

DIESEL

international

DIESEL SUPPLEMENT
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DRILLING RIG
"SOILMEC SR-45"

MISSION
100 KW

DIESEL OF THE YEAR:
the new Kohler horizon
Kdi3404Tcr Scr is the winner



For Earth, For Life
Kubota

Go EVERYWHERE Inside, Outside



WG2503
Spark Ignited
Gasoline / LPG /
Natural Gas

WG1605
Spark Ignited
Gasoline / LPG /
Natural Gas

WG3800
Spark Ignited
Gasoline / LPG /
Natural Gas

Kubota Large Spark Ignited (LSI) engine is industrial diesel based powerful, clean and reliable engine. Fuel options (Gasoline, LPG and Natural Gas) enable your machine to go everywhere inside, outside. Kubota's one source multiple solutions engines offer your machine a variety of operation work site.

Engine Model	Output	Displacement
WG1605	Gasoline : 42.5kW (57.0HP) @3600rpm LPG : 41.0kW (55.0HP) @3600rpm Natural Gas : 38.4kW (51.6HP) @3600rpm	1.537L
WG2503	Gasoline : 45.5kW (61.0HP) @2700rpm LPG : 46.0kW (61.7HP) @2700rpm Natural Gas : 42.4kW (56.9HP) @2700rpm	2.491L
WG3800	Gasoline : 65.0kW (87.1HP) @2600rpm LPG : 70.0kW (93.8HP) @2600rpm Natural Gas : 63.0kW (84.4HP) @2600rpm	3.769L

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SOILMEC & CUMMINS:

SR-45 drilling rig is powered by Cummins Qsb6.7, a 6.7 liters rated at 201 kW. Other partners? Berco, Transmital Bonfiglioli, Bosch Rexroth, Sampierana.



4 HI-TECH

Kubota: Lpg for working, and, if needed, gasoline

Volvo Penta: selling Eicher shares, not the partnership

Yuchai: ten diesel platforms for all applications

Deutz: 3.6 liters and 55.4 kW for Terex backhoe loaders

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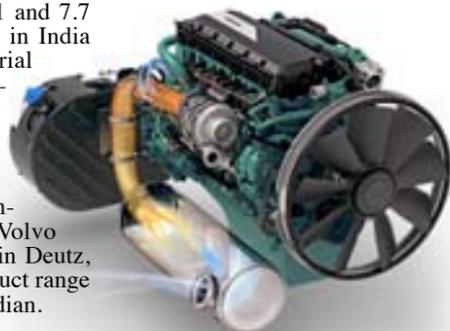
10 to 11 trucks: a German range where Fpt stands very fine

HI-TECH

EICHER AND VOLVO: ENGINES NOT SHARES

Volvo Penta sells its shareholding of Indian company Eicher, cashes 2.5 billion Swedish kronor (about 268 million Euro at current exchange rates) and raises. Where? This is unknown, certainly the Swedes cannot be blamed of inaction. Eicher, leader of the Indian market for commercial vehicles and motorcycles, replaced Deutz as Volvo and Renault partner for base Euro 6

truck engines. The 5.1 and 7.7 liters are in fact born in India and also meet industrial needs, class Tier 4 final. At the moment the disengagement of Volvo does not change anything in the manufacturing and commercial alliance. As Volvo kept its shareholding in Deutz, the bottom of the product range will keep speaking Indian.



Launch at Wuhan.

YUCHAI NEWS

The company from Guangxi developed ten diesel platforms for different applications: agriculture (4.8 liters), construction (6.5 and 4.2 liters), heavy and light automotive (2.2 - 3.8 - 4.7 - 10.6). There is also a 6 liters Euro 6, the Yc6L-60, which delivers from 177 to 243 kW and features every main European technology, common rail, egr, dpf and scr. Yuchai followed all the guidelines of modern engineering research: the 2.5-liters, 65 kW Yc4Fq-48, for example, is lighter and modified in cooling.

KUBOTA AND DUAL FUEL

Double view in jobsites. Lpg and gasoline

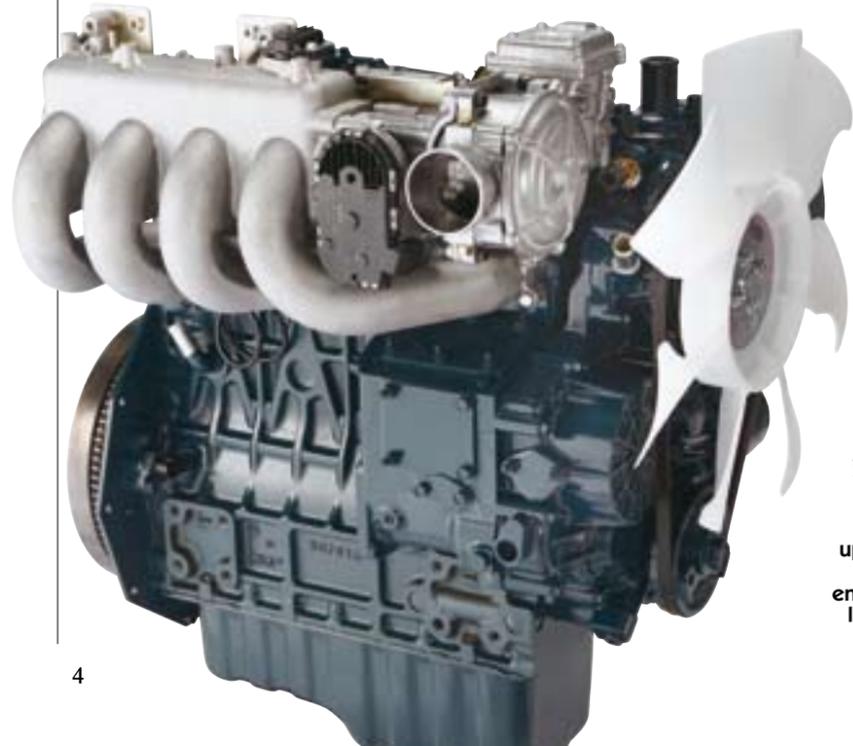
Lpg as main fuel, and gas as 'spare' fuel. A recipe to reduce costs, lower noise, and build a bridge towards Stage V. Kubota manufactures Wg series, which includes 1605 and 2503 4 cylinders and 752 and 952 3 cylinders. At the top of the range, Wg3800 is coming

Gas has never won the favor of building industry. Using diesel tanks to provide fuel for vehicles and construction equipment it's easier. The crisis, however, forced to reconsider prejudices and practices, for example by opening to dual fuel. If gasoline engines for mobile applications are still rare, on stationary application dual fuel engines have much

to say. Kubota believes in this technology, which however is still unveiled. A strategy that could prove useful also looking at Stage V. The research focused on the adjustment of the torque curve to mimic diesel engines with the same displacement, which stays a few kW away but maintains a linear shape between 1,600 and 2,800 rpm without losses. Gasoline and

lpg curves are also aligned: the latter is the solution with less impact on fuel consumption and emissions, then preferred by users. The design is not subject to upheavals, pushrod with camshaft down and distribution gear, obviously with necessary modifications to pistons. Despite the temperatures of exhaust gas are very different, Kubota tends to preserve the thermal

balance to avoid overloading the radiators. The Wg range, starting from bottom, includes the 3 cylinders 752 and 952 (respectively 740 and 962 cc), and culminates with the 4 cylinders 1605 and 2503 (1.53 and 2.49 liters). A new entry in the dual fuel range has been recently announced: the 3.8, renamed Wg3800, will join the range at its top. **Jean Nouveau**



On the left side, the Wg1650, on the right, the Wg2503. The range will be shortly upgraded with the next top engine, the 3.8 liter, Wg3800.



NO WORK IS TOO HEAVY FOR FPT ENGINES.



FPT INDUSTRIAL ENGINES. DESIGNED TO GO BEYOND.

FPT Industrial takes every project as a challenge. This is why we put our passion and experience in developing engines that set the standard of excellence. Equipped with innovative HI-eSCR technology, our specifically designed construction engines match maximum power with low fuel consumption and reduced emissions, without Exhaust Gas Recirculation (EGR).

FPT Industrial welcomes you at Hall 5B - Booth L041. INTERMAT 2015 Paris, April 20-25

MARINE ON ROAD OFF ROAD POWER GENERATION



DEUTZ TCD 3.6 AND TEREX TLB840R

Torque for pto & Co

Low profile calibration for the 3.6 liters for Terex. 55.4 kW - such as the 2.9 liters Tcd Series - it's enough, but all 390 Nm at 1,300 rpm are needed for supporting the peak stress

about 700 rpm, the torque curve provides enough Nm to keep up with stress peaks. The kinematic chain of the Tlb840R uses the most powerful of the calibrations - 330 and 390 Nm - of this 55.4 kW engine. Even emissions are right: unlike the 100 kW version, doc is enough.

Paul Cranes

Below, on the left, Deutz Tcd3.6. Here, the Terex backhoe loader.



The choice fell on the 3.6 liters, despite the power is limited at the same value of 2.9. An unusual choice, since the 3.6 liters made in Cologne won the favor of the oems especially in its 100 kW calibration, in the crowded segment of super compact, high performance engines.

Evidently Terex judged the dimensions to be right, and an additional weight of 113 kg compared to Tcd2.9 is not a problem for this 7,615 kg, 2.3 meters wide and 4-wheel steering backhoe loader. The reasons are identifiable in the respective curves: the power curve is relatively steady for



ASSIOT

The association of transmissions and gears Italian manufacturers had a turnover of 6.56 billion euro (+ 5.2%) in 2014, with a driving effect in the first quarter of 2015. The good news came from automotive and industrial automation areas, with losses in earthmoving and agricultural.



PARKER

The P33T - Cat 4 series redundant exhaust valves control the air flow through two specular valve elements. Among the security mechanisms, the reset can be done only through the electric reset of solenoids. In case of power failure, the valve discharges air rapidly.



SCANWILL

The Mp-Xp hydraulic pressure intensifiers by Scanwill are designed with an additional side exit to resend oil from high pressure circuit directly to the tank. The result? Clean oil always available for the cylinder.

AS MUCH AS SUFFICES...

Brand	Model	DEUTZ
Brand - Model		Deutz TD 3.6
I. D.		
B x S mm - S/B		98 x 120 - 1,22
N. cil. - dm ³		4 - 3,62
Maximum power kW - rpm		55,4 - 2.600
Mep at max power bar		7,2
Piston speed m/s		10,4
Maximum torque Nm - rpm		390 - 1.300
Mep at max torque bar		13,8
% power at max torque (kW)		60,7
Torque at max power Nm		206
% power at max torque (kW)		95,9 (53)
Work range rpm		1.300



Winkings maybe came to Canada from Scandinavia. Northern Ireland is closer. In any case, the Canadian corporation will manufacture screeners and motorized trollers in Ontario and Ulster using D5, the 5 liters engine born in India such as the 7.7. The D8 will also be fitted on base models of mobile jaw, cone and impactor crushers, and D11 and D13 for the most demanding applications. McCloskey scoured the whole Volvo Penta range,

MCCLOSKEY AND VOLVO PENTA

It has a cast iron stomach

In the Canadian manufacturer's portfolio we find the Volvo Penta full line, except for the 16 liters at the top of the range, thanks to power density and no dpf/doc down stream

excluding 16 liters only. The power is ranging from 105 kW @2,200 rpm (5.1) to 405 kW @1,900rpm (13). Volvo Penta reached tier 4 final without dpf/doc, thanks to low-recirculation egr and technical urea post treatment.

C. B.

A 'green' photo, as the Volvo Penta and McCloskey flag color.



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DIESEL OF THE YEAR
2013
DIESEL OF THE YEAR
Diesel of the year 2013. Find inside. Here's the engine of the future.

MISSION 100 KW
DIESEL OF THE YEAR: the new Kohler horizon Kdi3404Tcr Scr is the winner

- 1 Rear view camera
- 2 Lcd monitor
- 3 Warning alarm
- 4 Eyeball camera
- 5 Radar detection



The watchful eye of Brigade Electronics

MULTI-SENSORIAL PROTECTION



Shock and vibration resistance is the main feature of a visual protection system for construction applications. The 7" monitor communicates with an ultrasound proximity sensor, cameras, reversing alarms and digital recorders

During the work cycle of site vehicles in construction sites, hidden dangers can come not only from heat stress and strain to the cylinders, the flexible joints and the electrical system. The mobility of the machine body and the peripheral devices affects the safety of the drivers, as well as that of goods and equipment within the work area. In order to optimise the visibility and to comply with the necessary safety parameters, Brigade Electronics has conceived for tonnage machinery and vehicles with bulky envelopes, like the excavator in the figure, a system which turns on when in reverse such as those that for years have been used on road vehicles. But what are the differences between a system for construction and those destined

for other applications? Resistance to shock and vibrations, and this is why these devices are made of steel, hydro repellent and watertight. Posterior visibility is ensured through the dialog with a 7" monitor, with one or two inputs to communicate with more than one camera. On high payload excavators, like the one depicted, the chambers are by Elite or Extreme.

