

BETWEEN 1.5 AND 1.7 LITERS

# SUCH A LITTLE REVENGE



British won the highest Diesel Index. Meanwhile, electronics broke in and imposed after-treatment. Hatz switched its H series 4 cylinders to 3 cylinders in TI, TIC and TICD versions. The latter is Stage V approved and includes DPF, weighing 12 kg more. EGR and DOC complete the package. Common rail adds a boost both to power peak - 42 kW and torque peak. 3H is awarded the Diesel Index again after winning the comparison under 19 kW followed by Perkins. The 400 series derived from IIIB the electronic injection that brought common rail, turbo, DOC and DPF even on Peterborough's smaller engines. Kohler has also brought the 1603 into Stage V, like the 1003 that has been

shown in hybrid version at Eima International. After the 3-liter, one-liter cylinder, it could be the first candidate to join the K-HEM, the hybrids in the Kohler portfolio. Yanmar controls this range with a double, aspirated and supercharged. Just two millimeters bore gap and 18 percent power for the turbo version. Both engines are part of the common rail family and feature DPF. Kubota strengthened up its V1505, the only quadricylinder in the comparison, which features common rail and is appreciated for its overall dimensions, in particular as regards the global density (mass-displacement ratio). In conclusion, two other illustrious Japanese that didn't participate the

Ultra-specialized machinery are set up for the 1.5 - 1.7 liters diesel engines, such as Visani landsmaschinen, in South Tirol. Other examples of applications to be fitted are wheel loaders, professional lawn mowers, multi-purpose machines, stationary

The 1.5 - 1.7 liters range is wider than ever. The brands are the usual ones in the range under 56 kW. Kubota and Yanmar are also competing here, as usual among super-compact engines. From the Far East Kiota has an odd that fits the description, the aspirated 3A165LW, mechanical injection, which however sticks to Tier 3. Displacing 1.65 liters (BxS 87x92.4 mm) this engine delivers 26,1 kW at 2,600 rpm and 107 Nm at 1,700 rpm.

But there's life also in Europe. Hatz, Kohler and Perkins represent the Old Continent versus the Japanese quartet. But what are the roots of these three cylinders that took up the challenge of the European Union and the EPA? When Tier III came in DIESEL

Three cylinders engines from 1.5 to 1.7 are very versatile thanks to their wide power range. Our threshold is from 30 and 40 kW, a 42 kW peak by Hatz wins the Diesel Index. The best power density? Perkins. Kubota is the only 4 cylinder although being very compacts. Yanmar scores two goals, two other notorious Japanese brands 'speak' here their voice, Isuzu and Mitsubishi

probed the one liter engines, which we talked about in the last issue. Kubota and Yanmar introduced the D 1005 (BxS 76x73.6 mm) and the 3TNV 86 (76x82). Japanese roots also for Briggs & Stratton with its Daihatsu-born 950 (BxS 72x78 mm) and Perkins with its 403C (BxS 77x81 mm) in collaboration with Shibaura. Lombardini relied on the LDW1003 (BxS 75x77.5 mm). We're in the realm of overhead camshaft, prechamber (where the Japanese planted their flag, see Kubota's E-TVCS) and in-line pump, except for B&S, which uses the rotary one, and Kubota pump injectors that used turbo on this engine. Also Lombardini (now Kohler) changed its clothes: the FOCS Plus increased the 300 cc cylinder to enter this grid and winning the power race with 21 kW, just like Perkins. The

