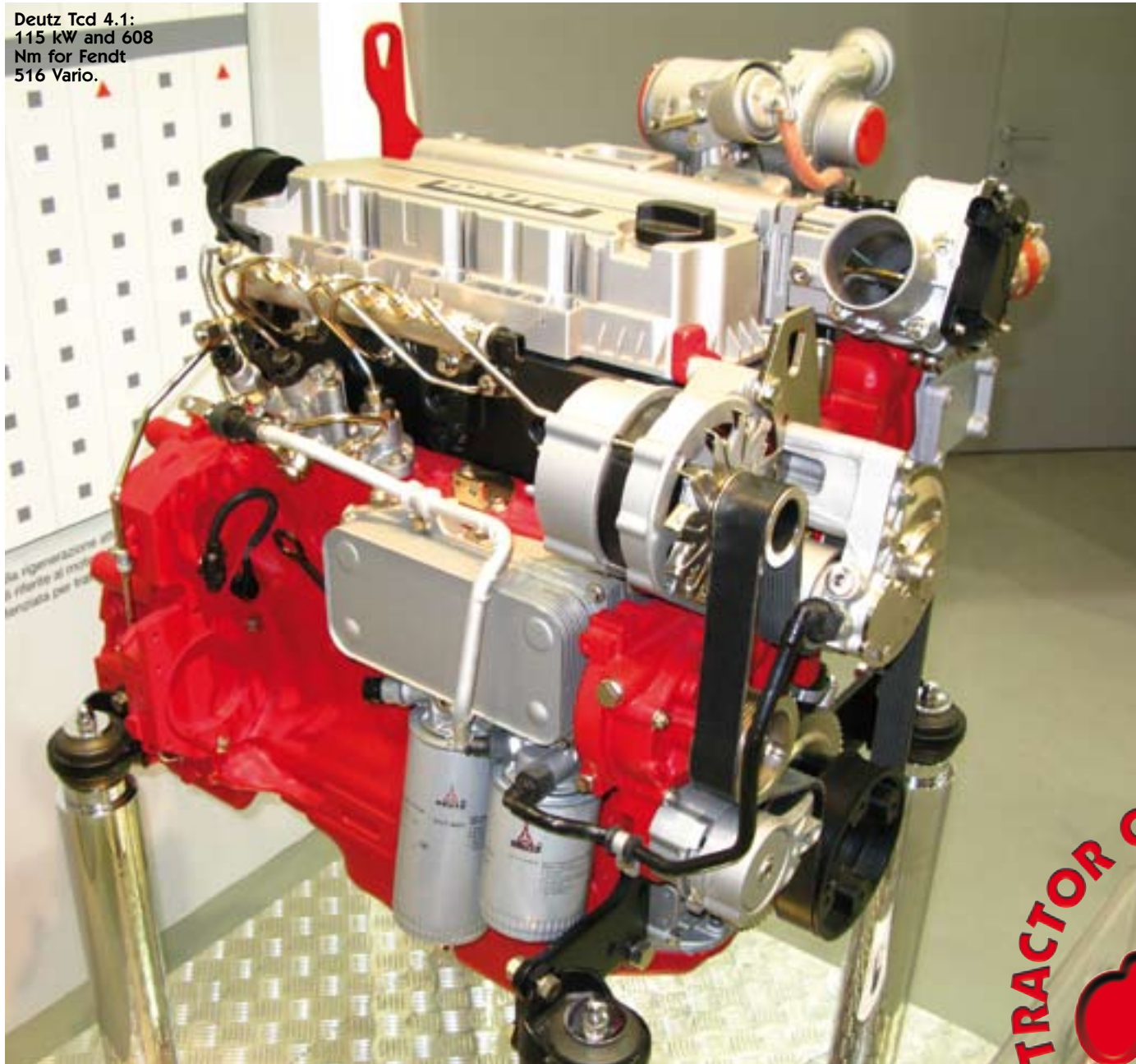
TOWARDS THE 100 EDGE

The British company releases an upgraded version of their series 850, designed in collaboration with Fpt Industrial. The top of the range reaches 90 kW, with a strong 490 Nm torque. While scr is present, there is no sign of dpf

As a result of the agreement with Fpt Industrial, the 800 series is rising towards the 100 kW summit. It is actually not quite there yet, as the top of the range has

climbed only four steps, from 86 to 90 kW. The compact range by Perkins is strengthening, and it is destined to defend the strategic agricultural mechanisation group. A high

power intensity to face the requirements from specialised machinery and middle range open field tractors. The 854 is all-electronic, with a common rail that could not be avoided



Deutz Tcd 4.1:
115 kW and 608
Nm for Fendt
516 Vario.



Fpt Industrial
N67: 194 kW and
1.130 Nm for
Claas Axion 850.

TRACTOR OF THE YEAR® 2014

The free spirits of the Tractor of the Year

These are the icons of the free market: Fpt Industrial and Deutz. The Italian company uses the 6.7 litre Nef on the Axion 850 by Claas, the German 4.1 Tcd is on the Fendt 516 Vario

The finalists are prevalently captive manufacturers such as New Holland, John Deere, Kubota and Massey Ferguson. Lamborghini strikes with one peculiarity: under its bonnet lies the 3.6 Tcd by Deutz. Until recent times this would have seemed a captive move, but now that Same is out of Deutz's board, it can be considered a free project. The compact 4 cylinder has been riding the electronic wave for some time, having been

mounting the common rail since the IIIA, a convention that would have been fulfilled simply by internal recirculation.

From 56 to 130 kilowatts

Gradually, the catalytic exhaust was introduced and, for the regulation range between 56 and 130 kW, also dpf and scr, which are mandatory for the final (the newest yields as much as 97 kW and 500 Nm). Lamborghini's 94 kW are not the only ones to represent Deutz,

which can wear without reserve the gallons of the 'free' for the model that in its catalogue follows the Tcd 4.1, with a one litre swept volume, that on the Fendt 516 Vario exceeds 120 kilowatts.