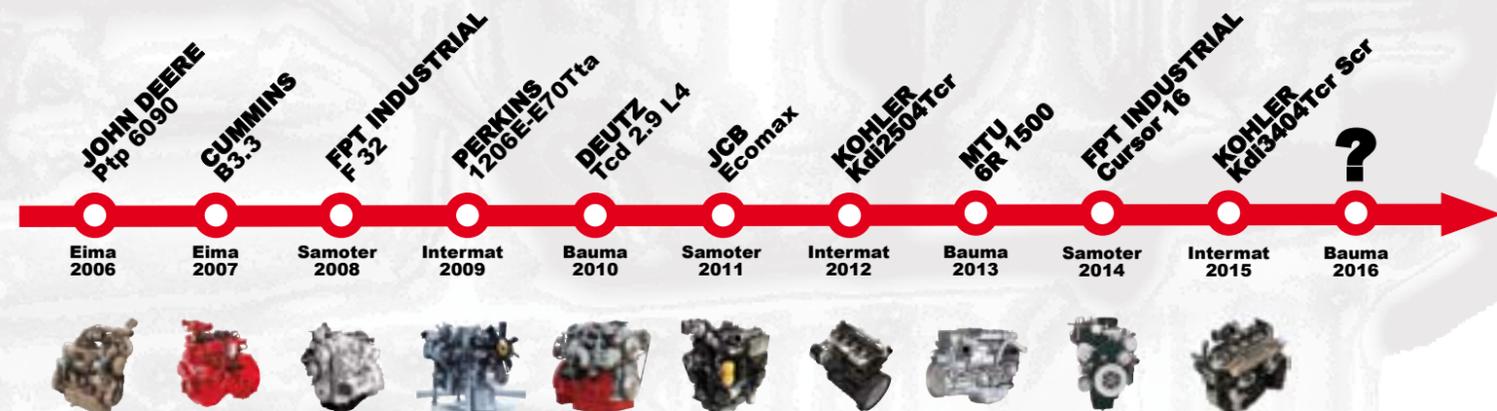
The latter is equipped with a pair of automated triggers, with distance indicators that are visible on the monitor and other indicators for the alignment of towing or lifting devices. To resist the fluctuation in temperature, the Be have an automatic heater that is activated when the temperature plummets below 10 degrees, to demise the electronic 'eyes'. And speaking of eyes, Brigade also provides complementary cameras with shutter, the so-called eyeball cameras, that can be mounted on the blindest spots, such as the bucket hydraulic cylinder, with six infrared led lights that can

act up to 5 metres and in variable weather conditions, from -30 to +80 °C. The declared electrical consumption is of 6 Watt. The Bbs acronym indicates the buzzer alarms, the last piece of the puzzle. This is a broadband technology, the sound is directional and multiple-frequency, as it develops at the rear of the vehicle in manoeuvre, without dissipating. Bs stands for Back sense and indicates the radar sensors that are able to detect fixed or mobile obstacles, and are shielded from adverse weather conditions with a sealed casing. The presence of obstacles is communicated through a system of cables to the led display, which outputs a range of chromatic (green to red) and acoustic (intermittent to continuous buzzer sound) signals.



KOHLER Kdi3404Tcr Scr

See you at the next stop



www.vadoetorno.com

LOW PRESSURE AND TECHNO

Safely crossing the Pillars of Hercules of EU Stage V regulations requires focusing on application and duty cycle. Gases are taken out after the turbine and reintroduced before the turbocharger to increase gas input and preserve turbo

In recent times the hunger for egr has been constantly increasing, together with stricter emission standards and the consequent coming of new low-temperature combustion methods, which require a high fraction of exhaust gas. These methods were initially confined to low load, low speed cycle points, then extended to higher loads and engine speeds, where the pressure differential between outtake and intake is lower while the amount of gas to be recirculated is higher.

How cool down egr

Then came the problem to recirculate and cool down a greater amount of egr. The recirculation under load was initially managed on medium and heavy-duty engines through reed valves to maximize recirculation avoiding back flows, or through ‘donor cylinders’ acting as pumps for gas to be recirculated, at the price of higher fuel consumption. To avoid these palliatives, in recent years a new technique called low pressure recirculation has been used alongside high-pressure egr systems. In this case, in fact, exhaust gases are taken out after the turbine, where the gases have lost most part of its energy, and subsequently reintroduced before the

turbine.

In doing so it is possible to recirculate a greater amount of gas, even when there’s a high boost pressure after the compressor. It also avoids compromising the efficiency of the turbocharger, improving fuel consumption. These systems have been used on early Euro6 engines, and most engineers believe that, along with the evolution of emission and fuel consumption standards, low pressure recirculation will spread by the end of this decade.

In the most common scheme both high and low pressure circuits coexist. The high pressure circuit is normally simplified by removing the heat exchanger and its by-pass, while the low-pressure circuit features a cooler without by-pass. High pressure circuit becomes basically the low load and ‘hot’ circuit, while low pressure circuit acts as a ‘cold’ circuit as well as high load circuit. Low pressure egr was not usable until particulate filter came in, which cleaned exhaust gases allowing to bring them back to the intake without contaminating the compressor. On the other hand, however, ceramic cordierite particles of the dpf constitute a potential danger to the compressor vanes and require a suitable protec-

tion filter on the recirculation circuit. Compared to high pressure recirculation, low pressure circuit improves the mixing of recirculated gases in the intake air thanks to the transition in the compressor which homogenizes air/egr charge. Furthermore, low pressure recirculation has a lesser influence on the turbocharger and requires smaller heat exchangers because of the heat losses due to the longer circuit, the expansion in the turbine and the subsequent crossing of the intercooler.

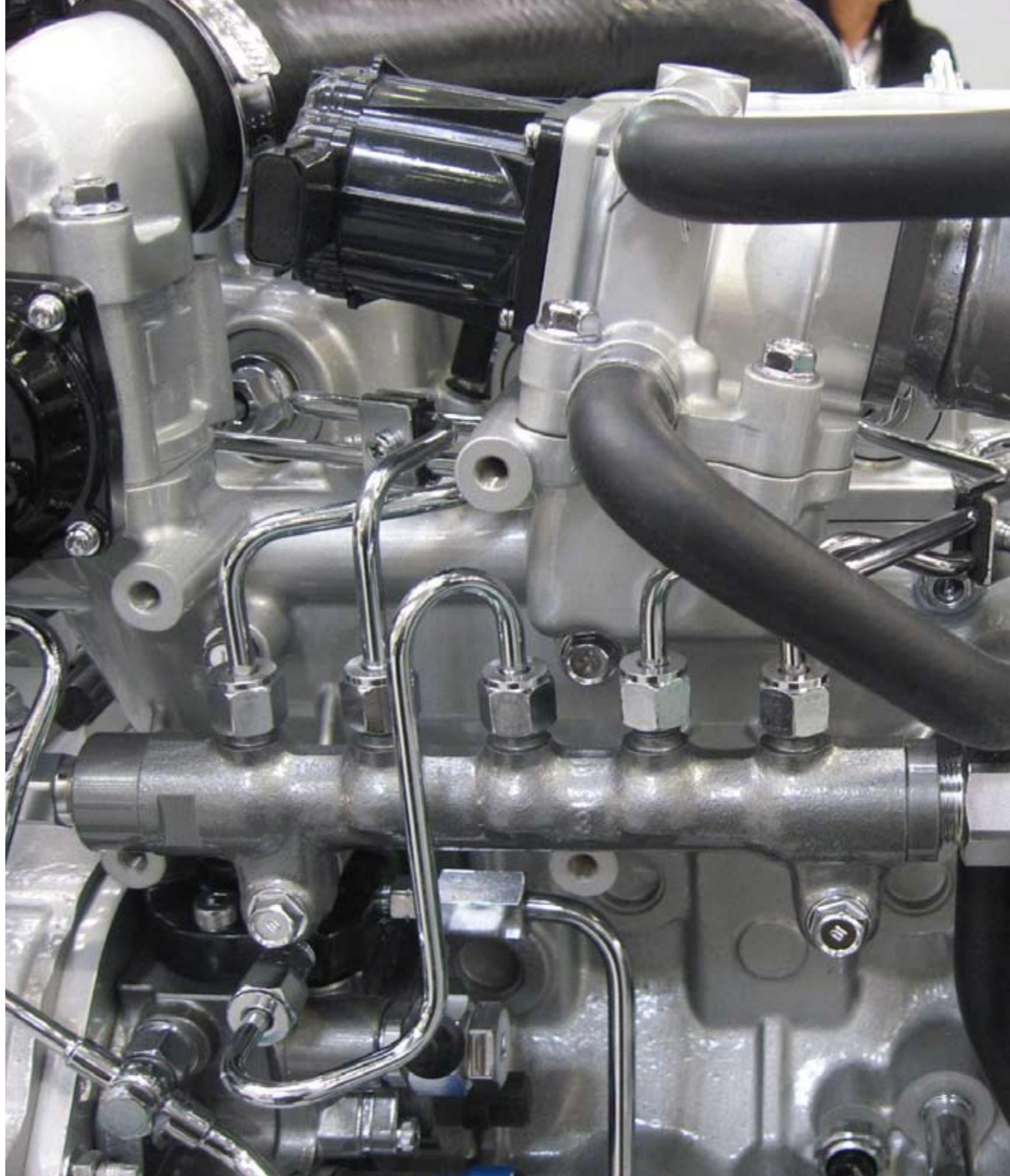
A longer circuit determines however a significant response delay. Furthermore, any condensation can lead to water droplets in the compressor, which can be avoided through a careful design and testing of the heat exchanger and the circuit layout.

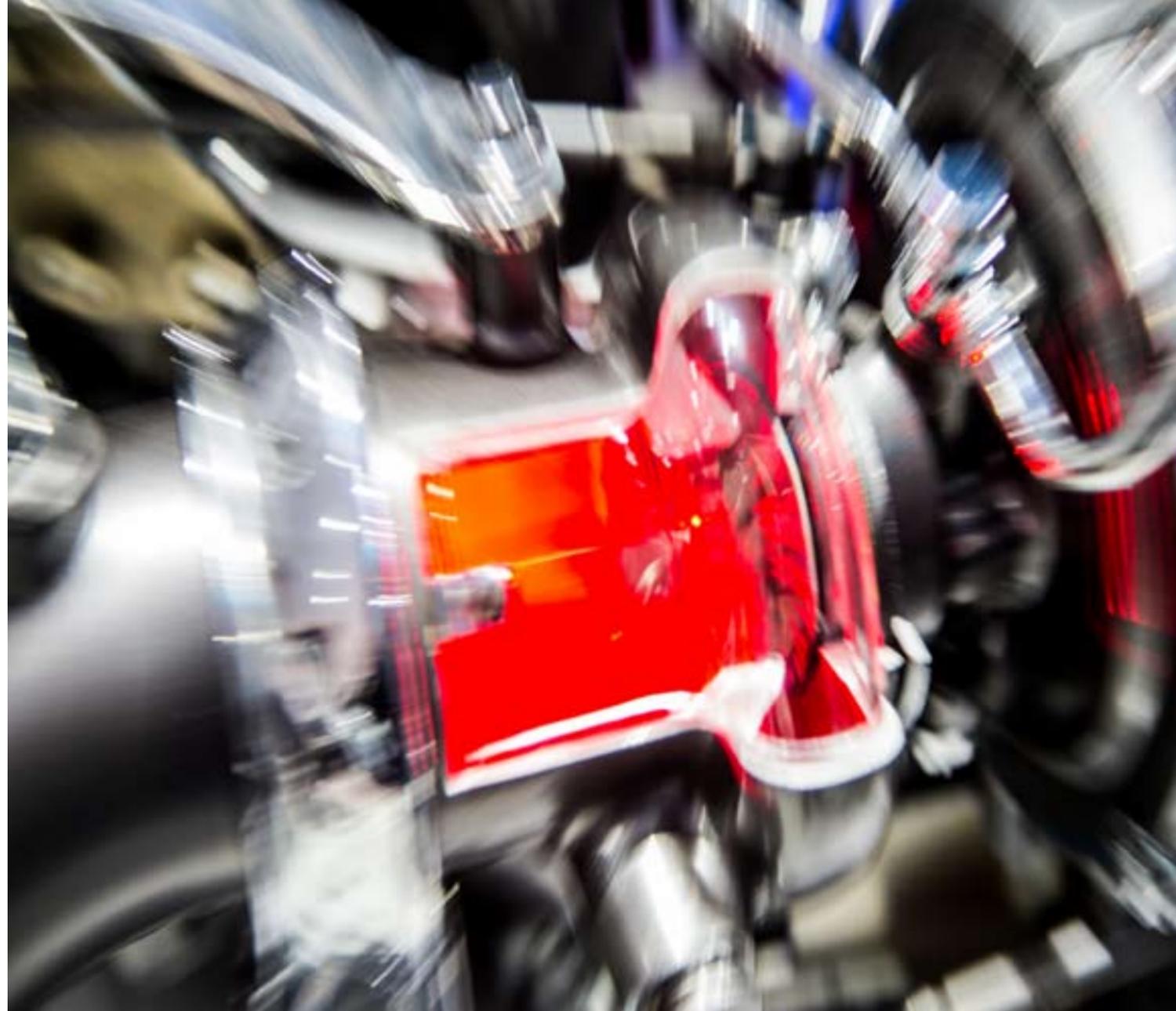
Low pressure egr valves

Low pressure egr valves have lesser requirements as regards the closed valve sealing. This allows the use of throttle and flap valves instead of poppets, improving the flow. On the other hand, since the pressure jump in the low pressure egr is rather low, it is necessary to insert narrowings in the outtake to generate a counterpressure through exhaust valves. More