BRAND MODEL	HATZ 3H50TIC	ISUZU 3CE1	KOHLER KDW 1603	KUBOTA V 1505	MITSUBISHI D03CJ-T	PERKINS 403J-E17T	YANMAR 3TNV86CT	YANMAR 3TNV88C
I.D.								
B x S mm - S/B	84 x 88 - 1,05	88 x 90 - 1,02	88 x 90 - 1,03	78 x 78 - 1,01	86 x 95 - 1,10	84 x 90 - 1,07	86 x 90 - 1,05	88 x 90 - 1,02
Cylinders - dm <sup>3</sup>	3 - 1,46	3 - 1,64	3 - 1,64	4 - 1,49	3 - 1,65	3 - 1,49	3 - 1,56	3 - 1,64
Max power kW - rpm	42 - 2.800	29 - 3.000	27,6 - 3.000	33 - 3.000	36 - 2.500	34 - 2.800	32,4 - 3.000	27,5 - 3.000
Potenza intermittente kW - rpm	12,5	7,2	6,8	9	10,6	9,9	8,4	6,8
Mep at max power bar	8,2	9	9	7,8	7,9	8,4	9	9
Piston speed m/s	185 - 1.600	118,6 - 1.900	106,5 - 1.600	120 - 1.800	166,6 - 1.600	165,6 - 1.600	125,4 - 1.900	110 - 1.900
Max Torque Nm - rpm	16,2	9,3	8,3	10,3	12,9	14,2	10,3	8,6
Torque rise %	34,2	30,9	28,6	26,3	36,2	38,7	28,7	30
Torque at max power Nm	147	88	88	108	137	118	108	88
% Power at max torque (kW)	73,9 (31)	81,40 (24)	64,70 (18)	68,60 (23)	77,60 (28)	81,70 (28)	77,10 (25)	79,60 (22)
<b>DETAILS</b>								
Specific power kW/dm	28,6	17,6	16,7	22,0	21,7	22,7	20,6	16,7
Specific torque Nm/dm <sup>3</sup>	126,5	72,2	64,5	80,1	100,6	110,7	79,9	66,9
Areal specific power kW/dm <sup>2</sup>	25,30	15,93	15,16	17,28	20,69	20,48	18,62	15,11
Dry weight kg	133	165	156	114	250	149	175	170
LxWxH mm	576x541x603	611x528x682	563x445x593	591x433x621	559x550x622	514x422x643	781x536x762	781x536x751
Volume m <sup>3</sup>	0,19	0,22	0,15	0,16	0,19	0,14	0,32	0,31
Weight/power kg/kW	3,2	5,7	5,7	3,5	6,9	4,4	5,4	6,2
Weight/displacement kg/dm <sup>3</sup>	90,9	100,5	94,6	76,1	151	99,6	111,6	103,5
Power density kW/m <sup>3</sup>	221,1	131,8	184	206,3	189,5	242,9	101,3	88,7
Total density t/m <sup>3</sup>	0,70	0,75	1,04	0,71	1,32	1,06	0,55	0,55
Displacement/volume dm <sup>3</sup> /m <sup>3</sup>	7,70	7,46	10,99	9,36	8,72	10,69	4,90	5,30

### From 1.8 to 1.9 liters

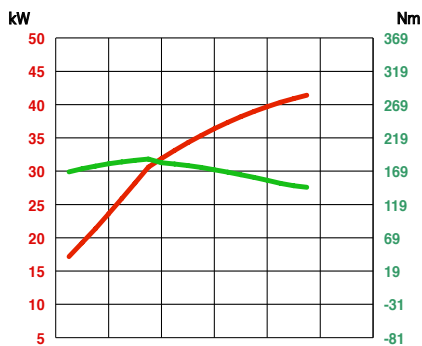
When a comparison focuses on such a specific segment it's good to expand the view. We find two great brand in the range including 1.8 and 1.9 cc liters: the **Doo-san Infracore D18** and the **Kohler KDI19TCR**. The first one is the base model of the Korean compact range, which adopted Bosch common rail instead of Delphi in the transition to Stage V, raising from 37 to 45 kW. Here, as on the D24, the EGR remains in place, but has been dismissed on the D34. The KDI features 1,861 liters, available both aspirated and supercharged, which in the most performing version with electronic management delivers 42 kW at 2,600 rpm and 225 Nm at 1,500 rpm.



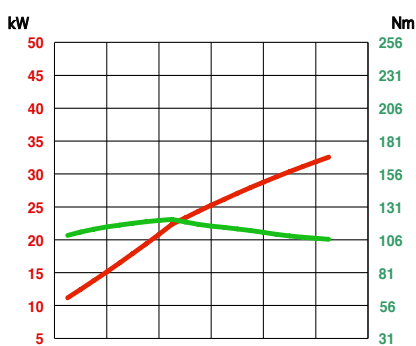
great European fairs. Isuzu delivers 29 kW in aspirated version. If Isuzu updated the ECU of this engine it would probably find application in construction, its natural environment. Mitsubishi could dare more, in terms of marketing because its MEP is high and its stroke-bore ratio would allow to customize the rotation speed and optimize frictions; the automotive expertise would allow the Japanese to transfer this know – how into a hybrid package, under the supervision of Bosch common rail.

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INDEX								
Torque	14,1	12,6	15,3	13,5	10,8	14	12,6	12,5
Performance	4,9	3,5	3,3	3,6	4,1	4,4	3,8	3,4
Stress	8,1	6,1	5,8	6	6,9	7,5	6,4	5,9
Lightness	10	11,7	10,5	8	16,1	11,1	13	12,7
Density	37	18,6	24,6	27,6	29,6	43,6	14,2	12,3
DIESEL	7,5	5,9	5,8	6,7	6	6,8	6,1	5,7

## 1 HATZ



## 2 KUBOTA



## 3 PERKINS

