ACCREDITED LABORATORY REPORT · TESTING 2011–2014

Truck and bus diesels: compression and geometry restored without teardown

Universalneftekhim Testing Laboratory, VTII LLC · NAAU accreditation certificate No. 2T 495, DSTU ISO/IEC 17025:2006 · laboratory head: P. V. Karnozhitskiy

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PRODUCT

XADO MAXIMUM FOR DIESEL TRUCK

atomic metal conditioner with 1 STAGE revitalizant · 950 ml pack · TU U 24.6-31233443-005:2010

TEST OBJECTS

Six vehicles in regular service

four-stroke diesels MAN, DAF, KamAZ, LAZ · mileage from 71,000 to 1.9 million km

DOCUMENT TYPE

Test report by an accredited laboratory

VEHICLE	MILEAGE AT TEST START	WHAT WAS MEASURED
MAN TG-A	**743,800 km**	Compression, per cylinder
LAZ-52528 bus	**71,363 km**	Compression, per cylinder
MAN F2000	**630,740 km**	Compression, cylinder geometry
KamAZ-53202	**520,640 km**	Oil system pressure
MAN ME220-18.220	**793,252 km**	Smoke opacity, fuel consumption
DAF GAG 85.430	**1,885,900 km**	Metal wear particles in oil

The application scope on the product label is broader than this sample: it also covers marine and locomotive diesels. The tests were run on trucks and a bus in regular service.

Key results

↑ 10.75 %
compression by cylinder, 18-29 → 26-31 bar

↓ 2.95 %
fuel consumption, highway cycle, 25.8 → 25.1 l/100 km

↓ 15.7 %
exhaust smoke opacity, 1.438 → 1.21 m^{-1}

↓ 0.04 mm
worn cylinder bore diameter, 128.12 → 128.08 mm

Compression by cylinder — three engines

ENGINE	BEFORE TREATMENT	AFTER TREATMENT
MAN TG-A, 6 cylinders	**28-29 bar**	**31 bar** in every cylinder
LAZ-52528 bus, 8 cylinders	**22.6-28.5 bar**	**28-29.5 bar**
MAN F2000, 6 cylinders	**18-24 bar**	**26-27 bar**
Cylinder-to-cylinder spread, average	**3.5 bar**	**0.8 bar**

ZECA 363 and Motometer compression testers. Compression is capped by the engine's rated value: all cylinders reaching one and the same figure is the limit of what is achievable.

Cylinder geometry — micrometry along the mileage

MEASUREMENT ZONE	BEFORE, 631,612 KM	AFTER, 637,155 KM	AFTER 272,587 KM
Upper zone, 40 mm	**128.12 mm**	**128.08 mm**	**128.09 mm**
Middle zone, 150 mm	**128.10 mm**	**128.06 mm**	**128.06 mm**

Averages over six cylinders, two measurement axes. The smaller diameter is the coating grown in the worn zone; over the next 272,587 km the size holds.

Smoke opacity and fuel consumption — MAN ME220-18.220 tractor unit

PARAMETER	BEFORE	AFTER	CHANGE
Smoke opacity, absorption coefficient K	1.438 m^{-1}	1.21 m^{-1}	−15.7 %
Fuel consumption, highway cycle	25.8 l/100 km	25.1 l/100 km	−2.95 %

Smoke opacity to DSTU 4276-2004, fuel consumption to GOST 20306-90, highway cycle driven on the road.

Oil system pressure — KamAZ-53202

MODE	BEFORE TREATMENT	AFTER TREATMENT
Idle, 600 rpm	1.3 bar	1.5 bar
Working speed, 2000 rpm	3.7 bar	4.2 bar

Measured to GOST 14846-81. The pressure rise is a sign of restored clearances in the crankshaft bearings.

Metal wear particles in oil — DAF tractor unit, 1.9 million km

METAL, mg/kg	186,000 KM	249,000 KM	279,000 KM	314,000 KM
Iron Fe	136	70	49	49
Copper Cu	38	38	36	23
Nickel Ni	15	22	18	0
Lead Pb	12	0	6	10
Total	201	130	109	82

Oil samples to GOST 27860-88. The anti-wear properties of the oil were retained over 128,000 km of running.

Laboratory conclusion

The Universalneftekhim Testing Laboratory of VTII LLC recorded the following for the selected group of trucks:

1. An increase in compression of **10.75 %** and a reduction of its cylinder-to-cylinder spread from **3.5** to **0.8 bar**.
2. Restoration of the geometric dimensions of worn rubbing engine parts: cylinders (diameter reduction) by **0.04 mm**; connecting-rod journals of the crankshaft (diameter increase) by **0.03 mm**. Retention of the restored dimensions over no less than **250,000 km** of running.
3. A reduction in exhaust gas toxicity (smoke opacity) of **15.7 %**.
4. A reduction in fuel consumption of **4.15 %** in steady-state driving modes and of **2.95 %** in the highway cycle.
5. A reduction in the total content of metal wear particles in the oil by **2.5×** and retention of anti-wear properties over **128,000 km** of running.

XADO

The results relate to four-stroke diesels of trucks and a bus tested in regular service in 2011–2014; on other engines and duty modes the figures may differ. The original test report of the Universalneftekhim Testing Laboratory of VTII LLC, with signature and stamp, is published in full and available for download.