KEY ASPECTS OF HIGH AND LOW PRESSURE RECIRCULATION

High pressure (Hp egr)	Low pressure (Lp egr)
+ well known and tested	+ high recirculation rates
+ use of redundant exhaust enthalpy	+ dpf – filtered gas recirculation
- Difficult recirculation at high loads	- Need to narrow outtake or intake
- Difficulty in mixing air and egr	- Condensation before the compressor
- Need of closed valve perfect sealing	+ Uniform mixture between air and egr
- High operating force	- Need of a protection filter
- Possible contamination	+ Low operating force
-High gas temperature	+ Low gas temperature





recently, valves were adopted also on the intake side to generate a vacuum that draws recirculated gases, as in the case of the 1.6 Honda that features a throttle after the compressor and a throttle before the compressor. In other cases, egr flap valves that evert in the exhaust (or intake) manifold diverting at the same time the exhaust gases to the intake are used to limit costs and complexity of the system. It is even possible to use double valve devices (one egr valve, one to narrow the intake) driven by a single actuator. In all configurations with a single actuator the flow variation caused by the valve opening is obviously influenced by the valve shape, while two independent actuators scheme provides greater flexibility. All these layouts are surely exciting for the engineers, but also show a still evolving technology.

an intuitive graphical representation of the evolution of the phenomena in progress is not even conceivable. Consequently, the number of conditions to be tested during calibration increases dramatically, and even the most sophisticated automatic calibration systems require unbearable time and costs. That's why a simplified approach was chosen, by testing the engine in a limited number of conditions and then extrapolating the other conditions, evaluating on this basis the best adjustments to be checked. Even this method, however, begins to show its limits when the same motor is used in different applications, therefore requiring multiple calibrations. That's why the latest thing in

Management system

As shown in the picture, the management system is quite complex, having up to four valve actuators for egr, intake and/or outtake. Doubling the egr not only ends up into a simple doubling of the calibration but also in a much higher complexity. If we had only one valve to be managed we could graphically represent torque curve, fuel consumption, emissions, temperature shift for each operating point. If we had two actuators we could create three-dimensional graphics. But with four valves,



calibration is the 'NOx model based' approach. Translating this concept into simple words, this method consists in building up a mathematical model of the physical phenomena that determines the valves control parameters for each operating condition in order to optimize NOx emissions. This approach involves a careful initial experimental activity to characterize and validate the model; then it is much more simple and quick to determine all calibrations required for each application.

In-house software

This is one of the most advanced frontiers in engine management area, and that's why the most experienced manufacturers decided to develop in-house models and software instead of working with electronic control units suppliers. In doing so, manufacturers are building up a know-how that could end up in a competitive advantage over other competitors, completely free of limitations imposed by suppliers.

As well as for high pressure egr, even in low pressure recirculation post-treatment technology is an alternative option. Based on current state of the art and developments, we can say that the progressive tightening of emission standards will most likely impose a coexistence of recirculation and NOx after-treatment.

In exhaust systems technology is making significant progress through the integration between dpf and NOx after-treatment, and even passive scr that could even do without urea injection. But while high pressure egr can work along with after-treatment, low pressure egr might also be discarded. Always considering, as usual, the specific application, in other words specific use, emission standards, production volumes, overall dimensions available, involved mass, cost constraints, etc. In conclusion, there is no 'good for all' formula: finding each time the winning solution is the real challenge for engineers.

Carlo Pifferi

WHERE THE HEART OF ENERGY BEATS

The most popular power generation show worldwide has taken place on the Red Sea shores between March 2nd and 4th. Here the diesel gensets are introduced to a new life. A few anticipations have emerged, such as those from Doosan Infracore and Fpt Industrial, and from the show's newbies, like Bergen, John Deere and Geminiani

Biogas is often the one to steal the scene, but at the Mee (Middle East Electricity) in Dubai, power generation is still talking diesel, especially for non-emissioned markets, where a capillary electrical network is still lacking.

EUROPE

Ftp Industrial has participated with Nef and Cursor, in the G-Drive set-up, for which the declared maintenance interval is up to 800 hours. The top of the range carries the Cursor signature, in this case the 13 litre engine calibrated to 500 kVA, together with the N series with the 4.5 and 6.7 litre, the latter reaching 200 kVA.

Geminiani runs for global player and deploys its Hyntesis, the axial flux permanent magnet generator and its Genesis, coupling a thermic (Perkins, Jcb or other) to the generator, and is ready to offer optimal calibrations depending on the load, and a power pack, a solution that provides all the attachments for the client's specific application.

Perkins has brought the heavy loads from the UK, increasing

the frequency from the 4000 series to 60 Hz. The 4016-61 Trg completes the series at the top of the range, yielding 1,600 kWe in stand-by (Trg1) and 1,800 and 2,000 with the Trg2 and Trg3 respectively. Further down the line, the 8.8 litre 6 cylinder engine, 200-330 kVA range, switchable to 50 and 60 Hz. The 1500 series substitutes the 1300 and 1600 series and is let go from Seguin, Texas.

To conclude Perkins' offer, the 1106A-70Tag, that is no longer manufactured only in Wuxi, China, but is also being produced, since 2014, in Curitiba (Brazil) and Peterborough (UK). The British count on the 7.1 litre, because of its power density and its simplified mechanics and installation.

Also strong is **Rolls-Royce Power Systems**, presenting the synergisms between **Mtu** and **Bergen**, such as the 16 cylinder from the 2000 series with common rail, 1,120 kWe, and the 4000 with cng. The B35:40, the 20 cylinder by Bergen with 9.4 electrical MW, has appeared for the first time at the Dubai World Trade Centre. Then from Norway to Sweden.

Volvo Penta focuses on the after-market, offering a Tad1641-Ge with 38 thousand work hours for the workers in the sector. Under the spotlight are the D7 (1.1 litres, B x S 108 x 130 mm) and the D16 (16.1 litres, B x S 144 x 165 mm), the second from the top of a catalog that is able to satisfy the requirements of the Tier 1 and Tier3, spanning between 85 and 700 kVA.

Deutz has invested on the Td 2011 L4 Telco, 60 kVA, designed to power mobile network repeaters. A step upwards on the power scale we find the Tcd 2013 L6 4V and the Tcd 2015, 8 cylinders, that round up the production from Cologne at 500kVA.

AMERICA

The Compact International series has arrived from the Us mirroring **Caterpillar**'s offer, with as many as 32 models, single and three-phase, ranging from 6.8 to 220 kVA. To become even more appealing, Cat offers the Esc (Extended service coverage) program on 'stand-by' vehicles (on 'prime' vehicles is available on demand),

that guarantees an extra four years of after-sale service.

A giant from Minneapolis plays for **Cummins Power generation**: the Qsk95, 16 cylinders for 95 litres and 3,132 mechanical kW, two-stage cooling, one control unit for every 4 cylinders, scr especially designed, no egr and 2,200 bar common rail.

John Deere Power systems completes the American trio, for the first time at the Mee. It brings the 6.8 litre engine, with 250 kVA, in the same technological format already seen for the offroad: from the tier 4 interim, egr, doc, dpf and scr. The 6.8 litre is available in its basic set-up or inclusive of air filters and radiator. The Deer's strong point are its numerous help centres, which make the most of the worldwide distribution of the tractor driving network, with more than 4,000 points.

ASIA

Amongst the myriad of oriental firms, Doosan and Weichai are worth a mention.

Doosan Infracore brings two novelties, the collaboration with Psi for the gas range and



From top to bottom, the B35:40 by Bergen, the Compact by Cat, the Cummins Qsk95, Deutz Td 2011, Doosan Dp066, the cover of the Cursor 13, Geminiani's 'jewels', Mtu 18V2000 and the Perkins 4016. Volvo Penta ends the collection.

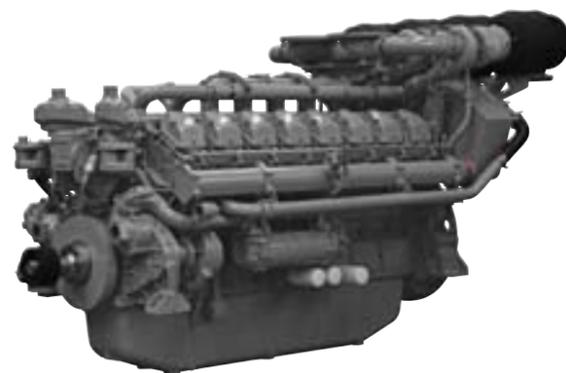


the Dp series. The latter shows off its Dp066, a 6 cylinder in line with two cylinder liners, 5.8 litres (B x S 102 x 118) and 8 litres (B x S 111 x 139 mm), supercharged, with limited volume and mass (474 kilograms for the 5.8 and 790 for the 8.07 litre). The series is able to yield power values

between 86 and 828 kW. The Doosan - Psi series will be launched in summer, and will comprise 8.06, 11, 14.6, 18.3 and 22 litre engines, with power values between 65 and 350 kW at 1,500 rpm.

Weichai capitalises on the synergy with Baudouin. Following the launch of marine

engines at the Smm in Hamburg and at the Cannes Yachting festival, the time has come for the powergen 6 cylinder M25 (BxS 150x150 mm), reaching 450 to 1,000 kVA, and for the 12 cylinder M33 (the stroke increases to 185 mm), yielding between 575 and 1,250 kVA. **Joseph Mbagoku**



STILL A FINE SHOWCASE

Almost sold out amongst the engine manufacturers. Kohler conquers the Diesel of the year with the 3.4, Perkins releases the 404F, Kubota and John Deere are on home ground. There is already talk of the Stage V, which will revive the dpf: challenge is just began

The anticipated absence of Caterpillar and Jcb has not affected the Parisian event, for which the role model is still the Bauma, rather than what remains of the Samoter. No one is missing amongst the 1,300 exposing firms, with the exception of Doosan, that has been displaying its products in Europe since the Bauma 2013, to the point that even those who will not be present, will be sending their motoring branches, namely Perkins and Jcb Power Systems.

Perkins and Yanmar news

There is no foreseeable novelty on the cards, apart from the 404 series promoted in the tier 4 final stemming from the Caterpillar orbit and the prototype of the future Yanmar top of range, the 4Tnv94 Cht. Kohler will therefore have the chance to be under the spotlight to formalise its change in name (at the Hexagon the Lombardini brand is still strong), with the 3404Tr Scr, that will be applauded at the Diesel of the year 2015. As expected, Deutz will be crossing the Rhine river from Cologne bringing its winner horse(power)s, the small 2.9 and 3.6 litre engines, which continue to amaze, while it is still waiting to redefine its offer for the high power, spanning

from the Tcd 6.1 to the current top of the range, the Tc 16. Mtu, from the Lake Constance, will present its renovated range, adopted from the Euro 6 Mercedes (as it is well known, although Daimler has left the Mtu capital stock to join that of Rolls-Royce, the Mannheim line is split into automotive and industrial), which comprises 5.1, 7.7, 10.7, 12.8 and 15.6 litres. Hatz is already accustomed to the construction, and is

1,300
The foreigner exposing firms at Intermat. Paris don't miss its strong appeal for oems and engine manufacturers

back with its two litre engine, which escapes the competition with a cubic capacity and a dimensional value without parallel. Its refined electronics has been the object of praises and criticisms: the first, regarding its thermodynamic parameters and the load management, the latter coming from the fans of the odd-number and for its price difference. Fpt Industrial,

as usual, will be a very strong presence: its most interesting pieces will be at both ends of the catalog, with the 3 cylinder R22, with Vm origin, and the Cursor 16, the outgoing Diesel of the year. Man has decided to present the D2676 Le13, the offroad version of the two litre cylinder displacement. It is the same engine already seen at the Agritechnica, being manufactured since this year and available with a structural oil pan, with scr but no dpf, and that is able to reach, at full calibration, 382 kW and 2,400 Nm.

