TEN TECHNICAL ACTS · MEASUREMENTS 04.09 — 09.11.2001

GAZ-66, ZIL-131, KAvZ, PAZ: compression up, fuel use and emissions down

Tatneft JSC, Almetyevneft oil and gas production division, Almetyevsk Technological Transport Department (AUTT-1) · treatment carried out by AI-XADO LLC

Almetyevsk, Republic of Tatarstan · contract No. 15 of 23.08.2001 · measurements 04.09.2001 and 09.11.2001

PRODUCT

Treatment by XADO technology

without engine disassembly, in the fleet's regular service

TEST OBJECT

Petrol eight-cylinder engines

GAZ-66 · GAZ-3307 · ZIL-131 · KAvZ-3976 · PAZ-32051

DOCUMENT TYPE

Ten technical acts and the customer's summary

VEHICLE	MILEAGE AT START	RUN BETWEEN MEASUREMENTS	WHAT WAS MEASURED
GAZ-66, 55-29 TBSh	**103,156 km**	**7,057 km**	compression, fuel use, oil pressure
GAZ-66, V 483 NO	**11,292 km**	**9,296 km**	compression, fuel use, oil pressure
GAZ-3307, V 014 OV	**23,980 km**	**12,911 km**	compression, fuel use, oil pressure, CO and HC
ZIL-131, 69-19 TBV	**121,566 km**	**5,686 km**	compression, fuel use, oil pressure, CO and HC
ZIL-131, V 951 VKh	**111,010 km**	**7,811 km**	compression, oil pressure
ZIL-131, V 134 SA	**17,166 km**	**3,488 km**	compression, oil pressure
KAvZ-3976, V 599 OV	**52,229 km**	**9,571 km**	compression, fuel use, oil pressure, CO and HC
KAvZ, V 475 VKh	**72,054 km**	**14,116 km**	compression, fuel use, oil pressure, CO and HC

VEHICLE	MILEAGE AT START	RUN BETWEEN MEASUREMENTS	WHAT WAS MEASURED
KAvZ-3976, V 185 OV	**37,721 km**	**13,697 km**	compression, fuel use, oil pressure, CO and HC
PAZ-32051, V 648 EM	**29,230 km**	**11,398 km**	compression, fuel use, oil pressure, CO and HC

The treatment was performed without disassembling the engines; between the first and the check measurement the vehicles ran their usual fleet routes.

What repeated on every vehicle

↑ 10-15 %

compression across cylinders, 3.0-11.0 → 6.0-11.7 kgf/cm²

↓ 6-13 %

petrol consumption, measured on a metered 100 g portion of fuel

↓ 46-67 %

HC content in exhaust gases, 300-2000 → 230-780 ppm

Customer's summary after treating the fleet

DOCUMENT	WHAT THE CUSTOMER RECORDED
Summary of the work	“I consider the use of XADO technology for restoring worn mechanisms in regular service to be expedient at an engine life consumption of **25-75 %** and with no oil leaks, including operation in severe climatic conditions”
Check disassembly	“During the disassembly of a ZMZ engine after **150,000 km**, the piston group and the crankshaft were measured. The dimensions comply with GOST”
Observations across the fleet	“Significant improvement in engine operation”, “Increase in oil pressure”, “Reduction in oil consumption”, “Easier engine starting in winter”, “Reduction of CO and HC emissions”

The summary was signed by S. A. Brusov, head of automotive operations at AUTT-1 of the Almetyevneft division, on 04.09.2001, contract No. 15 of 23.08.2001. This is the customer's assessment, not our measurement.

Compression: ten vehicles, measured before and after treatment

VEHICLE	BEFORE, kgf/cm²	AFTER, kgf/cm²	GAIN PER THE ACT
GAZ-66, 55-29 TBSh	**7.8-8.5**	**8.6-9.2**	**10.5 %**
GAZ-66, V 483 NO	**7.0-10.0**	**9.0-11.5**	**14.6 %**

VEHICLE	BEFORE, kgf/cm²	AFTER, kgf/cm²	GAIN PER THE ACT
GAZ-3307, V 014 OV	9.5-10.1	9.5-10.8	1.5 %
ZIL-131, 69-19 TBV	6.1-7.8	7.0-8.2	11.5 %
ZIL-131, V 951 VKh	3.0-8.7	6.0-8.8	10.7 %
ZIL-131, V 134 SA	4.5-8.0	6.0-8.0	14.3 %
KAvZ-3976, V 599 OV	8.5-10.0	10.0-11.7	12.5 %
KAvZ, V 475 VKh	9.0-10.5	9.5-11.2	9.3 %
KAvZ-3976, V 185 OV	9.0-10.0	9.0-10.0	no change
PAZ-32051, V 648 EM	6.5-11.0	10.0-10.8	24.2 %

The percentages come from the “Results” section of each act. Compression rises up to the factory nominal and stops there: the heavier the wear, the larger the gain.