Deutz and Fendt

Stable at the interim, the last emission version displays the aftertreatment coupled with a catalytic exhaust. Hence, no particulate filter. On the Fendt the common rail will collaborate with the engine control unit and an aftercooler. Simple architecture and constant pressure facilitate with tasks that would otherwise overwhelm the engine during the most intense working periods,

NATURAL BORN 'CAPTIVES'

Autarchy is spreading throughout the agricultural sector. Amongst the finalists, four are captives: John Deere, Kubota, Massey Ferguson and New Holland. The only 6 cylinder is the Cursor 9, the most powerful of the lot, which relies on scr just like the 4.9 litre by Sisu (the motorists by Agco), whereas John Deere, for the 66 kW of its 4.5 litre Pwv, unites vgt, common rail Denso and egr. From the Land of the Rising

Sun, Kubota brings the V3800, which has transplanted the common rail to

achieve 80 kW. All the above engines are interim homologated.

mainly during the summer season. A 'final' is also amongst the finalists, and it strengthens the connection between Fpt Industrial and Claas.

The N series, in its 6.7 litre cubic capacity, moves the Axion 850 with its 194 kilowatts and 1.130 Newton metres. It consumes limited kW and it runs at low rpm not to overwhelm the piston and stress the combustion. The injection pressures limit the formation of soot in the combustion chamber. The scr 'vedette' is in charge of the rest.



BETWEEN THEM, THE ALPS

A 'VARIO' DEUTZ

Brand - Model	Deutz Tcd4.1 L4
I. D.	
B x S mm - S/B	101 x 126 - 1,25
N. cil. - dm3	4 - 4,03
Maximum power kW - rpm	115 - 2.400
Mep at max power bar	14,5
Piston speed m/s	10,1
Maximum torque Nm - rpm	608 - 1.600
Mep at max torque bar	19,3
% power at max torque (kW)	3,2
Torque at max power Nm	461
% power at max torque (kW)	88,6 (102)
Work range rpm	1.400
DETAILS	
Specific power kW/dm³	28,4
Specific torque Nm/dm³	150,5
Areal spec. power kW/dm²	35,94
Areal spec. torque Nm/dm²	189,7
RULES AND BALANCE	
Dry weight kg	400
L x W x H mm	783x629x812
Volume m³	0,40
Weight/power kg/kW	3,5
Weight/displacement kg/dm³	99,1
Power density kW/m³	287,5
Total density t/m³	1,00
Displacement/volume dm³/m³	10,10
SPECIFICATION	
Emission level	tier 4f
Injection system	common rail
Valves - Air intake - Techno	4v egr scr



It's a good deal the agreement between Fpt Industrial and Claas.

A 4 cylinder for a tractor completely Made in Germany

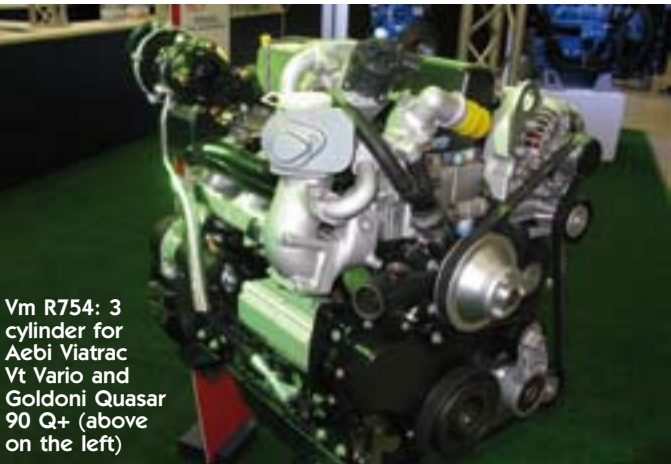
FPT CLAA(S)S

Brand - Model	Fpt industrial N67
I. D.	
B x S mm - S/B	104 x 132 - 1,27
N. cil. - dm3	6 - 6,72
Maximum power kW - rpm	194 - 1.900
Mep at max power bar	18,6
Piston speed m/s	8,4
Maximum torque Nm - rpm	1.130 - 1.500
Mep at max torque bar	21,5
% power at max torque (kW)	1,5
Torque at max power Nm	980
% power at max torque (kW)	91,6 (178)
Work range rpm	900
DETAILS	
Specific power kW/dm³	28,8
Specific torque Nm/dm³	167,9
Areal spec. power kW/dm²	38,04
Areal spec. torque Nm/dm²	221,7
RULES AND BALANCE	
Dry weight kg	520
L x W x H mm	1.062x681x1.018
Volume m³	0,74
Weight/power kg/kW	2,7
Weight/displacement kg/dm³	77,3
Power density kW/m³	262,2
Total density t/m³	0,70
Displacement/volume dm³/m³	9,09
SPECIFICATION	
Emission level	tier 4f
Injection system	common rail
Valves - Air intake - Techno	wg, doc scr egr