What happens in Japan

The Japanese companies are arousing some interest, as they enter the tier 4 final with the V step of the European Union in mind. The average size is the least represented. Isuzu has brought to the Eima in Bologna the 2.2 litre 4Le2X, delivered at the tier 4 final with 46 kW and 215 Nm, with just the egr and doc. Yanmar is in turmoil, as it is experiencing a sabbatical year in the making. The Tnv series, that has flabbergasted the insiders with its robust torque values and exciting novelties such as the recirculation, uncommon on the 2-3 litre engines until a decade ago, will acquire the Cr abbreviation, which identifies the ubiquitous common rail.

Almost all the engines manufacturers are present at this edition. Perkins shows the Tier 4 final 404F, Yanmar unveils the prototype of the 88 kW Tnv engine, Stage V compliant.

The dpf will surely be reintroduced, as Yanmar has developed a three-step regeneration system: assist, reset and stationary regeneration. However, we are curious about 4Tnv94 Cht, 88 kW @ 2,500 rpm and 3.3 liters displacement. Yanmar will identify it that will be able to reach Stage V parameters. We have already mentioned Kubota in

this issue: bringing forward the dual-fuel engine gpl-petrol, with V3800, pioneer in the Carb certification for the tier 4 final, obtained with the complete package: dpf, doc and scr. Foreign by name but French in deed (for the location of its European headquarters), like Kubota, is John Deere, which designs and manufactures engines for this

hemisphere from Saran (near Orléans). The recipe has long been known and is based on diversifying according to the cubic capacity: the 2.4 litre maintains the two valves (a few others do, like Vm, Same and Deutz), that double on the 4.5 litre, with the Pvx abbreviation; this, similarly to the 6.8 and the 9 litre, installs the vgt before transitioning to

the doc dpf cylinders. With the Psx abbreviation the turbines become two: a fixed geometry is added to the vgt. The Psx is at its best on the 13.5 litre, which is able to go from 298 to 448 kW. Cummins will present what has already been shown at the Bauma, where it introduced the Qsf3.8 and Qsm12. From Sweden will come not

A WINDOW ON SIMA

Between February 22nd and 26th, Sima has put up a head to head with Eima to establish which will be the maid of honour of the Agritechnica. In our opinion, the difference between Bologna and Hannover - the same that exists between Sima and Intermat - is the reduced attention dedicated to the kinematic chain. With no local manufacturer, John Deere Power systems was the leading presence, while an absent Kubota is mainly focused on garden machinery and specialised tractors. Fpt Industrial, from Italy, that with the Bimotor distributor had the Cursor 16, 570 kW at 1,900 and 3,320 Nm at 1,500 as the central piece of its range, might



end up networking with some constructors of big harvesters like the Dutch Agrifac, where Volvo Penta has recently left its trace. The Swedish were also present, with a range suitable for open field tractors, starting from the 5.1 litre, to the 16 litre at the top of the range, as seen on the beetroot harvester by the above mentioned Agrifac. Back to Italy with Kohler, which unveils the Kdi range, with its star, the Kdi 3404Tr Scr. To conclude the motoring exhibition, Jenbacher introduces massive gas cogeneration units, with the J624 at the top, a dual-stage with 4.4 electronic MegaWatts.

Manufacturers of Italian origin are well represented in parts production, electromechanics, power transmission and quick release couplings, and some, like Bondioli & Pavesi, will replicate at the Intermat.





Same acronym (Kdi), same venue (Intermat), almost all the rest is changed. Kdi is Diesel of the year for the second time. Kohler is now able to extend the application range and aspire to become a global player in both earthmoving and agricultural.

Kohler Kdi 3404Tcr Scr is the Diesel of the year 2015

TIME TO MOVE ON

The 3.4-liter consecrates the leap ahead of Kohler, who reached the milestone of 100 kilowatts. A second award for Kdi platform, which enters previously inaccessible applications. The after-treatment module length is 900 mm

The tenth edition of the Diesel of year award bears the name of Kohler 3404Tcr Scr. The brand, which is still known in Europe as Lombardini and marked the agricultural mechanization in the postwar period, has become great. In every sense. Now the company data are those of Kohler and the horizon is no longer limited to rotary plough, vibrating plates, excavators and specialized tractors: the Diesel of the year doubles, after the 2.5 also awarded at Intermat, and reaches the 100 kilowatts fateful threshold, with a torque curve of 500 Nm avai-

lable from 1,400 rpm. Kohler is thus able to extend the application range and aspire to become

KDI TWICE WINNER

Brand	KOHLER
Brand - Model	Kohler Kdi 3404Tcr Scr
I. D.	
B x S mm - S/B	96 x 116 - 1.21
N. cil. - dm3	4 - 3.35
Maximum power kW - rpm	100 - 2,200
Mep at max power bar	14
Piston speed m/s	10.1
Maximum torque Nm - rpm	500 - 1,400
Mep at max torque bar	19.1
% power at max torque (kW)	73.4 (73)

a global player in both earthmoving and agricultural, where a certain amount of market share has been eroded by other aggressive competitors. The formula of compact engines between 3.2 and 3.8 liters that achieved this goal is winning the favor of the oems. Its identikit is an offroad engine upda-

ted to the needs of electronics, camshaft placed in the basement, distribution gear, rods and rocker arms with hydraulic tappets, Denso 2,000-bar common rail and GS3 solenoids, recirculation, waste gate. The 100 kW threshold does not ends the potential of 3.4 liters: the range without scr includes a calibration under 56 kW and two other models, 75 and 90 kW, which share with the top version the after treatment with technical urea. And here Kohler still plays the card of the absence of dpf, who awarded the 3B/Tier 4 interim, satisfying dimensional requirements. Tier 4 final imposes scr, closed in a 900 mm module. That's enough, at least up to stage V, but that's a different story. That Kohler know how to deal with. Starting right from the 900 mm of the after-treatment module. F.B.

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4 valves, turbo aftercooler, doc and common rail. The Tier 4 final Perkins short abstract.

Perkins 404F-22T and the last step

FINAL SHOW

The curtain falls on the rotary even for 400 series, which aligns Perkins to competitors and other series by mounting the common rail. Performances and exhaust emissions benefit from it, without weighing on overall dimension

Perkins completed the Tier 4 final mosaic with its smaller piece. This remark is purely dimensional: with the 400F series the updating of engine platforms from Peterborough, widely seen at Bauma, also involved the base model of the product range. Shared since more than two decades with Shibaura, with over one million pieces sold, the 400 series platform (550 cc cylinder displacement) splits in 3 and 4 cylinders

(with the 402D two cylinders still in production, and still with indirect injection), takes a step forward and gets rid of the rotary pump to include the unavoidable common rail. A too long delayed choice, maybe not to offend the sensitivity of oems and end users, that proved to be the only way. The displacement of just 2.2 liters and 50 kW power allow to comply the emission limits essentially through electronics and ignition timing

managed by the extreme precision of the common rail. The fuel homogenization is the ace up the sleeve of Perkins turn, who relies on a fixed geometry turbocharger, along with the aftercooler in the 50 kW version. One step below is the turbo without cooling, which stands at 36 kW and 165 Nm. The engine profile is increased only by the cylinder of the doc, positioned above the flywheel. Measuring the quantum leap

compared to mechanic version, power and torque curves improve by 10 and 8 per cent in terms of performance. Specific values (22.5 kW/liter and 208 Nm/liter) allow the 404F to recover positions among the competitors in close to 56 kW range, where only Hatz stands up in performance/weight/volume ratio. The production sites of 400 Series are located at the headquarters in Peterborough (Uk), Griffin (Us) and Wuxi (China). **U.R.**



ON THE 'RAIL'...

Brand	PERKINS
Brand - Model	Perkins 404F-22T
I. D.	
B x S mm - S/B	84 x 100 - 1,19
N. cil. - dm ³	4 - 2,21
Maximum power kW - rpm	50 - 3.000
Mep at max power bar	9,2
Piston speed m/s	10
Maximum torque Nm - rpm	208 - 1.800
Mep at max torque bar	12
Torque at max power Nm	157
DETAILS	
Specific power kW/dm ³	22,5
Specific torque Nm/dm ³	93,8
Areal spec. power kW/dm ²	22,52
RULES AND BALANCE	
Dry weight kg	228
L x W x H mm	727x635x772
Volume m ³	0,36
Weight/power kg/kW	4,6
Power density kW/m ³	138,9
SPECIFICATION	
Emission level	tier 4 final
Injection system	cr
Valves - Techno	4V doc

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A TASTE FOR RECORDS

The Jcb Gt is the fastest backhoe loader, having reached in Australia the speed of 116.82 km/h thanks to its V8 automotive engine. A record that comes nine years after the Dieselmax record, who reached 563 km/h. Featuring a supercharged version of the Jcb 4.4 - liters

"A leopard can't change its spots". It is the exciting taste of challenge that led Jcb to replicate the same enterprise of August 2006. Numbers are different, but the spirit is the same: back then, it was the Dieselmax torpedo to whiz in the Utah lunar landscape at 563.418 km/h, last year in December it was the Jcb Gt to enter the Guinness Book of Records as the fastest backhoe loader. In Bathurst, in the neighborhood of Sidney, the needle of the tachograph reached up to 116.82 km/h. Under the fiberglass and aluminum of the supercharged backhoe beats a V8 automotive engine, the one of Chevrolet Cherry, for instance, about which nothing leaks from Staffordshire. Another difference between the two records: the last one rewards the machinery division, the Utah 'missile' (Bonneville salted lake is 1,300 meters high) praised the daring choice of Sir Bamford to leave the historical British partner Perkins, who ended up in the network of its main competitor Caterpillar. Even in 2006 backhoes were involved to some extent; although deeply modified, the Jcb 4.4 liters was primarily designed to equip those machines. First of all, stroke was increased by 18 mm (from 132 to 150 mm, without changing the crankshaft) with a displacement increase of 600 cc. No need to comment on data, the comparison table is very explanatory. We will mention only the mean effective pressure, 36.1 bar. The 1,600 bar Delphi common rail relied on two parallel pumps and required changing the heads to accommodate greater injectors.

Exhaust valves and springs were modified to endure major stress, such as nozzles, which endured a flow increased by 600 percent thus ensuring effective cooling. Ricardo contributed to cooling and fuel supply, relying on a double turbine with intercooler and aftercooler. Radiators proved to be too large and cooling was assigned to an 'empiric' solution: a 200 liters tank of ice and water. Talking of backhoes, the wet clutch came from there. Finally, let's go back to the award winning

backhoe. Commercial versions of the machine feature the 4.4 engine from which it all started. The calibration is 81 kW, 4-valve, 2,000 bar Delphi common rail and vgt.



The British record - backhoe loader in an aggressive image. It's the last Jcb speed challenge.

MTU REPLACES CUMMINS

As they say in football slang: «Cummins out, Mtu in». Jcb is now focused on its 4.4 and 4.8 liter, up to 129 kW, with a special relationship with Kohler under 56 kW range (Jcb stops at 55 with the base model), but in the above 130 kW range the six-cylinder is still waiting for test runs. So there is place for the "signatures" of international diesel engines. In this case, Mtu has successfully convinced Jcb with its 1000 Series, replacing the Qsl9 Cummins on Tier 4 final 457 wheel loaders. Power increases, gaining a few kilowatts (from 186 to 193 kW) at the same engine speed, and the torque curve is roughly comparable: the American 8.9 liters flies up to 1,085 Nm, the German 7.7 liters draws a mean curve between 900 Nm (170 kW version) and 1,250 Nm (230 kW version). Performances are equal, but with a smaller displacement (2.2 liters less) and 20 kg lighter. Power density and performances are on Mtu 1000 side.

7.7 liters allowed some changes in the relation among engine, torque converter and transmission, which features both a four-speed standard version and an optional five-speed version. On 457 wheel loader the engine compartment is now tilted, featuring an electric-operated hood. The rear part is removable to facilitate the cooling group maintenance, which features a variable flow, hydraulic-operated removable fan.



Mtu is a new member of Jcb family.

ECOMAX AND TEREX MINIDUMPERS

When Jcb launched Operation Ecomax the goal was not only leaving Perkins, in the first instance, and probably Isuzu, when the 6 cylinders will be definitely tested for emission - regulated markets. There was also an expansion policy in Rocester plans, and Terex is a big step ahead: the 3B/Tier4 final Ecomax 55 kW will equip Ta6 e Ta6S Series dumpers. Even here there is a 'prophetic' change: Terex previously used the more powerful 1104D-44T, but it broke the 56 kW safety threshold: having the same displacement (4.4 liters AxC 105 x 127 mm Perkins, 103 x 132 mm Jcb) and engine speed (2,200 rpm), the 4 cylinders by

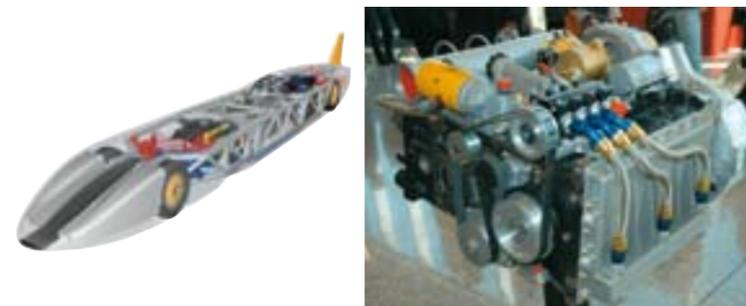


Perkins delivers 62.5 kW and 353 Nm, compared to 55 kW of Jcb that however provides 400 Nm at 1,200. Staying below 56 kW allows Ecomax to avoid complications faced by its major brothers (66, 81 and 93 kW), being able to do without fixed geometry turbo and scr. Perkins is also a winner on the scale, mostly because of the robust bedplate that Jcb used to lower vibration induced stress and noise. The annual contract is worth six million Euros.