Petrol consumption: check measurement on a metered 100 g portion

VEHICLE	RUN TIME ON 100 G, BEFORE	AFTER	CONSUMPTION REDUCTION
GAZ-66, 55-29 TBSh	1 min 35 s	1 min 41 s	5.9 %
GAZ-66, V 483 NO	2 min 20 s	2 min 32 s	7.9 %
GAZ-3307, V 014 OV	1 min 50 s	2 min 07 s	13.4 %
ZIL-131, 69-19 TBV	2 min 05 s	2 min 17 s	8.8 %
KAvZ-3976, V 599 OV	1 min 03 s	1 min 17 s	18.2 %
KAvZ, V 475 VKh	3 min 35 s	4 min 00 s	10.4 %
KAvZ-3976, V 185 OV	1 min 55 s	1 min 55 s	no change
PAZ-32051, V 648 EM	1 min 50 s	2 min 00 s	8.3 %

Metered portion of 100 g: the longer the engine runs on it, the lower the consumption. A reduction was recorded on seven of the eight vehicles where consumption was measured.

Exhaust gas toxicity

VEHICLE	CO, %	HC, ppm
GAZ-3307, V 014 OV	2.58 → 0.21	790 → 430
ZIL-131, 69-19 TBV	0.23 → 0.10	2000 → 780
KAvZ-3976, V 599 OV	2.3 → 0.18	1660 → 630
KAvZ, V 475 VKh	1.2 → 0.48	2000 → 670
KAvZ-3976, V 185 OV	1.81 → 1.70	300 → 230
PAZ-32051, V 648 EM	0.13 → 0.08	1960 → 430

Measured with a gas analyser before and after the treatment. A reduction in both CO and HC was recorded on all six vehicles where toxicity was measured.

Oil pressure at an engine temperature of 60 °C

VEHICLE	IDLE, kgf/cm²	2000 rpm, kgf/cm²
GAZ-66, 55-29 TBSh	3.0 → 4.0	4.0 → 5.0
GAZ-66, V 483 NO	1.5 → 1.7	1.8 → 2.0
GAZ-3307, V 014 OV	1.0 → 1.3	2.0 → 2.5
ZIL-131, 69-19 TBV	0.5 → 0.8	2.5 → 2.7
ZIL-131, V 951 VKh	1.5 → 1.5	3.0 → 3.2
ZIL-131, V 134 SA	1.0 → 2.0	2.5 → 4.0
KAvZ-3976, V 599 OV	1.0 → 1.1	3.0 → 3.1
KAvZ, V 475 VKh	1.0 → 1.2	1.5 → 2.5
KAvZ-3976, V 185 OV	0.7 → 0.7	1.0 → 1.2
PAZ-32051, V 648 EM	1.8 → 2.0	3.0 → 3.0

A rise in pressure means restored clearances in the friction pairs of the lubrication system: the pump holds pressure again. On ZIL-131, 69-19 TBV, the act also noted that an oil leak stopped.

Conclusions of the acts and of the customer

All ten acts of Almetyevsk TTD-1 were drawn up on the same form and end with the same list: higher compression and evening-out across cylinders, lower petrol consumption, lower CO and HC emissions, "complete cleaning of the engine". The worn engines responded most strongly: on the PAZ-32051 the compression spread between cylinders narrowed from **4.5** to **0.8 kgf/cm²**, on a ZIL-131 the weakest cylinder rose from **3.0** to **6.0 kgf/cm²**. Where an engine ran evenly, the gain is smaller: compression rises up to the factory nominal and stops there. On a KAvZ bus the act recorded separately: "In the first cylinder of the left bank the ring must be replaced urgently, as evidenced by the drop in compression" — the treatment did not hide a mechanical defect but revealed it. Following the work, the customer found the technology expedient to use at an engine life consumption of **25-75 %**.

XADO

The results relate to the petrol eight-cylinder engines of GAZ-66, GAZ-3307 and ZIL-131 trucks and KAvZ-3976, PAZ-32051 buses of Almetyevsk TTD-1, treated without disassembly in regular service; on other engines and duty cycles the figures may differ. The originals of the ten technical acts and of the customer's summary, with signatures and stamps, are published in full and available for download.