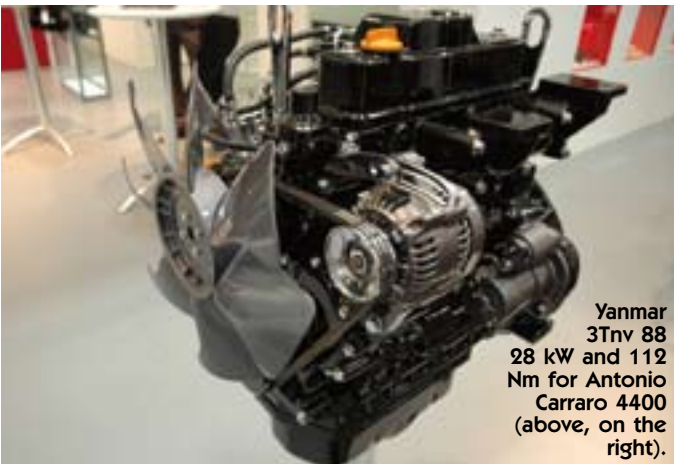
THREE FOR TWO

Brand - Model	Vm R754 IE4
I. D.	
B x S mm - S/B	94 x 107 - 1,14
N. cil. - dm3	4 - 2,97
Maximum power kW - rpm	72 - 2.600
Mep at max power bar	11,4
Piston speed m/s	9,3
Maximum torque Nm - rpm	340 - 1.400
Mep at max torque bar	14,7
% power at max torque (kW)	2,8
Torque at max power Nm	265
% power at max torque (kW)	69,3 (50)
Work range rpm	1.600
DETAILS	
Specific power kW/dm³	24,2
Specific torque Nm/dm³	114,4
Areal spec. power kW/dm²	25,90
Areal spec. torque Nm/dm²	122,5
RULES AND BALANCE	
Dry weight kg	257
L x W x H mm	702x557x736
Volume m³	0,29
Weight/power kg/kW	3,6
Weight/displacement kg/dm³	86,5
Power density kW/m³	248,3
Total density t/m³	0,89
Displacement/volume dm³/m³	10,24



Vm R754: 3 cylinder for Aebi Viatrac Vt Vario and Goldoni Quasar 90 Q+ (above on the left)

Brand - Model	Yanmar 3TNV88
I. D.	
B x S mm - S/B	88 x 90 - 1,02
N. cil. - dm3	3 - 1,64
Maximum power kW - rpm	28 - 3.000
Mep at max power bar	7,0
Piston speed m/s	9
Maximum torque Nm - rpm	112 - 1.800
Mep at max torque bar	8,8
% power at max torque (kW)	2,8
Torque at max power Nm	88
% power at max torque (kW)	75,9 (21)
Work range rpm	2.000
DETAILS	
Specific power kW/dm³	17,0
Specific torque Nm/dm³	68,6
Areal spec. power kW/dm²	15,38
Areal spec. torque Nm/dm²	61,8
RULES AND BALANCE	
Dry weight kg	138
L x W x H mm	564x518x622
Volume m³	0,18
Weight/power kg/kW	4,9
Weight/displacement kg/dm³	84,0
Power density kW/m³	155,6
Total density t/m³	0,77
Displacement/volume dm³/m³	9,12



Yanmar 3Tnv 88 28 kW and 112 Nm for Antonio Carraro 4400 (above, on the right).

'Specialized' engines

3 OF THE 4 ARE FROM ITALY

Aebi and Goldoni make use of the 3 litre Vm, Antonio Carraro of the 3 Tnv by Yanmar. Same gives its 1000 to Lamborghini

Yanmar is in charge of moving the Antonio Carraro Ttr 4400 II Hst with its Tnv88. A precursor of the direct injection in this range, the 1.6 litre 3 cylinder yields 28 kW distributed over the isodiametric wheels, for 112 Nm. Their trademark: the Mp2 pump, which has lasted to the final program.

Same is the captive one

The Same 1000 is the only captive in the scene, and it is under the bonnet of the Lamborghini Rs110. Four litres (BxS 105x11.5 mm) with 78 kW at 2.300 rpm and 390 Nm, it relies on individual pumping elements to inject oil in the chamber at 1.400 bar. Hydraulic tappets and countershafts are still present; egr and turbo with aftercooler are in charge of optimising the combustion and to comply with the IIIa.

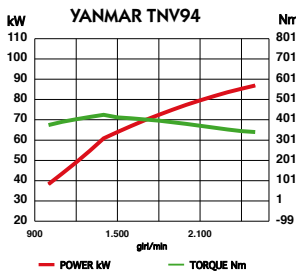
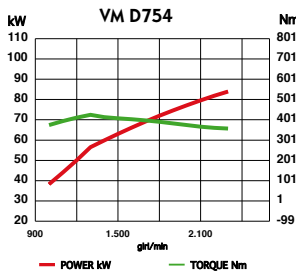
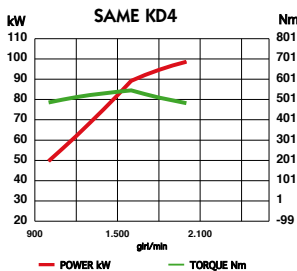
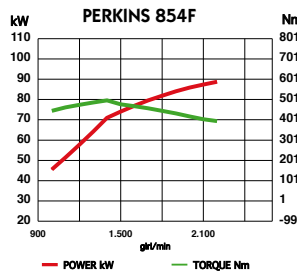
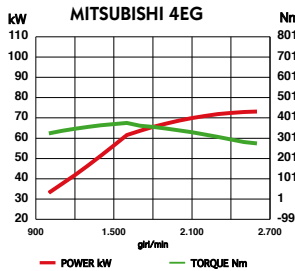
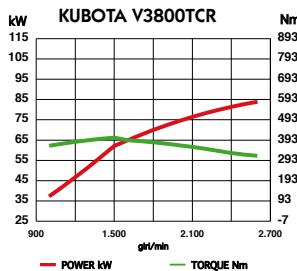
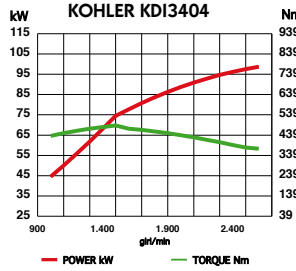
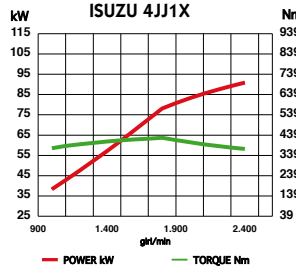
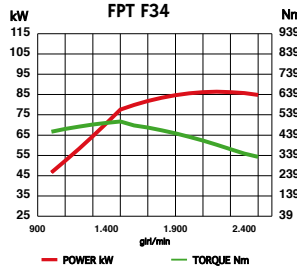
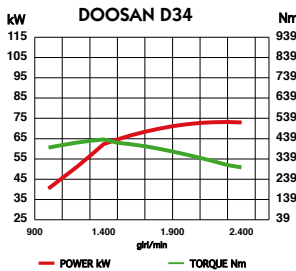
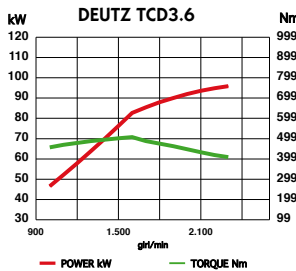
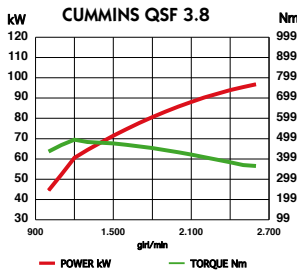
WAITING FOR THE RISING SUN