Here, the Jcb 4.4 liter who had replaced Perkins on Terex Ta6.



DIESELMAX: THREE POINTS OF VIEW

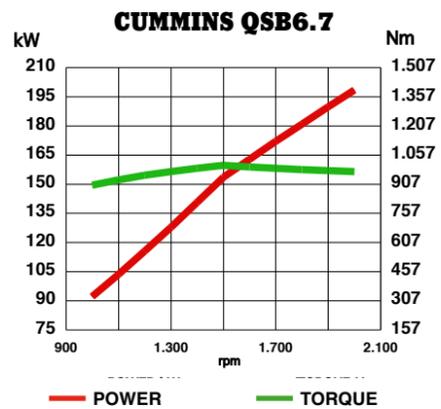


FISH-EYE

Cummins and Soilmec

BORN TO DRILL

A red American six cylinder for an international Italian guy. Thanks to its new concept design, the Soilmec SR-45 drilling rig offers very good performances in several activities for the foundation projects. All packed in a sturdy and reliable package



Brand Cummins
Model Qsb 6.7

I. D.
B x S mm - S/B 107 x 124 - 1.16
N. cil. - dm³ 6 - 6.69
Maximum power kW - rpm 201 - 2,000
Mep at max power bar 18.4
Piston speed m/s 8.3
Maximum torque Nm - rpm 990 - 1,500
Mep at max torque bar 19
% power at max torque (kW) 39.3
Torque at max power Nm 960
% power at max torque (kW) 77.4 (156)
Work range rpm 500

DETAILS

Specific power kW/dm³ 30
Specific torque Nm/dm³ 147.9

RULES AND BALANCE

Dry weight kg 536
L x W x H mm 1,059x726x960
Volume m³ 0.74
Weight/power kg/kW 2.7
Weight/displacement kg/dm³ 80.1
Power density kW/m³ 271.6

TECHNO

Injection system Common rail
Air intake - devices vgt egr dpf

DIESEL INDEX 7.6

FOR OFF-ROAD TOO

In North America and China, Cummins practically stands for automotive engines, and especially bus engines in the Far East. In Europe, while maintaining a certain appeal in the automotive area, particularly in passenger transport, the brand is mainly identified with medium to high-power construction equipment (see J 427 and J 437 Jcb wheel loaders). Moreover, the Soilmec drilling rig takes good advantage of this versatile engine, which always stood out for its lightness: in comparison with other same-sized competitors in Tier 4 final version, the Qsb 6.7 outweighs by only 1 kg (without post-treatment module, which weighs 37 kg) the - smaller - N6.7 by Fpt Industrial, a bit more than 1000 Series by Mtu and 100/150 kg less than other competitors. Specific torque lacks a few Nm, but power per liter ratio leaves all other brands behind. An automotive signature is the vgt by Holset, which helps the tracks of this heavyweight to make good use of torque in stop/start cycles, while Cummins provides the filtration system, which must manage temperature range, severe environmental conditions and impurities conveyed by the dust. This task is entrusted to Ces - Cummins emission solutions.





BOSCH REXROTH

First class parts

A technologically advanced machine designed for demanding operations could not miss reliable hydraulics and electrical systems, adequately sized and thus able to provide the SR-45 all the power needed in any type of application. At the heart of the hydraulics, branded **Bosch - Rexroth**, we find two main pumps, providing a flow rate of 214 liters per minute each, supported by an auxiliary 120 liters per minute pump, both supplied by a 450 liters hydraulic oil tank. An electronic control unit controls the total power use so as to maximize the available power; all hydraulic compo-

The SR-45 undercarriage, manufactured by Sampierana with Berco class D5 components, thanks to the variable gauge through telescoping side frames can reach a width of 3,750 mm

ponents are positioned on the right side of the machine, so as to be easily accessible. The electrical system, completely separate from the hydraulic system, is managed through a wired control panel by **Gea**, and makes use of wiring with automotive harness and Deutsch connectors to achieve maximum reliability even in harsh environments. The system includes an inclinometer and a depth measuring device.



How to do to draw the coordinates between Columbus, in Ohio, and Cesena, in Emilia - Romagna, a small town nearby the excellences of motor valley (Ferrari, Lamborghini, Ducati)? It's easy. Combining the renowned Italian creativity with technological excellence to face the international market challenges. And it's

The SR-45 features a device capable of automatically moving the mast from the transportation condition to the working position and vice versa, allowing the SR-45 to be transported complete with kelly bar hence reducing setup time.



The SR-45 features a controlled descent main winch, providing 165 kN line pull (first layer) and a line speed of 81 m/min, and an auxiliary winch providing 65 kN line pull (first layer).

The rotation of the turret, mounted on a wheel manufactured by La Leonessa, is driven by two Trasmital Bonfiglioli gearbox.



The rotary waves the Italian flag

Maximum torque of 185 kNm, maximum drilling speed of 47 rpm, maximum spin - off speed of 146 rpm, and a total weight of 2715 kg. This is the Id card of the Soilmec Rd-160 rotary table installed on the SR-45, which is characterized by a particularly compact and flattened shape so to contain the overall weight of the machine. The cylinder is made of removable and reversible nosings, which can be replaced without removing the shaft, while rotation torque is achieved through two variable displacement axial piston motors and two planetary gears branded **Trasmital Bonfiglioli**. Spin-off operation is driven by a specific radial piston motor which provides high rotation speed. Slides supports allow an easy replacement of the three nylon nosings without disassembling the rotary, which also features a centralized lubrication system.



surely a challenging area – the drilling and foundations sector - the playground of Soilmec, that has updated at the beginning of 2015 one of its most successful models, the SR-45 hydraulic drilling rig.

By rotary head

Powered by Cummins, the SR-45 has been specially designed

for suiting applications such as cased bore piles with casing driven directly by rotary head or optionally by casing oscillator powered by the base carrier itself, deep uncased bored piles stabilized by drilling fluid or dry hole, Cfa (Continuous flight auger) piles by means of long auger string, Dp (Displacement Piles)/Tct (Traction compacting tool) and Tj (Turbojet)/Ttj

(Twin shaft turbojet) for soil consolidation. Let's take a look at its main features. According to Soilmec, the new SR-45 represents a new approach to the hydraulic drills market.

A redesigned rig

The basic rig, in fact, has been completely redesigned in order to offer greater comfort

and safety on site, featuring special solutions such as the casings entirely covered with sound damping and absorbing material, the totally redesigned walkways, handrails and the camera system complete with lcd screen to guarantee the best possible safety for the operator, and the new Soilmec 'H-Cab', with sliding doors, a touch-screen Dms adjustable

monitor and more ergonomic controls and knobs to offer the operator a significantly greater comfort.

A versatile engine

All packed in a sturdy and reliable technological package powered by a Cummins Qsb6.7 Tier4 engine, capable of delivering high power (201 kW at 2,000 rpm) while maintaining

Brand Model	Soilmec SR 45 (Wcs Version)
I. D.	
Operating weight kg	42,000
Max pile diameter (alog mast) mm	1,300
Max pile diameter (tool below mast) mm	2,000
Max pile depth (friction kelly) m	63 - 65.5
Max pile depth (locking kelly) m	47.5 - 50.5
WINCH CROWD SYSTEM	
Crowd force pull up (down/up) kN	240/240
Stroke mm	14,500
Speed (down/up) m/min	28
Fast speed (down/up) m/min	28



Automotive comfort

The new Soilmec 'H-Cab' fitted on the SR-45 comes in a complete set-up not only in terms of equipment but also with a comfort level that sticks to one of the main inputs followed in the design of the machine, which is the maximum operator comfort. In this view lies the implementation of an automotive concept seat, complete with air suspension, adjustable backrest and seat and lumbar support; a micro-switch inserted in the driver's seat, similar to safety belt alarms in automobiles, inhibits all movements of the machine when the driver's seat is empty. Talking about instrumentation, two main joysticks control all driving movements; two monitors - a 12" touch screen for the Dms system and a 7" for the four cameras of the control system (located on winches, excavation front, right and rear side of the machine), and a display for diesel and particulate filter diagnostics provide a full overview of all the parameters of the machine. Standard equipment includes sliding door, air conditioning with control display, Radio & cd kit, Rops & Fops protection, cab and excavation front light kit.



TOTAL CONTROL

Dms Onboard is the whole group of electronic devices and instrumentation dedicated to machine supervision and control, recording of production data, tracking usage of raw materials and fuel consumption. The visible part of the system is constituted by a multi-language touch screen display, installed in the cab, designed to show in real time all the information relating to the operation and performance of the machine, assisted execution of work cycles, fuel consumption and diagnostics. Production data is recorded on a removable Usb memory for subsequent elaboration on a pc to conduct analysis and to obtain detailed production reports. Dms Pc is the software that displays and processes the data acquired by Dms Onboard. It's possible to analyze, process and print production data and verify the use of raw materials and fuel consumption. Available on demand is the 3D option, which is a virtual reconstruction that processes three-dimensional models based on the data acquired in the execution of diaphragm walls. Dms Manager, finally, is the software for remote, centralized supervision of the rig fleet. The rigs can automatically send real time geographic location, events, alarms, production and consumption data to a customer's company server equipped with Dms Manager. The software is web accessible, giving valuable support to project managers, site managers and maintenance supervisors.



The SR-45 provides easy access to inner components facilitating maintenance.

efficiency and flexibility. The SR-45 has been designed to meet different geological and operational conditions, using each time the most suitable drilling technologies.

Rotary table

This concept is accurately reflected by its outfit, which includes a rotary table designed to give a particularly

compact and flattened shape to the case, bringing considerable advantages also with regard to its weight. It was also designed to facilitate maintenance operations and deliver a maximum torque of 185 kNm.

The mast, which is completely new, is built with high strength steel that allows streamlining the rig for easier portability

and optimizing the balance in the front part of the drill rig by improving its stability.

The gift of flexibility

The rig is also equipped with a device capable of automatically moving the mast from the transportation condition to the working position and vice versa, which is particularly functional because the SR-45

A front weight-The special Soilmec leverage mechanism fitted on the SR-45 allows rapidly shifting from transport to working configuration, a large work radius and ease of positioning.



can be transported complete with kelly bar hence reducing the site installation times. Thanks to the new Soilmec concept design, the SR-45 shows very good performances in traditional bored piles with kelly bars - but also in cased piles - and it can be easily reconfigured to perform different drilling technologies such as continuous flight au-

The compact SR-45 mast geometry allows to make the most of the features of high tensile steel. The head can remain folded during transport; electrical and hydraulic connections both in the head and the mast are housed internally.

ger piles, full displacement piles and consolidation treatments with Turbojet. The SR-45 can be optionally equipped with a mast extension that allows using 5x13,5 self erecting masts and drilling up to a depth of 61.5 m.

Drilling mate system

The Sr-45 is equipped with the Soilmec Dms system in order to have total control over the rig performance and site production rates. Dms - Drilling mate system - is a project born in the mid-90s with the aim of providing to both operator and jobsite personnel an active instrument to control and interact with the machine (sensors, safety devices, diesel engine, drilling parameters, etc.). Soilmec, having perceived an upcoming electronic revolution in the field of drilling

machines, used the extensive experience acquired on jobsites to develop a tool that would allow the operator to manage both machine and production.

A double plc

Featuring characteristics such as Can open bus, full colour touch-screen suitable for the drilling field, diesel engine electronic control unit and machine parameters interface, easy troubleshooting and a double plc redundant system for superior reliability the Dms, thanks to its software, is able to collect, display and process via a pc all the data collected by the machine (drilling and concreting parameters), allowing to create jobsite reports, analyze production and processing, plan machine maintenance, et other features.





One cylinder engines confirm multi-nozzles injection and improve air and fuel filtration systems.

Singles at work: Hatz, Kohler and Yanmar

WORKING LIKE GULLIVER

They are employed in a plethora of applications and show a very simple structure and high sturdiness. The air-cooled mono cylinder engines span across a range of approximately 5 kW. Hatz aims for silence, Kohler focusses on filtration and Yanmar on the doc

Multifunctional, simple and resistant: the mono cylinder engines are the perfect candidates for construction work. They can be found in oscillation plates, mini dumpers, genset, platforms, diaphragm pumps and compressors. Although the evolution of the single range's technology might boost with the stage V, the current scenario is pretty conservative.

