



FOUR REPORTS OF KAZZINC JSC · JULY 2001 — MAY 2002

DEUTZ and KamAZ-55111 diesels: compression and oil pressure rose without teardown

Kazzinc JSC, Republic of Kazakhstan · LRMZ production complex · LGOK · Tishinsky mine · in-house commission reports, signed and stamped

Leninogorsk · testing July 2001 — May 2002 · contract No. M-14/2001-182 of 01.10.2001

PRODUCT

XADO gel for diesel engines
friction surface modifiers (XADO FSM) · three-stage treatment without disassembling the unit

TEST OBJECTS

Four diesels of mining and haulage machinery
DEUTZ F4L912 · F6L413F · FL413FW · KamAZ-55111

DOCUMENT TYPE

Technical commission reports of Kazzinc JSC, signed and stamped

MACHINE	ENGINE, SERIAL No.	CONDITION AT START	AFTER TREATMENT · REPORT
ATLAS excavator, fleet No. 6755 ZN	DEUTZ F4L912, No. 7972910	10,000 engine hours since 1991, 150 engine hours after overhaul	376 engine hours · May 2002
TORO-301 LHD, underground work	DEUTZ F6L413F, No. 9127608	CPG wear, oil leaks into the manifolds, knocking	10 engine hours · July 2001
TORO LHD, Tishinsky mine	DEUTZ FL413FW, No. 2421700	3484 engine hours after overhaul, substantial cylinder wear	2292 engine hours underground · May 2002
KamAZ-55111 dump truck, reg. No. F 294	KamAZ-55111, engine No. 107499	Mileage 102,998 km since 1999	60 engine hours · May 2002

All four engines were treated without disassembly; the machines were not taken out of service. Compression per cylinder and oil pressure were measured on each.

What repeated on all four diesels

↑ **2.2-6.7 %**

compression per cylinder, 18-28 → 18.4-30 bar
(maximum 15.4 %)

↑ **0.2-1.0 bar**

oil pressure at idle, 2.0-3.1 → 2.4-3.6 bar

Compression per cylinder — four engines side by side

MACHINE AND ENGINE	BEFORE	AFTER	GAIN PER ENGINE
ATLAS excavator · DEUTZ F4L912	25.5-28 bar	28-29 bar	+6.7 %
TORO-301 LHD · DEUTZ F6L413F	24-25 bar	28-30 bar	+15.4 %
TORO LHD · DEUTZ FL413FW	24-25.5 bar	25-26.5 bar	+3.0 %
KamAZ-55111 dump truck	18-21.5 bar	18.4-21.9 bar	+2.2 %

Measured cylinder by cylinder on a warmed-up engine; values converted to bar (1 MPa = 10 bar). Compression rises up to the factory nominal and stops there.

Oil pressure at idle speed

MACHINE AND ENGINE	BEFORE	AFTER	CHANGE
ATLAS excavator · DEUTZ F4L912	3.1 kgf/cm ²	3.6 kgf/cm ²	+0.5
TORO-301 LHD · DEUTZ F6L413F	2.0 bar	3.0 bar	+1.0
TORO LHD · DEUTZ FL413FW	2.8 kgf/cm ²	3.0 kgf/cm ²	+0.2
KamAZ-55111 dump truck	2.2 kgf/cm ²	2.4 kgf/cm ²	+0.2

Measured on a warmed-up engine; the reports attribute the pressure rise to reduced clearances in the crank and connecting-rod mechanism. On the TORO-301 at 1500 rpm — **4.8 → 5.6 bar**.

Noise, knocking and vibration — what the commissions recorded

MACHINE AND ENGINE	BEFORE TREATMENT	AFTER
ATLAS excavator · DEUTZ F4L912	Ultrasonic noise above 20 dB , isolated knocks; elevated noise in cylinders 1 and 4, vibration in cylinder 3	Noise and knocks minor, no elevated noise, vibration minor
TORO-301 LHD · DEUTZ F6L413F	Isolated knocks and elevated noise; oil leaks from cylinders 1, 2 and 4 into the manifolds	"The engine runs quieter and smoother"
TORO LHD · DEUTZ FL413FW	Ultrasonic noise, knocks and an early stage of mechanical defects in cylinder 2	Not recorded
KamAZ-55111 dump truck	Elevated ultrasonic noise in cylinders 3-6, noise and knocks at crankshaft supports 2-3, vibration	Not recorded; vibration minor

Assessment of the ultrasonic component of a warmed-up engine at idle — the same procedure before and after treatment.

Conclusions of the Kazzinc JSC commissions

The plant commissions recorded in the reports: for the ATLAS excavator — "increase and equalization of compression in the cylinder-piston group (CPG) by **1-3.5 bar**, increase of oil pressure by **0.5 bar** on a warmed-up engine owing to reduced clearances in the crank and connecting-rod mechanism"; for the TORO LHD — "with substantial cylinder wear, compression increased by **0.5-2.5 bar**" after **2292 engine hours** of work underground. The same result was obtained both on a diesel run in for **10 engine hours** out of the **80** recommended by the manufacturer, and on a KamAZ dump truck with a mileage of **102,998 km**. When the right-bank cylinders of the LHD were opened, the commission saw an even, smooth bore with a glossy coating. The overall conclusion of the reports: "the effectiveness of XADO technology for the repair and restoration of an engine without its disassembly, under normal operating conditions, has been experimentally confirmed".

XADO

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The results relate to the DEUTZ F4L912, F6L413F, FL413FW and KamAZ-55111 diesels of the mining and haulage machinery of Kazzinc JSC, treated without disassembly under normal operating conditions; on other machines and duty cycles the figures may differ. FSM is the designation of XADO formulations of the early 2000s; the current product generation is revitalizants. The treatment was performed by "W. F. G. Corporation", whose representatives were members of the commissions. The original reports with signatures and stamps are published in full.