No manufacturer is willing to back out of the demand for maxi-compact engines. A Japanese trio is missing from the ‘final’ sprint. The prime choice is that of focussing on common rail pressures and on acting downstream to the scr. A few adjustments in the calibrations are on the way to reach 100 kW

Together with other equal cylinders with a one litre or higher swept volume, the compact engines between 3 and 3.8 are becoming a synonym of agricultural mechanisation. Less than a semester has gone by since Bauma, however something seems to be moving also in this series. The range has seen the four cylinders as main players, with the exception of John Deere (see box), that has revived the three cylinder, well equipped for the big leap. This

choice was possibly more for its use in the captive sector rather than the free mobile, even though, thanks to very competitive prices (at least on paper), it could be of great interest also in the production sector. Unlike its traditions, Cummins has brought into play the Qsf 3.8, designed together with Foton. The 2.8 litre engines also stem from this Anglo-Chinese joint venture. The 3.8 litre engine substitutes Komatsu’s B3.3 and yields 16 kW and 68 Nm more compared to the Diesel of the

year 2007, reaching the top of the charts. These automotive traits cost something in metres (although the density index is



A CHALLENGE FOR 12

Brand	CUMMINS	DEUTZ	DOOSAN	FPT INDUSTRIAL	ISUZU	KOHLER	KUBOTA	MITSUBISHI	PERKINS	SAME	VM	YANMAR
Brand - Model	Cummins QSF 3.8	TCD 3.6	D34	F34	4JJ1X	KDI 3404 T CR	V3800T CR	4EG	854F-E34TA	KD 4	D754TE3	TNV94HT-CR
I. D.												
B x S mm - S/B	102 x 115 - 1,13	98 x 120 - 1,22	98 x 113 - 1,15	99 x 110 - 1,11	95 x 104 - 1,10	94 x 116 - 1,23	100 x 120 - 1,20	94 x 120 - 1,28	99 x 110 - 1,11	103 x 115 - 1,12	94 x 107 - 1,14	94 x 110 - 1,17
N. cil. - dm3	4 - 3,75	4 - 3,62	4 - 3,40	4 - 3,38	4 - 2,99	4 - 3,22	4 - 3,77	4 - 3,33	4 - 3,38	4 - 3,85	4 - 2,97	4 - 3,05
Maximum power kW - rpm	98 - 2.600	97 - 2.300	74 - 2.400	86 - 2.500	92 - 2.400	100 - 2.600	85 - 2.600	74 - 2.600	90 - 2.200	100 - 2.000	85 - 2.300	88 - 2.500
Mep at max power bar	12,3	14,3	11,1	12,4	15,6	14,6	10,6	10,5	14,8	15,9	15,2	14,1
Piston speed m/s	10	9,2	9	9,2	8,4	10,1	10,4	10,4	8,1	7,7	8,2	9,2
Maximum torque Nm - rpm	488 - 1.200	500 - 1.600	430,2 - 1.400	500 - 1.500	420,4 - 1.800	480,2 - 1.500	399,8 - 1.500	372,4 - 1.600	490 - 1.400	539 - 1.600	420,4 - 1.300	420,4 - 1.400
Mep at max torque bar	16,7	17,7	16,2	18,9	18	19,1	13,6	14,3	18,6	18	18,2	17,7
% power at max torque (kW)	3,4	2,4	4,6	5	1,6	3,2	2,7	3,6	2,5	1,2	1,9	2,6
Torque at max power Nm	363	402	294	333	363	363	314	274	392	480	353	333
% power at max torque (kW)	62,6 (61)	86,40 (84)	85,30 (63)	91,4 (79)	86,2 (79)	75,5 (75)	73,9 (63)	84,4 (62)	79,9 (72)	90,4 (90)	67,4 (57)	70,1 (62)
Work range rpm	1.600	1.300	1.400	1.500	1.400	1.600	1.600	1.600	1.200	1.000	1.300	1.500
DETAILS												
Specific power kW/dm3	26	26,8	21,7	25,4	30,6	31	22,6	22,2	26,4	25,9	28,7	28,8
Specific torque Nm/dm3	129,8	138	126,2	147,6	140,1	149,1	106	111,8	144,6	140	141,5	137,6
Areal spec. power kW/dm2	29,97	32,12	24,50	27,92	32,17	35,97	27,07	26,62	29,22	30,03	30,58	31,65
Areal spec. torque Nm/dm2	149,3	165,7	142,6	162,4	147	173	127,3	134,2	159,1	161,7	151,4	151,4
RULES AND BALANCE												
Dry weight kg	280	270	204	360	320	-	300	250	270	540	257	235
L x W x H mm	818x728x786	713x580x792	701x580x769	678x586x896	928x760x888	-	745x562x816	715x625x750	747x662x882	602x578x679	702x557x736	719x496x717
Volume m3	0,47	0,33	0,31	0,36	0,63	-	0,34	0,34	0,44	0,24	0,29	0,26
Weight/power kg/kW	2,9	2,8	2,8	4,2	3,5	-	3,5	3,4	3	5,4	3	2,7
Weight/displacement kg/dm3	74,5	74,6	59,8	106,3	106,7	-	79,6	75,1	79,7	140,3	86,5	76,9
Power density kW/m3	208,5	293,9	238,7	238,9	146	-	250	217,7	204,6	416,7	293,1	338,5
Total density t/m3	0,6	0,82	0,66	1	0,51	-	0,88	0,74	0,61	2,25	0,89	0,9
Displacement/volume dm3/m3	8	10,97	11	9,41	4,76	-	11,09	9,80	7,7	16,04	10,24	11,75
SPECIFICATION												
Emission level	tier 4f	tier 4f	tier 4f	tier 4 f	epa tier 4 interim	tier 4f	tier 4f	tier 4f	tier 4f	tier 4f	tier 4f	tier 4f
Injection system	common rail	common rail	common rail	common rail	common rail	common rail	common rail	common rail	common rail	common rail	common rail	common rail
Valves - Air intake - Techno	4 wg, scr egr	2 turbo afterc, egr doc scr	4 i wg, doc scr egr	4 wg, doc scr egr	4 vgt, egr	4 turbo afterc, scr egr	4 turbo afterc, dpf doc egr4 turbo afterc, dpf - scr - doc egr4 wg, doc scr egr	4 turbo afterc, dpf - scr - doc egr4 wg, doc scr egr	2 wg, doc scr egr	2 turbo afterc, scr dpf egr4 turbo afterc, dpf egr		
INDEX												
Torque	21,8	18,7	21,4	20,7	17	3	19,7	19,6	19,2	15,1	18,6	19,8
Performance	1,2	1,3	0,9	1,1	1,2	1,2	0,9	0,8	1,3	1,6	1,1	1,1
Stress	100,2	98,9	75,1	88	93,9	102,4	86,7	75,4	92,1	101,9	86,6	90
Lightness	1,4	1,4	1,4	1,2	1,3	-	1,4	1,4	1,3	1,1	1,3	1,4
Density	2,6	3,1	2,9	3	2,1	-	3,1	2,8	2,6	4,5	3,2	3,3
DIESEL INDEX	4,2	4,2	4,4	4,9	3,5	-	3,8	3,1	3,9	3,5	3,3	3,8