To reduce noise

At the moment, the injection systems have not undergone any major makeover and they still offer the basic solution of injection pump directed to the injector capable of triggering a pre-charge. The pre-injection at low loads allows the knocking to be attenuated (the European Commission dictates strict rules

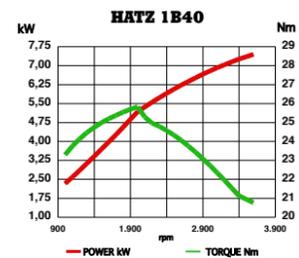
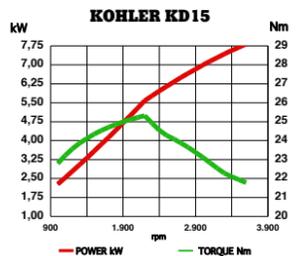
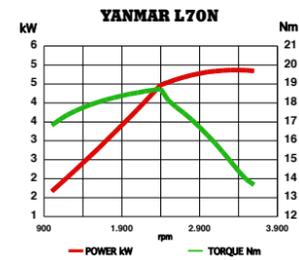
regarding acoustic emissions for all outdoor machinery) and the temperature within the combustion chamber to be limited. No manipulation has been introduced to the suction to support power curves ranging between 3 kW at onset and 8 kW at shutdown. The Hatz B series has been pioneer in the regulation of noise, through interventions on the recoil and hood. Hatz, the top of the range for the half litre (avoided by Yanmar and rejected by Kohler) with a V disposition (with the exception of the 1B27), employs the Scs (Single cam system), which relies on a single cam and the equaliser. Kohler has renamed the 15 Ld series with the abbreviation Kd, and it is now available with 350 and 440 cc, both silenced and not (with a margin of 0.5-0.7 kW).

Improvements can be appreciated mainly to the air filter and to the tank. A pre filter separation system, a dust ejection valve, different filtering paper and an enlarged cartridge all contribute to a better filtration.

Two filters for the diesel

The diesel tank has a double filter and a tap that facilitates its emptying. Yanmar, on the other hand, has launched the Ln series, conceived a decade ago from the ashes of the Lv, gravitating in the tier 4 final, with the addition of a catalyst, and has increased its availability with variable or fixed speed. The Ln series comprises three different capacities: 219, 320 and 435 cc and 3.5, 4.9 and 7.4 power for torque values of 11.6, 18 and 27 Nm respectively.

Fabio Butturi



Since the times of Günter Kamplichler, Hatz has been adopting pioneer solutions. For over ten years the Scs has ruled the distribution: the camshaft has only one cam, which simultaneously governs the two valves and the injection pump. Its heart beats solidly behind the only engine block cover: injection pump with control and regulator, distribution gear and camshaft, oil pump and pressure control valve, automatic decompression system.

Rsn by Stanadyne

The Rsn by Stanadyne is in charge of the diesel atomisation in the chamber, with a throttling area preceding the spray holes and a wider nozzle diameter for knock control. To reduce its weight, the flywheel and conveyor housing have been removed. Not considering the half litre, that has been excluded from the market and favours the bicylinder engines for the size, the 1B40 is the most robust, albeit only slightly, at 462 cc, with a marginal retouch to its power, halted at 7.5 kW, with torque value of 25 Nm at 2,000 rpm. Hatz is leader with the 1B30 and 1B40 on oscillation plates together with Weber, Wacker, Dynamic, Bomag, Amman and Vibromax. Here,

Hatz 1B40 for Magnani&Crocco

PRODUCING AIR WITH DIESEL

Comfortable amongst the compactors, but this time it approaches construction on an air compressor. The 462 cubic centimetre engine has survived over ten years in the B series, with particular attention to noise reduction



BORN IN BUILDING SITE

Brand Model	Hatz 1B40
I. D.	
B x S mm - S/B	88 x 76 - 0.86
N. cil. - dm ³	1 - 0.46
Maximum power kW - rpm	7.5 - 3,600
Mep at max power bar	5.5
Piston speed m/s	9.1
Maximum torque Nm - rpm	25 - 2,000
Mep at max torque bar	6.9
% torque rise	23.3
Torque at max power Nm	19
% power at max torque (kW)	69.9 (5)
Work range rpm	1,600
DETAILS	
Specific power kW/dm ³	16.2
Specific torque Nm/dm ³	54.1
Areal spec. power kW/dm ²	12.3
RULES AND BALANCE	
Dry weight kg	48
L x W x H mm	392x335x480
Volume m ³	0.06
Weight/power kg/kW	6.4
Weight/displacement kg/dm ³	103.9
Power density kW/m ³	125
Total density t/m ³	0.8
Displacement/volume dm ³ /m ³	7.7



however, a single moves the Magnani&Crocco air compressor.

Arrow of the Arch

This compressor, called Arco (in Italian it means 'Arch'), by the North-Eastern Italian manufacturer, is available also in its static version (commonly found on firefighting vehicles and assistance vehicles, such as tyre specialists, plumbing machinery and in construction sites) and in its free-wheeled version. In the picture, the palletised version, suitable for construction sites, where it can easily be removed or fixed.

FIGHTING IMPURITIES

The transition to the Kohler era brings along twice as many air and diesel filters and double the maintenance interval for the 441 cc. The engine is here represented on the genset of its sister company the French genset maker Sdmo, third worldwide in this sector

The passage to the Kohler era is symbolised not only by the new black coating. The presence of the 'deus ex machina' from the late Ld 440, now called Kd 440, is clearly visible in the captive dimension (lost by Lombardini in the domestic tractor production). The 441 cc is in fact the soul of the single stage group by Sdmo, called Diesel 6000 E X1 C, and the French company is well known to be part of the American family. So what else has changed, aside from the chromatic evolution from the Lombardini bright red to the black evening dress by Kohler? As already mentioned in the introduction, the changes have involved mainly the air filtration system, which has been amplified, and the diesel tank, with an extra safety filter.

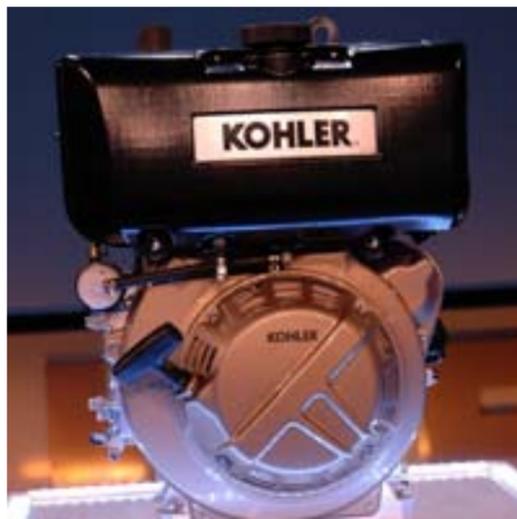
More oil (upon request)

Furthermore, an enlarged sump is available upon request for the engine oil, which allows for the extension of maintenance intervals to those of big vehicles, estimated to about 500 hours. When the 15 Ld series was launched, the Lombardini engineering focused on the reduction of noise, with the Stanadyne formula above all (with a throttling area preceding the spray holes just above the sealing diameter and a wider nozzle) and interventions on the whole combustion cycle, from the injection pump to the cham-



AIR CARE

Brand Model	Kohler Kd 15-440
I. D.	
B x S mm - S/B	76 x 86 - 1.13
N. cil. - dm ³	1 - 0.39
Maximum power kW - rpm	5.9 - 3,600
Mep at max power bar	5.1
Piston speed m/s	10.3
Maximum torque Nm - rpm	24 - 2,200
Mep at max torque bar	8.1
% torque rise	31.7
Torque at max power Nm	15
% power at max torque (kW)	95.7 (6)
Work range rpm	1,400
DETAILS	
Specific power kW/dm ³	15
Specific torque Nm/dm ³	62.8
Areal spec. power kW/dm ²	13.11
RULES AND BALANCE	
Dry weight kg	45
L x W x H mm	413x340x512
Volume m ³	0.07
Weight/power kg/kW	7.6
Weight/displacement kg/dm ³	115.4
Power density kW/m ³	84.3
Total density t/m ³	0.64
Displacement/volume dm ³ /m ³	5.57



ber. The power take-off is located on the side of the flywheel, and a solenoid valve activates the emergency stop. Its quietness is a plus for this application; the 6000 E X1 group, calibrated to 5.2 kW and 230 Volt, declares 80 dB (A), measured at a 7 metre distance and with 103 kg weight, of which 45 are attributed to the mono cylinder. From the Brittany coast, Sdmo has reached third place in the worldwide genset market. This year will be the tenth anniversary of its admission to the Wisconsin club.

A HALF-WAY SOLUTION

An oscillation plate plays for Yanmar against Hatz, and conquers the Dpu4045. With 320 cubic centimetres, this silenced engine reaches 4.9 kiloWatts and 18 Newtonmetre. The injection is taken care of directly by the Japanese company

Playing a crucial role with the Japanese triad, the 320 cc engine fits on the Dpu4045 plate, the 'handyman' according to Wacker Neuson. Compared to its competitors, the silenced mono cylinder with almond-shaped eyes has 200 cc less capacity, which is perfectly in line with its power.

Talking about torque

The torque value is more or less superimposable to that of the Hatz 1B30, however in some features, it goes beyond the Kd15.350S, both in the silenced and non-silenced versions. The torque reserve gives a good idea of the operating index of the engine, the most performing of the three Ln, though its mep is lower than the other two. The ratio between total weight and volume and between the latter and cubic capacity are also very encouraging. That was enough to persuade Wacker Neuson about the Dpu4045 oscillation plate. The German manufacturers, well accustomed to compaction but reaching out also to other construction applications, have devised this vehicle with special attention to the operator's comfort. To this end, the first and foremost element is the handle, designed to redu-



BEAR THE STRESS

Brand Model	Yanmar L70N
I. D.	
B x S mm - S/B	78 x 67 - 0.86
N. cil. - dm ³	1 - 0.32
Maximum power kW - rpm	4.9 - 3,600
Mep at max power bar	5.2
Piston speed m/s	8
Maximum torque Nm - rpm	18 - 2,400
Mep at max torque bar	7.2
% torque rise	26.5
Torque at max power Nm	12
% power at max torque (kW)	92.4 (5)
Work range rpm	1,200
DETAILS	
Specific power kW/dm ³	15.4
Specific torque Nm/dm ³	56.2
Areal spec. power kW/dm ²	10.21
RULES AND BALANCE	
Dry weight kg	36
L x W x H mm	290x422x453
Volume m ³	0.06
Weight/power kg/kW	7.3
Weight/displacement kg/dm ³	112.5
Power density kW/m ³	81.7
Total density t/m ³	0.6
Displacement/volume dm ³ /m ³	5.33



ce the vibrations transmitted to the forearm (the tolerance allowance is below 2.5 m/s², metre per second square, the unit of acceleration). Speed and direction can be modified with a lever, simply by moving it back and forth.

Safety features

Other safety features include a system that halts the vehicle to keep the operator from being run over when he steps back, a switch-off system, which is activated when the sensors reveal an insufficient oil level, and an alternator, which does not require any maintenance work.

