

R&D; REPORT AND TECHNICAL NOTE · AUGUST 2000

UMZ-412 and VAZ-2101: compression rose, cylinders gained metal

Moscow State Technical University "MAMI", Department of Automotive and Tractor Engines · research supervisor: Prof. A. R. Makarov, Cand. Sc. (Eng.) · approved by Vice-Rector for Research Prof. S. V. Bakhmutov

Moscow, Russia · "MEZ VSETIN" engine bench · tests on 20 and 23 August 2000

PRODUCT

XADO RVS
repair-and-restoration
compound "XADO – technology
®": in the UMZ-412 engine —
into the oil in three stages; on
the VAZ-2101 — applied to the
cylinder walls

TEST OBJECTS

Two petrol engines
with service life exhausted
UMZ-412 — run-in under load
on the bench · VAZ-2101 — 2 of
4 cylinders treated, two left as
controls

DOCUMENT TYPE

R&D; report
and technical note
signed by the research
supervisor and the performers,
approval by the Vice-Rector,
university embossed seal

ENGINE	CONDITION AT START OF TESTS	RUNNING TIME WITH THE COMPOUND	WHAT WAS MEASURED	DATE
UMZ-412	service life exhausted: power 25 % below rated, compression across cylinders 8-10 kgf/cm²	50 h of run-in at 30 % load, n = 2500 rpm	compression, power, mechanical losses, fuel consumption, CO, micrometry	20.08.2000
VAZ-2101	service life exhausted: compression across cylinders 5-7 kgf/cm²	15 h of cold cranking, n = 800 rpm	compression, micrometry; cylinders 2 and 3 — control	23.08.2000

Both engines were tested on the "old" oil they had been running on earlier, without changing the oil or the oil filter.

Key results

↑ **12.5-27 %**

compression in the worn cylinders,
5.5-8 → 7-9 kgf/cm²

↓ **2.5-3.5 %**

specific fuel consumption of the
UMZ-412 along the full-load speed
curve

↓ **2-10 μm**

bore diameter of the worn cylinders —
the reason compression rose

Compression by cylinder, kgf/cm²

ENGINE	CYLINDER	BEFORE	AFTER	CHANGE
UMZ-412	1st, worn	8	9	up by 12.5 %
UMZ-412	2nd	10	10.5	up by 5 %
UMZ-412	3rd, worn	8	9	up by 12.5 %
UMZ-412	4th	10	10	no change
VAZ-2101	1st, treated	5.5	7	up by 27 %
VAZ-2101	2nd, control	7	7	no change
VAZ-2101	3rd, control	5	5	no change
VAZ-2101	4th, treated	6	7	up by 16.7 %

On the VAZ-2101, cylinders 1 and 4 were treated, cylinders 2 and 3 were left as controls. The gain came from the worn cylinders: where compression was already close to working level, it hardly changed.

Cylinder micrometry — change in bore diameter

ENGINE	CYLINDERS	BORE DIAMETER
UMZ-412	1st and 3rd, upper zone	decreased by 4-10 μm — wear partly compensated
VAZ-2101	1st, treated	decreased by 2-6 μm in the upper and lower zones
VAZ-2101	4th, treated	decreased by 2 μm

ENGINE	CYLINDERS	BORE DIAMETER
VAZ-2101	2nd and 3rd, control	no decrease — over the same hours on the same oil wear went on

Measured in the upper and lower zones — **20** and **50 mm** from the cylinder face — in two perpendicular planes, with an instrument graduated to **0.002 mm**, before and after treatment.

Engine bench, UMZ-412 — power, losses, fuel, emissions

PARAMETER	MODE	CHANGE
Mechanical loss power	whole range 1000-5000 rpm	down by 4-5.5 % ; at 5000 rpm — by 1.2 kW
Effective power	full-load speed curve	up by 3-3.5 %
Specific effective fuel consumption	full-load speed curve	down by 2.5-3.5 %
CO content in the exhaust gases	depending on the speed mode	down by 0.5-2 %

“MEZ VSETIN” bench: cooling water temperature **80-85 °C**, oil **85-90 °C**, carburettor settings were not altered.

What the MAMI Department of Automotive and Tractor Engines recorded

From the report on the UMZ-412 engine test: "As a result of the action of RVS, cylinder wear in the upper zone was compensated to some extent. This showed up especially clearly in cylinders 1 and 3, which were hopeless in terms of compression". From the technical note on the VAZ-2101 engine: "The increase in compression in the cylinders is confirmed by the results of cylinder micrometry. The change in dimensions (reduction of the bore diameter) amounted to 2 to 6 μm in cylinder 1 and 2 μm in cylinder

4. No change in the dimensions of the untreated cylinders 2 and 3 was observed". Both engines had exhausted their service life and ran on their own old oil, without overhaul: metal built up where there had been wear. On the UMZ-412 the result was obtained even at a reduced concentration of the compound — because the crankshaft tail seal failed during the 50-hour run-in, oil was topped up without the compound, and, in the assessment of the report's authors, the positive effect proved lower than it could have been.



© XADO. All rights reserved.

The results relate to the UMZ-412 and VAZ-2101 petrol engines with their service life exhausted, and to the bench conditions of the MAMI Department of Automotive and Tractor Engines; with other engines and operating modes the figures may differ. RVS is an obsolete XADO designation, the zero-generation compounds; the current product generation is revitalizants. The originals of the report of 20.08.2000 and the technical note of 23.08.2000, with signatures and the university embossed seal, are published in full and available for download.