CUMMINS



DEUTZ



DOOSAN



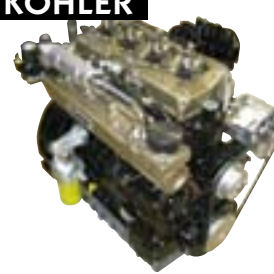
FTP



ISUZU



KOHLER



KUBOTA



MITSUBISHI



JOHN DEERE POWERTECH EWX 2.9

The 2.9 litre 3 cylinder engine is back. The power values range between 36 and 55 kW, egr and exhaust with dpf and doc are enough to be final

The choice of an odd number is becoming more and more popular in the motoring scene after more than a 5-year halt. The power values are more drawn to the green machinery rather than to the rest of the agricultural world, with ten models ranging between 36 and 55 kW and covering an interval of 190 and 304 Nm. The new look of the three cylinder is in line with the trend seen in Illinois regarding low powers: two valves per cylinder governed by rocker arms and pushrods, with waste gate and a 1975 bar common rail.



SAME



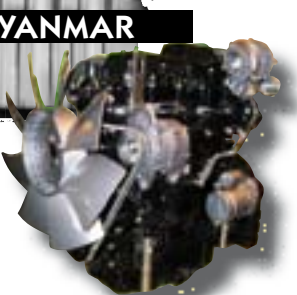
PERKINS



VM



YANMAR



Together with other equal cylinder with a one litre or higher swept volume, the compact engines between 3 and 3.8 litre are becoming a synonym of agricultural mechanisation

Doosan responds with the D34, a novel 3.4 litre 4 cylinder engine manufactured in the Korean plants for captive uses that has immediately motorised the Bobcat.

Doosan for agriculture

An important project conceived with the big players in the sector (Avl and Ricardo), able to snatch the Tier 4 final without a particulate filter. For the exhaust gas cleaning, in fact, scr and catalytic converter are called into action, and the electronic modulated exhaust gas recirculation completes the picture. Its structural versions are about to be completed and will probably be ready before the Eima in Bologna. The cubic capacity and the absence of a filter immediately suggest a confrontation, technological at least, with Kohler.

The strong 3.4 litre that will be manufactured in Reggio Emilia starting next year will be included in this comparison. Meanwhile, the Kdi are nodding in the direction of earth moving machinery, as recently demonstrated by the agreement with Jcb.

Kohler Kdi and the future

For both models the exhaust gas post-treatment is with urea solution and the latest version of Delphi common rail. The performances are substantially different from those of the Korean engine, which is settled on the canonical 74 kW to satisfy the needs of the house machinery in these initial phases, especially for Bobcat. The future will tell. Kohler has announced that its maxi compact will reach 100 kW maximum power, for a

maximum torque value of 480 Nm. A goal that symbolises the craved leap over the 56 kW threshold to conquer fields which were precluded until now to the Lombardini old engines.

Vm and the 750 cc

While considering immortal Italian engines, it is worth mentioning the Vm, one of the few in the Tier 4 final version, thanks to the scr system working alongside with the exhaust gas recirculation and particulate filter. The 750 swept volume, that has shaped the history of the specialised agriculture, comes in an 'all inclusive' version to comply with the final parameters: scr is supported by dpf and recirculation. The engine surely does credit to its 'compact' name: it is lighter than its contestants and the power-to-weight ratio is all in its favour. From agricultural free to agricultural captive, but Italian nevertheless: the profile is that of the Same Kd4, a four cylinder with 692 cc swept volume (with the same swept volume there is also a three cylinder available and a six cylinder will be released in the future). Unlike its younger brother in the Tier 4 interim, which has marked the Same's comeback to full-speed engine production, it relies on scr. Its maximum power is 100 kW for a torque value of 543 Nm, the top of the grid.