The 'core' under a microscope: 4 - 4.4 liters and 4.5 - 5.2 liters

ANALYZED IN MINUTE DETAIL

It's a battlefield for the Germans with Mtu/Mercedes and Man, who have great amounts of cc to spend compared to the traditional one - liter cylinder formula. The comparison was then splitted in two parts. All gathered in a bunch, engines challenge each other on dimension and specific performances

Backbone of the off – road engine technology and quintessential of this industry, the one - liter cylinder has spread, swelling up to 1.1 and then to 1.2 liters and beyond. The more and more high pressures of the ultra – performing electronics need cubic centimeters, going where only six – cylinders could go in the stage IIIA era. Among an approved segment with regard to the injection and quite varied in terms of supercharging, Diesel International splitted in two the 4 to 5 liters range. Opening with a comparison between the heirs of the one liter cylinder, the following table includes the 5 liters and the 4.8 liters from Jcb. This section includes the Man 4.5 liters, which straddles the two sides of the same coin in equilibrium between a displacement of 1,145 liters per cylinder and top level performances, placing it close to the best in class Mtu. It seems an age since Perkins was sporting the net one liter, with Cummins just below with the B series, and the Japanese were coming en masse (Yanmar with Tne series and Isuzu with the long-lived model also included



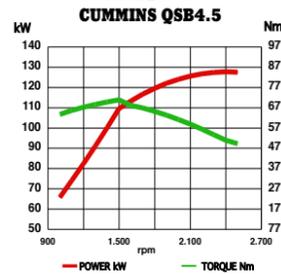
FROM 4 TO 4.4 LITERS

Brand - Model	CUMMINS Cummins QSB4.5	DEUTZ TCD 4.1 L4	FPT N45 ENT SCR	JOHN DEERE 4045HFC93	PERKINS 1204E-ETTA
I. D.					
B x S mm - S/B	107 x 124 - 1.16	101 x 126 - 1.25	104 x 132 - 1.27	106 x 127 - 1.20	105 x 127 - 1.21
N. cil. - dm³	4 - 4.46	4 - 4.03	4 - 4.48	4 - 4.48	4 - 4.39
Maximum power kW - rpm	129 - 2,500	115 - 2,300	125 - 2,200	129 - 2,200	129 - 2,200
Mep at max power bar	14.2	15.2	15.5	16	16.3
Piston speed m/s	10.3	9.7	9.7	9.3	9.3
Maximum torque Nm - rpm	706 - 1,500	610 - 1,600	696 - 1,600	713 - 1,600	750 - 1,400
Mep at max torque bar	20.3	19.4	19.9	20.4	21.9
Torque at max power Nm	490	480	539	559	559
% power at max torque (kW)	86 (111)	88.9 (102)	93.4 (117)	92.7 (120)	85.3 (110)
Work range rpm	1,500	700	1,200	1,200	1,200
DETAILS					
Specific power kW/dm³	28.8	28.4	27.8	28.7	29.2
Specific torque Nm/dm³	158.3	151	155.1	159	170.4
Areal spec. power kW/dm²	35.83	35.94	36.76	36.54	37.28
RULES AND BALANCE					
Dry weight kg	360	400	410	540	420
L x W x H mm	818x713x820	783x629x812	810x678x901	867x680x1.076	854x741x867
Volume m³	0.48	0.4	0.49	0.63	0.55
Weight/power kg/kW	2.8	3.5	3.3	4.2	3.3
Weight/displacement kg/dm³	80.7	99.1	91.4	120.5	95.5
Power density kW/m³	268.8	287.5	255.1	204.8	234.6
Total density t/m³	0.75	1	0.84	0.86	0.76
Displacement/volume dm³/m³	9.29	10.1	9.15	7.12	8
SPECIFICATION					
Injection system	common rail	common rail	common rail	common rail	common rail
Valves - Air intake - Techno	vgt scr doc dpf	turbo egr dpf scr	Hi-eScr	fissa-vgt scr	2 stage doc scr
INDEX					
Torque	11.3	9.6	9.6	9.4	10.3
Performance	1.7	5.8	1.9	2	2
Stress	131.1	90.7	127.7	131.3	131.3
Lightness	1.3	12	1.3	1.2	1.2
Density	29	22.5	30	27	28
DIESEL INDEX	12.2	11	12	11	12.3

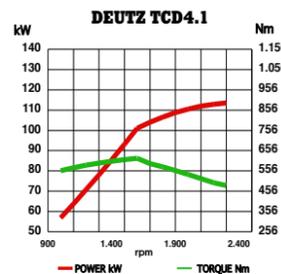
FROM 4.6 TO 5.2

Brand - Model	ISUZU 4HK1	JCB ECOMAX 129	MAN DO834	MTU R4 1000	SISU 49 CWA	VOLVO PENTA TAD572VE
I. D.						
B x S mm - S/B	115 x 125 - 0.81	106 x 135 - 1.27	108 x 125 - 1.16	110 x 135 - 1.23	108 x 134 - 1.24	110 x 135 - 1.23
N. cil. - dm³	4 - 5.19	4 - 4.76	4 - 4.58	4 - 5.13	4 - 4.91	4 - 5.13
Maximum power kW - rpm	145 - 2,100	129 - 2,050	162 - 2,100	170 - 2,200	129 - 2,200	160 - 2,200
Mep at max power bar	9	16.2	20.6	18.4	14.6	17.3
Piston speed m/s	8.8	9.2	8.8	9.9	9.8	9.9
Maximum torque Nm - rpm	686 - 1,200	690 - 1,500	850 - 1,750	951 - 1,400	750 - 1,500	902 - 1,200
Mep at max torque bar	9.3	18.6	23.8	23.8	19.6	22.5
Torque at max power Nm	657	598	735	735	559	696
% power at max torque (kW)	59.5 (86)	84.1 (108)	96.2 (156)	82.1 (140)	91.4 (118)	70.9 (113)
Work range rpm	900	550	1,100	1,200	1,200	1,200
DETAILS						
Specific power kW/dm³	15.3	27	35.3	33.1	26.2	31.2
Specific torque Nm/dm³	72.7	144.8	185.5	185.3	152.7	175.7
Areal spec. power kW/dm²	19.21	36.54	44.26	44.74	35.25	42.11
RULES AND BALANCE						
Dry weight kg	470	590	490	540	390	560
L x W x H mm	1,019x776x1,034	787x701x921	937x882x926	818x755x1,033	902x620x887	772x859x995
Volume m³	0.82	0.51	0.77	0.64	0.5	0.66
Weight/power kg/kW	3.2	4.6	3	3.2	3	3.5
Weight/displacement kg/dm³	49.8	123.8	107	105.2	79.4	109.1
Power density kW/m³	176.8	252.9	210.4	265.6	258	242.4
Total density t/m³	0.57	1.16	0.64	0.84	0.7	0.85
Displacement/volume dm³/m³	11.51	9.34	5.95	8.02	9.8	7.78
SPECIFICATION						
Emission level						
Injection system	common rail					
Air intake - Techno	aftercooler egr	vgt	2 stage egr dpf	2 stage	aftercooler	vgt egr scr
INDEX						
Torque	10.6	8	8.7	19.9	10.4	19.2
Performance	3.6	5.7	2.8	2.9	2	2.6
Stress	6	9.3	10.7	11.6	1	11.5
Lightness	1.73	1.48	1.2	1.2	1.4	1.2
Density	6.6	7.4	2.5	2.9	2.9	2.8
DIESEL INDEX	5.8	6.1	7.1	5.8	4	5.5

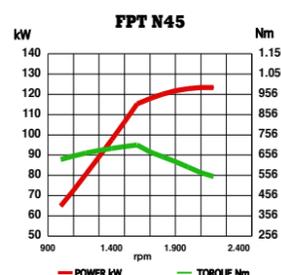
CUMMINS



DEUTZ



FPT INDUSTRIAL



on these pages), but it was just the very early 2000. Let's start from one liter and around. The top power is 129 kW, supplied by the triad Cummins, John Deere and Perkins, with the 125 kW of Fpt Industrial N45 coming close and, at a distance, the Tcd 4.1 from Deutz with 115 kW. How to evaluate those competitors, divided by just a few kW? Among those very similar figures stands out the power of Perkins engine with 29.2 kW, which confirms an efficient engine exploitation even in terms of specific torque, with its 170 Nm dominating all his peers and surrendering just to Man, Mtu and Volvo Penta.

Density is a lovely word

Another magic word is density: when it comes to 'condensed' power the one liter cylinder from Deutz is inferior only to Agco Power, while the mass/nominal power ratio is Cummins' strong point, thanks to one of the few engines not made in China after the 2012/2013 agreements (see 3.8 and 12 liters). Moreover, the variable here plays all in favor of the Qsb and Tcd, and that variable is the weight: with 360 and 400 kg, Cummins and Deutz have tailored the slimmer dress both in terms of size and weight. This is a very important advantage for oems, that are not so prone to unbalance the axle loads and, above all, to alter the hood.

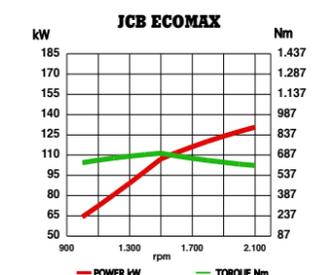
Turning the page and raising in category, the first mandatory stop is at the top of the list, the Man D08, a dated project that still surprises despite being the lightweight of the list, with its 540 kg and 4.58 liters that



ISUZU



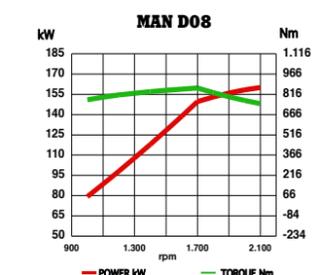
JCB POWER SYSTEMS



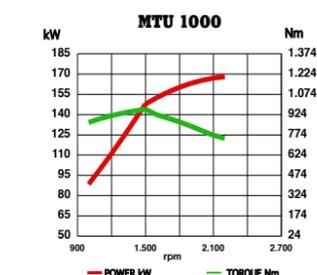
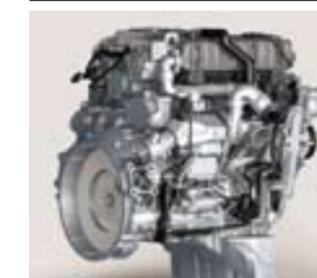
JOHN DEERE



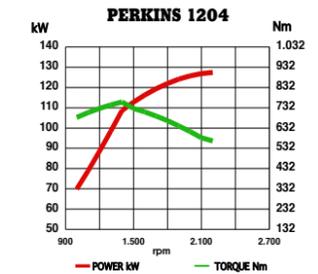
MAN



MTU



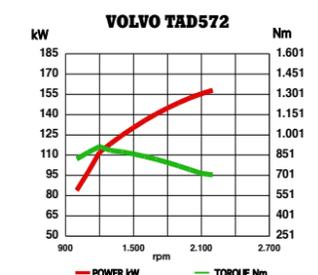
PERKINS



SISU AGCO P.S.



VOLVO PENTA



would place it on the lowest step if it were not for its kW and Nm. Thanks to its 35.3 kW and 185.5 Nm this engine leads the group, closely followed by Mtu 1000 Series (represented by the 4.8 liters 924 up to the Stage IIIB), which moves faster in terms of absolute values. Thanks to its 170 kW this engine is 6 percent far from the second and third, and 24 percent far from the big group of the 1,1 liter cylinder (129 kW). The distance increases when it comes to torque, lead by Mtu with 950 Nm. Sisu and Isuzu show low stress, balanced engines, larger than other competitors (especially the Japanese) that are 130 kg lighter. Among larger engines Volvo Penta reaches the second place in torque diagram, just 50 Nm from Mtu. The engine sports a Swedish project and is made in India (Eicher), sharing with the 100 Series bore, stroke and concept: double blower and no particulate filter.

Back to the Jubilee...

Coming back to the comparison with one liter cylinders in the jubilee year, the mep stood approximately at 10 bar (9.35 bar for Yanmar 4Tne and 10.59 for John Deere 4045T), disavowed by everyone except Isuzu. The other engines optimize fluid dynamic potential and volumetric efficiency, pushing the bar quite high, to increase torque values, improving the curve and consequently lowering the lower specific fuel consumption point, firstly to improve thermodynamics and reduce the particulate, leaving out the chemical decomposition of nitrogen oxide, and neutralizing the side effects of nitrogen/oxygen reaction.

Working on mep not only involved common rail but also over-charging, varying the atmospheric flow calibrated by the blades of the vgt (Cummins, Jcb, John Deere and Volvo Penta) or through the two-stage, just about ten years ago used in automotive only (Man, Mtu and Perkins).

A match for Albion teams

As a side note, the two British competitors could deploy different displacements: Jcb features a 4.4 liters (AxC 103 x 132 mm) which started its engine history and marks 93 kW and 550 Nm; Perkins (the historic Jcb partner before the Caterpillar era) could even boast a 4.4 liters (AxC 105 x 127 mm) of the 1100 Series and its twin, the replica of the 1200 Series for the holding company Caterpillar.

10 to 11 liters for quarry drifting

OFF-ROAD TRUCK DRIVERS

The Cursor family splits in three, 11, the contest leader, 9, and 13 liters. Among the same displacement class, the Swedish monobloc assembled in France keeps up with the leaders, along with the Man D20. Scania is not present in this segment while Liebherr enters the competition with its 16 fitted on Kamaz trucks

This is a peculiar displacement, tailored on central and northern Europe market, and an unusual variation in the seven sisters oligarchy: Scania is not part of the competition, having no engines in the segment between Dc9 and Dc13, and is replaced in this compari-

son by Liebherr. Analyzing the data from the cockpit, the absence of the Italian truck specialist Astra stands out, faithful to the 13-liter size, well established in the Italian market especially in 8x4 range. Liebherr takes advantage of the know – how developed in asso-

ciation with Man. Tgx was Swiss - born (Liebherr designs and manufactures engines in Bulle, Fribourg canton), and the versatility of the six-cylinder allowed to leave the captive borders, revoking exclusive rights to construction machines to hand over their services on Kamaz trucks.



Fpt Industrial joins with Iveco for the best performances.