Isuzu and Mitsubishi

If we now draw our attention to the East: aside from Mitsubishi, three powers such as Isuzu, Kubota and Yanmar are showing up with an interim title. Appeared for the first time at the 2010 Bauma, the 3 litre by

Isuzu will join the scr-devoted group to achieve the final goal. This choice may induce the Japanese company to shift towards a higher temperature combustion with the possibility to increase its already high performances.

Kubota and Tier4f

Another important name in the sector is Kubota, which has renovated its 3.8 litre engine pushing it to 85 kW for a torque value of approximately 400 Nm (historically Kubota has never disclosed its torque values, this is an estimate by Diesel). Design and architecture are the same as its previous version with the addition of the common rail that has replaced the rotary pump. This magic pipe has certainly contributed towards the reduction of emissions, although it would not have been sufficient without the exhaust gas recirculation and the dpf that are now leaders in the Kubota V3800 Cr. In this case too, the manufacturer has declared that the Tier 4 final will be with the scr.

Yanmar till 88,4 kW

To conclude this lengthy road show, we find Yanmar, that, just as Lombardini/Kohler, has exceeded its usual area of influence: the 3 litre offers 88.4 kW and 420 Nm. Strong in its specific performances, it currently uses egr and dpf. The head quarters have not revealed any detail regarding the near future: things seem to be leaning towards the scr, but the Yanmar engineering is known for its innovative solutions (e.g. the egr and the 4 valves on the under 56 Tnv from the Tier 3/Eu IIIa).

not the worst of the lot). A different story is that of Deutz, presenting a noteworthy industrial engine. It is the 3.6 litre Tcd3.6, that just last month was enhanced in its performances. The manufacturers from Cologne have revealed the top at Monaco Inter airport: 97 kW for a 500 Nm. The compact maxi from Cologne harbours an overhead with two valves (one of the few) while the injection is controlled by the Bosch common rail, a system that is monopolising the sector with different brands (here Delphi is rising fast).

Perkins improves power

Still in the top positions, Perkins too has improved its calibration, profiting 5 kW and 70 Nm, thanks to the opportunities offered by the electronic 'new age'. Perkins' 3.4 litre 854F is a well-balanced engine designed for industrial applications but with the ability to also blend automotive technology. In this calibration it displays a pme of almost 15 bar while retaining a truly agricultural speed: 8.1 m/s, and a lower engine speed (2200). With its 490 Nm, the torque is strong on all the line, approaching that of the highest performing, and the maximum value is well in agreement with

the transmissions available on the market. The 850 by Perkins have already settled under the bonnets of agricultural tractors by Argo: Landini and McCormick.

The Italian twin

Side by side with the British engine is its Italian twin: F5 is the series by Fpt Industrial that bares its signature only when installed on Cnh Industrial applications. Naturally, the most exuberant version adopts the same precautions as Perkins (egr, doc and scr), but it yields 86 kW at higher speed: 2500 rpm. A two-valve version with 55 kW is also available, and it substitutes scr with Pmcat. Once more, well in line with the British engine is the final revision of Mitsubishi: the 4Eg, the first of its kind to cross the finishing line, has inspired Perkins' 800 series. Performances are far from excellent and the two valves suggest a specific strategy to go along with the more conservative tendencies of the agricultural industry, however it may need to eventually double the valves to increase power. Having abandoned the rotary pump for the common rail, it is one of the few not to have familiarised with urea. Egr and dpf are in charge of it all.

THE TORQUE EXUBERANCE

Technology abounds within this range, with a wide variety of solutions to diversify the main players. Scr is the only essential element, however almost all solutions are available for the turbocharge: variable geometry turbocharger, waste gate, twin turbo and compound. Man and Scania take the lead

The Katana 65 illustrated in the photograph (turn the page...) is powered by the 15.9 Om 502, but ‘final’ displays good alternatives. Germany dominates the sixteen litres, and it monopolises the central portion of the contest grid; the American and Scandinavian duets being on each side (alphabetically speaking). The performance data are proportional to volume reduction,

especially as far as torque values are concerned; Caterpillar and Cummins make the most of the attractive volume size to place their best pieces under the bonnet. All the above considerations are matched with the different calibrations amongst the group’s front lines: Cat with 433 kW, Cummins reaching 503 kW not far behind Liebherr. It should be mentioned that the 15.1 litres in yellow yield, at maximum torque, 90 percent

of their power. Although the 14.9 by Columbus sacrifices a bunch of cc to its compatriot, it yields 70 kW more with the same peak torque, thanks to the high-vitamin treatment involving the 2,400 bar common rail and the variable-geometry turbocharger