THE MAGNIFICENT SEVEN

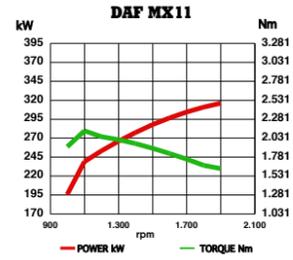
Brand Brand - Model	DAF Daf MX-11 320	FPT INDUSTRIAL C11	LIEBHERR D936 A7	MAN D20	MERCEDES OM470 - 428	RENAULT DTI 11	VOLVO D11 K460
I. D.							
B x S mm - S/B	123 x 152 - 1.24	128 x 145 - 1	122 x 150 - 1.23	120 x 155 - 1.29	125 x 145 - 1.16	123 x 152 - 1.24	123 x 152 - 1.24
N. cil. - dm³	6 - 10.83	6 - 11.19	6 - 10.52	6 - 10.51	6 - 10.67	6 - 10.83	6 - 10.83
Maximum power kW - rpm	320 - 1,900	380 - 2,100	320 - 1,900	324 - 1,800	315 - 1,800	338 - 1,900	339 - 1,800
Mep at max power bar	19	22.4	19.6	20.9	20.1	20.1	21.3
Piston speed m/s	9.6	9	9.5	9.3	8.7	9.6	9.1
Maximum torque Nm - rpm	2,100 - 1,000	2,082 - 1,500	2,000 - 1,000	2,097 - 1,000	2,100 - 1,100	2,200 - 1,400	2,200 - 1,400
Mep at max torque bar	24.9	27	24.4	25.6	25.2	26	26
% power at max torque (kW)	55.7	44.8	2.4	2.2	56.7	55	54.9
Torque at max power Nm	1,607	1,725	1,607	1,715	1,666	1,695	1,793
% power at max torque (kW)	68.8 (220)	86.10 (327)	65.5 (209)	67.8 (220)	76.8 (242)	95.5 (323)	95.2 (323)
Work range rpm	900	600	900	800	700	500	400
DETAILS							
Specific power kW/dm³	29.5	38.4	30.4	30.8	29.4	31.2	31.2
Specific torque Nm/dm³	193.7	210.6	190	199.3	196.6	203	203
Areal spec. power kW/dm²	44.88	49.22	45.65	47.72	42.8	47.41	47.55
RULES AND BALANCE							
Dry weight kg	820	1,200	1,150	975	990	994	994
L x W x H mm	n.a.	1,272x929x1,130	1,592x918x1,151	1,630x893x1,046	1,287x1,130x1,755	1,309x913x1,227	1,309x913x1,227
Volume m³	-	1.34	1.68	1.52	2.55	1.47	1.47
Weight/power kg/kW	2.6	3.2	3.6	3	3.1	2.9	2.9
Weight/displacement kg/dm³	-	121.4	109.3	92.7	92.7	91.7	91.7
Power density kW/m³	-	283.6	190.5	213.2	123.5	229.9	230.6
Total density t/m³	-	0.9	0.68	0.64	0.39	0.68	0.68
Displacement/volume dm³/m³	-	7.38	6.26	6.92	4.19	7.37	7.37
SPECIFICATION							
Emission level							
Injection system	common rail 2,500 bar	common rail	common rail	common rail	X pulse	common rail	common rail
Air intake - Techno	vgt scr egr dpf	waste gate Hi-eScr	waste gate scr	2 stage scr egr dpf/crt 2 stage egr scr dpf doc		vgt scr egr doc dpf	vgt scr egr doc dpf
INDEX							
Torque	12.1	9.5	11.5	11.4	10.2	10.5	10.5
Performance	7	7.5	6.9	7.5	7	7.3	7.2
Stress	11.5	12	11.6	11.4	11.3	11.9	11.7
Lightness	9.5	16.1	1.1	1.2	11.9	11.8	11.8
Density	-	10.2	2.5	2.6	4.9	8.8	8.8
DIESEL INDEX	7.8	8.2	6.1	7.6	8	7.9	7.1

THOSE WHO DON'T SHOW 11

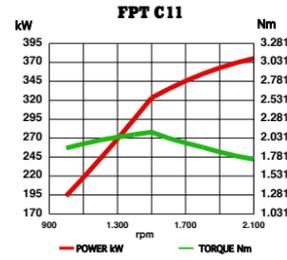
Among the illustrious victims of this confrontation, the most surprising is SCANIA. The strategy of the Griffon has ruled out entering the typically German ground of 10.5 liters (in Germany 9 is not used), which Daf and Fpt Industrial entered with their 11. The Scania Euro 6 steps up from 5-cylinders, 9.3-liter (calibration from 183 to 265 kilowatts, including two 206 and 250 kW gas versions) to 13, in four power ranges from 272 to 360 kW. The technical recipe is well known: Xpi for injection, vgt, egr, dpf and scr. CUMMINS is currently covering Euro 6 big sizes only with the IsI G, a gas powered 8.9-liters, power from 184 to 235 kW, torque from 990 to 1,356 Nm. Diesel engines come down to 6.7 liters, loved by the bus market (especially in China). CATERPILLAR is on the road, but only overseas with Epa approval (no Euro). For example, the range includes the C13, available from 268 to 349 kW and from 1,695 to 2,305 Nm, a 6-cylinders, 2,1liters per cylinder, overhead camshaft and dual stage supercharging. engine.



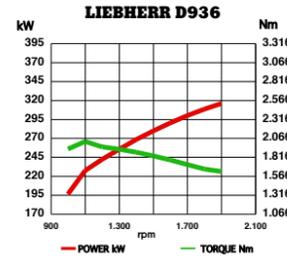
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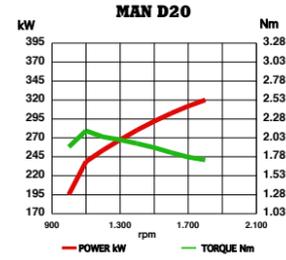
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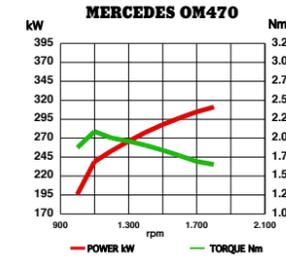
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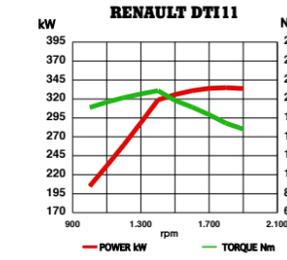
MAN



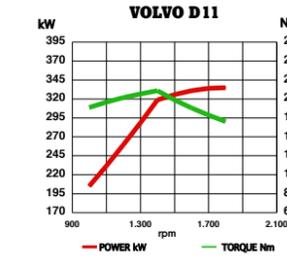
MERCEDES



RENAULT



VOLVO



And so the D936 A7 10.5 liters could find a place under potentially free bonnets, if this niche was not ruled by the same regulations that control the European truck market.

Cursor family

The strongest competitor comes from Fpt Industrial, the Cursor 11 that exceeds by 195 cc only the analyzed range. This slight increase does not make difference, even the 8.7-liter could win the podium with 330 kilowatts (the Cursor 9 is used by Iveco on 4x2 Trakker). The Cursor 11, entirely made in China, climbs up to 380 kW, taking advantage of the synergy between Bosch control unit and injection settings, calibrated at 2,200 bar, the same pressure used on 13 and 16 liters (Cursor 9 is set instead at 1,800 bar).

French-Swedish cousins

Although not using two-stage - the main reason of Cursor 13 success, but a simple waste gate, its 380 kW generate a vortex behind, resulting in +11 per cent compared to the French - Swedish pair, which differ in some calibrations to avoid overlapping and share the same monobloc, manufactured in Venissieux (near Lyon, France). Taking a step back to the starting calibrations of the comparison, it ranges between 16 and 19 percent.

A smooth torque curve

The hypothetical common torque curve is incredibly smooth, spreaded in a range of just 100 Nm. When focusing on detail, that is the specific torque, the torque/displacement ratio, peaks become very close, just 7 Nm away

It's the usual challenge among seven sisters, Scania excluded. Just Liebherr is the substitute.



from French-Swedish twins. Unveiled at Bauma 2013, the nearly 11 liters Volvo - Renault features overhead camshaft, four valves - common and consolidated heritage of the whole automotive universe, quite standardized 17 bar compression, showing weight and size that make it a virtuous model, just like Man and Daf. Liebherr, which shows its industrial roots, and Cursor 11, which have to withstand higher stresses and features a bedplate to prevent wear from stress and vibration, are rather bulky.

Vgt is the favorite one

Among overcharging systems the variable geometry turbocharging is the favorite solution, which allows convincing power such as of dual-stage, preferable however on long - range 13 and 16 liters. Here you need torque mainly at low engine rates to transfer the Gvw on rough or muddy roads, without altering the shape of the engine compartment which must be easily accessible, and without complicating the gas flow having to tip the balance too much on electronics, the real performance key factor.

The average effective pressure rewards the work of the first in class, Fpt Industrial, Man and Renault - Volvo, and its related thermodynamic parameters. Regarding Man, the D20 serves on Tgs, a multipurpose chassis for distribution and quarry sites.

After-treatment

As evidenced by the panoramic, here too the after - treatment module incorporates technical urea spraying and chemical treatment of unburned hydrocarbons, without this affecting the smooth operation of the egr valve. Filter shows up, as it's traditional, in the crt version (continuously regenerating trap), although this specific use would recommend a fbc (fuel born catalyst) or, in any case, the support of an induced regeneration device (heating coil or burner).

The 10.8 liters concedes something to the opponents in terms of brilliance, featuring average values in power and specific rates but showing good torque values, in line with other competitors, just 100 Nm under the corresponding transalpine.

Buses like Dutch

Staying on the road, but changing the application, buses love the Mx 11: you can find it under the hood of Solaris, Temsa, Van Hool, Vdl, Yutong.



Mtu Italia: it's 21 year old.
On water and off-road



On the field: Deutz for Tym, Same for Claas, Vm&Kohler for Goldoni



Fish-Eye: Kässbohrer and Mercedes for the hybrid way



PRICE LIST

The update prices of the new engines ranges



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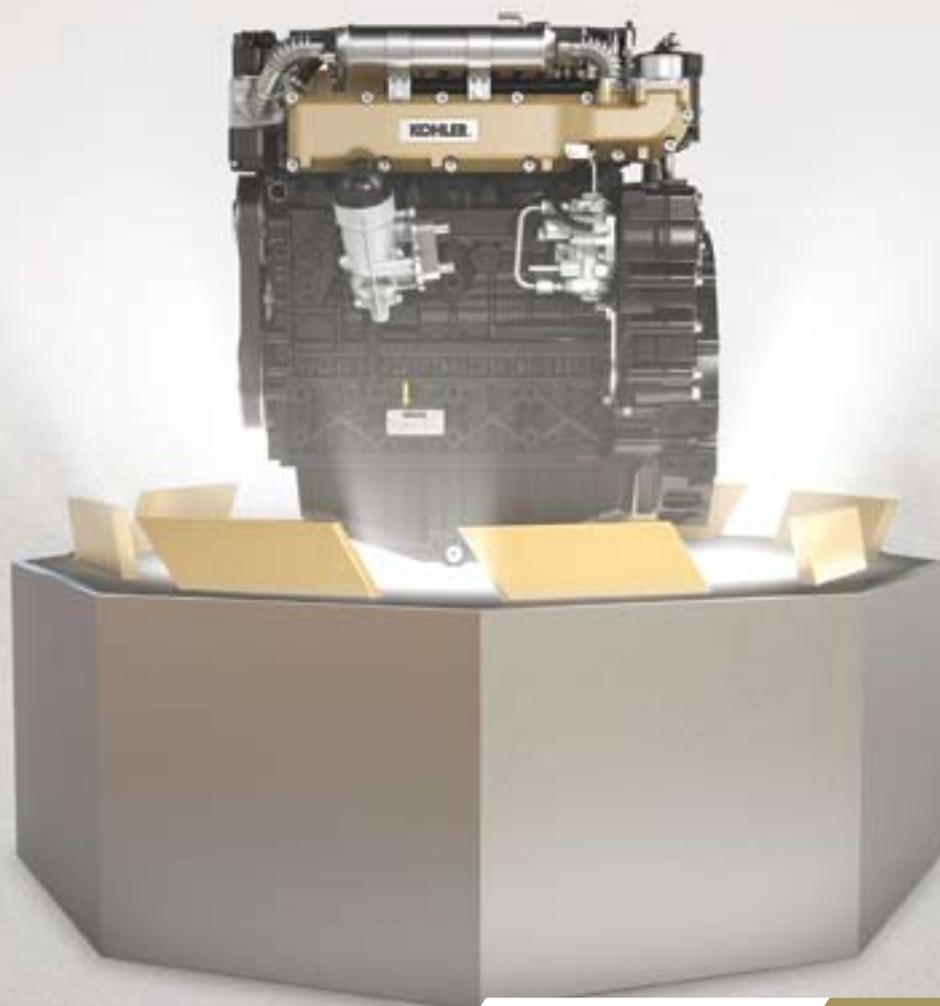


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