Yellow power

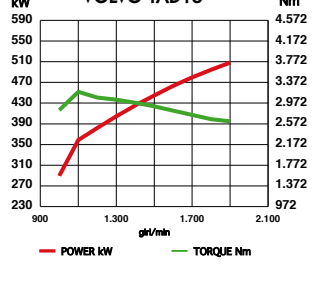
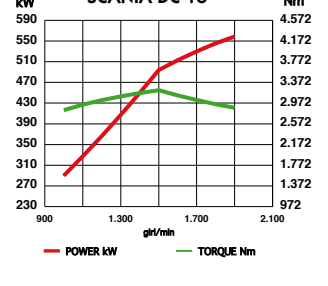
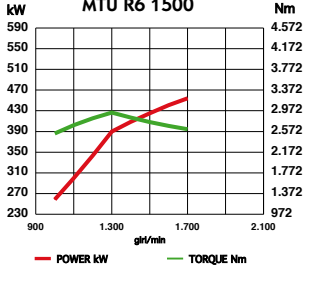
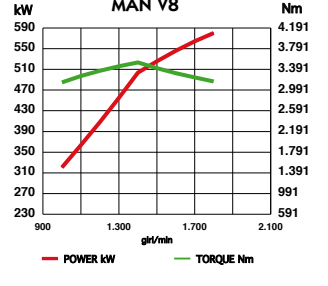
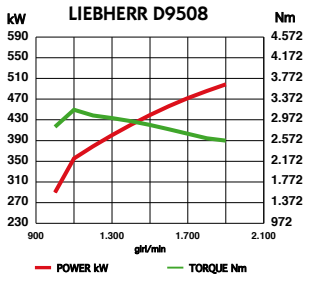
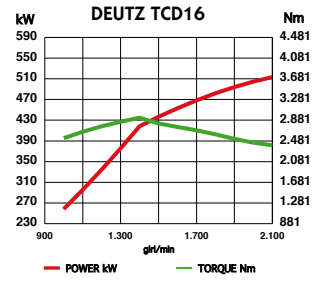
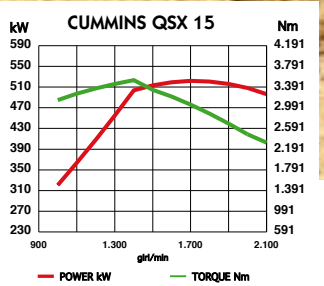
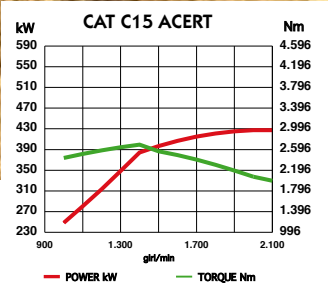
Back to the 15.2 litre in yellow, this six cylinders also stands out due to its architecture, not than-

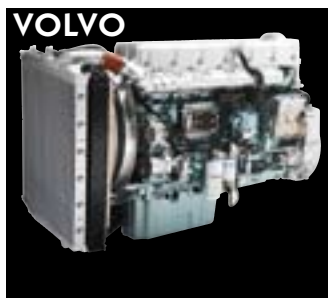


Power values ranging between 433 and 588 kW for the 16 litre engines, which are employed, in the agricultural sector, mainly on combine harvesters. Man focuses on the twin turbo, pushing the torque to the maximum peak of 588 Nm. Only Scania is following closely, with Deutz and Volvo behind. The Swedish says no to dpf, together with Mtu.

HARVESTER TIME

Brand	CATERPILLAR	CUMMINS	DEUTZ	LIEBHERR	MAN	MTU	SCANIA	VOLVO
Brand - Model	Caterpillar C15 ACERT	Qsx 15	Tcd16	D9508 A7	V8	R6 1500	DC 16	Tad16
I. D.								
B x S mm - S/B	137 x 171 - 1.25	137 x 169 - 1.23	132 x 145 - 1.1	128 x 157 - 1.23	128 x 157 - 1.23	139 x 171 - 1.23	130 x 154 - 1.18	144 x 165 - 1.15
N. cil. - dm³	6 - 15.12	6 - 14.94	6 - 11.9	8 - 16.16	8 - 16.16	6 - 15.56	8 - 16.35	6 - 16.12
Maximum power kW - rpm	433 - 2,100	503 - 2,100	520 - 2,100	505 - 1,900	588 - 1,800	460 - 1,700	566 - 1,900	515 - 1,900
Mep at max power bar	16.7	19.6	25.5	20.1	24.7	21.3	22.3	20.6
Piston speed m/s	12	11.8	10.2	9.9	9.4	9.7	9.8	10.5
Maximum torque Nm - rpm	2,655 - 1,400	2,779 - 1,400	2,890 - 1,400	3,125 - 1,000	3,480 - 1,400	2,900 - 1,300	3,183 - 1,500	3,150 - 1,000
Mep at max torque bar	22.5	23.8	31.1	24.8	27.6	23.9	25	25.1
% power at max torque (kW)	3.5	2.2	2.2	2.3	1.2	1.2	1.2	2.2
Torque at max power Nm	1,970	2,283	2,362	2,538	3,116	2,587	2,842	2,587
% power at max torque (kW)	90 (389)	81.1 (408)	81.5 (424)	64.8 (327)	86.8 (510)	85.9 (395)	88.4 (500)	64.1 (329)
Work range rpm	1,100	1,100	1,100	900	800	700	900	900
DETAILS								
Specific power kW/dm³	28.6	33.6	43.6	31.2	36.4	29.5	34.6	31.9
Specific torque Nm/dm³	175.5	185.9	242.7	193.3	215.3	186.2	194.6	195.3
Areal spec. power kW/dm²	48.98	56.9	63.34	49.08	57.14	50.55	53.3	52.71
Areal spec. torque Nm/dm²	300.2	314.2	352	303.6	338	318.5	299.8	322.4
RULES AND BALANCEI								
Dry weight kg	1,580	1,365	1,260	1,600	1,450	1,277	1,340	1,455
L x W x H mm	1,438x943x1,239	1,443x1,032x1,298	1,150x945x1,170	1,692x1,112x1,350	1,512x1,200x1,440	1,425x1,005x1,290	1,315x1,180x1,215	1,582x893x1,320
Volume m³	1.68	1.93	1.27	2.54	2.61	1.85	1.89	1.86
Weight/power kg/kW	3.6	2.7	2.4	3.2	2.5	2.8	2.4	2.8
Weight/displacement kg/dm³	104.5	91.3	105.8	99	89.7	82	81.9	90.2
Power density kW/m³	257.7	260.6	409.5	198.8	225.3	248.7	299.5	276.9
Total density t/m³	0.94	0.71	0.99	0.63	0.56	0.69	0.71	0.78
Displacement/volume dm³/m³	9	7.75	9.37	6.36	6.19	8.42	8.65	8.67
SPECIFICATION								
Emission level	T4f	T4f	T4f	T4f	T4f	T4f	T4f	T4f
Injection system	meui	common rail xpi	common rail	common rail	common rail	common rail	common rail xpi	common rail
Valves - Air intake - Techno	4 in line turbo afterc. scr dpf eg	r4 in line vgt scr dpf egr4	vee-type turbo afterc. scr dpf	4 vee-type wg scr egr4	vee-type more turbo. scr dpf egr	4 in line turbocompound. scr egr	4 vee-type vgt scr egr	4 in line wg scr egr
INDEX								
Torque	23.7	23.2	23.5	24.8	21.3	20.1	21.6	24.5
Performance	8.9	10.7	11.5	11.8	15.1	11.8	13.3	12.1
Stress	295	341	355.2	256.3	299.1	313	289.9	351.7
Lightness	1.2	1.3	1.2	1.2	1.2	1.2	1.3	1.2
Density	3	2.8	3.4	2.5	2.5	2.8	2.9	2.9
DIESEL INDEX	10.7	9.9	9.9	9.9	10	8.4	9.6	9.6





The Katana 65 is powered by the interim 15.9 Om 502 but 'final' displays good alternatives

ks to the annexes to the engine block as such (the rotor is fixed and no other additional feature is required), but thanks to its injection system, that adopts the Meui exception, the injection package mechanically-actued and electronically controlled patented by Caterpillar (Heui is its electronic version). With no pipe between the cylinders, this common rail enables Bosch to gather consensus and Scania to show off its Xpi, a project that was mentioned concerning Qsx, that grants record pressures and therefore a homogeneous nebulization. This comes as a combined effort from the automotive sector that has reached and is being implemented on the industrial machinery by Cummins and Scania.

The roaring echo

An aggressive roar comes from this best in class chart: it's the V engine with 8 cylinders from Man which, with a simple urea

injection (in this case too, however, the result of the synergy with Liebherr), is ready to cross the final finishing line that will be made official in Hannover. Exemplifying the success of this project are the mean effective pressure (the highest) and the mechanical stresses that, on the contrary, are the most limited: as shown in the table, the piston stops at as few as 9.24 metres; great credentials for someone already burdened with enough work load stress.

Fixed and variable

After all, the absolute and partial values of the torque curves are there to demonstrate the excellence amongst the supercharging systems under examination of the Bavarian engine, the only dual-stage that alternates fixed and variable-geometry turbine. Liebherr too has decided to go the extra mile and bring the cylinder liner, its joint creation together with Man, to the final

WITH FPT THE 16 SPEAKS ITALIAN

2014 is just around the corner and will not only bring the all-important Tier 4 final, but will also reveal the identity of the 16 litre Fpt, a six cylinder inline engine that will rocket the Cursor family to sky-high values of power and torque.

It will not be competing on the road with the Swedish and the Germans. The highest in the range is worth only 5 percent of the truck sector and is caught between the intensification of the over 700 horsepower duel between Volvo and Scania and the more moderate calibrations of Mercedes, with its revision of the Detroit Diesel, and Man, that has defined the details of Liebherr's substitute, but is still battling with them for the industrial sector. The 16 from Turin will therefore establish itself predominantly in the harvesters, shredders and heavy machinery sectors.



The Katana 65 is powered with the 15.9 litre V8 by Mercedes, which will stop at the interim. Amongst the engines in this range, German is the most common spoken language, followed in joint place by Swedish and English with an American accent. The next year will see the addition of Italian, with the 16 litre by Fpt Industrial.

steps of the regulatory procedure. Compared to the interim, the dead weight of the dpf has been abandoned to focus on the post-treatment. A control unit by Liebherr is in charge of managing the operations, and the common rail, again from Liebherr, has a pipe per cylinder bank and a waste gate. The Swedish performances are rising as well, in particular with Scania, here with an 8 cylinder with 2 litre swept volume, while Volvo settles for the same cc values but spread over 6 cylinders. With its 566 kilowatts, the Griffin is a stone's throw from Man and the torque gap reaches 9 percent (the bottom of the range reaches 30 percent), although the gap gets a lot wider when considering the specific torque curves.

Mtu and the Doty

The Diesel of the year (Doty), from Mtu, shows good performances, revealing an innovative turbo-compound that revives a Scandinavian must of a few years back.

Deutz comes third in the race for power, while losing some points as far as torque is concerned but still leading in terms of volume, the strength of the Cologne family feeling. The last comparison in terms of emissions is universal, with regard to the post-treatment (a 'smart' solution that needs to take into account the temperatures; on this kind of implementation, temperatures hardly rise over 250 degrees. For agricultural implementations, considering that they are mostly used during the summer months, the urea crystallization does not appear to be an environmental temperature-related issue). The spur of the combustion chamber degrees shared also by filters, conceivably equipped with a regeneration-induced trigger. The filter has not been adopted either by the Swedish company in Friedrichshafen, or in nearby Bulle, in Switzerland (the headquarters of the motoring branch of Liebherr).

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MARINE

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OFF ROAD

POWER GENERATION



HI-TECH

Fpt Industrial: the R22 3 cylinder on stage comes from Cento
Deutz: the Tcd 3.6 grew up.
Now giving 97 kW and 500 Nm

...

COMPONENTS

Yara: Optispray avoids urea deposits
Voith: the updated Diwa gets Euro 6
Zf Ave 130: electric axles feature two asynchronous motors

...

COMPANIES

Lombardini celebrates 80 years.
Among the gifts, a Jcb Teletruk
Hatz goes big
introducing H series

...

AGRITECHNICA

A lot of new entries.
A resourceful Man over all

...

COMPARISONS

4 cylinders final: the Germans cry aloud. Volvo follows up

...

FISH EYE

Fendt: Deutz supplies
a 4 cylinders for the 516 Vario

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