

ENGINE TREATMENT REPORTS · OCTOBER 2008 — FEBRUARY 2009

# LAZ 52528 and Toyota diesels: compression rose and evened out, no teardown

ArcelorMittal Kryvyi Rih JSC, vehicle fleets No. 10 and No. 11 · measurements: UPA engineering bureau  
and plant mechanics jointly with XADO LLC

Kryvyi Rih, Ukraine · treatment cycle 15.10.2008 – 05.02.2009 · reports dated 20.03.2009

**PRODUCT**

XADO revitalizant gel  
for diesel engines  
full three-stage cycle ·  
«VitaFlush» oil system cleaner  
before treatment

**TEST OBJECTS**

Two diesel engines  
LAZ 52528, reg. no. AE 3644  
AA · TOYOTA HACE, reg. no.  
AE 3149 AT

**DOCUMENT TYPE**

Company reports  
dated 20.03.2009  
approved by the fleet  
managers, signed by the  
commission

| VEHICLE, REG. NUMBER    | UNIT                    | MILEAGE AT START /<br>OVER CYCLE | WHAT WAS MEASURED                                     |
|-------------------------|-------------------------|----------------------------------|-------------------------------------------------------|
| LAZ 52528, AE 3644 AA   | Vehicle fleet No.<br>11 | 71 363 / 42 192 km               | Compression per cylinder,<br>spread between cylinders |
| TOYOTA HACE, AE 3149 AT | Vehicle fleet No.<br>10 | 586 831 / 39 130 km              | Compression per cylinder,<br>spread between cylinders |

ZEGA 363 compression tester: measurement before treatment and a repeat one after the full cycle. Both vehicles stayed in the plant's normal service.

## What was repeated on both engines

compression evened out across the cylinders

↑ **5.4-11.9 %**

average engine compression, 24.9-27.3 → 27.8-28.8  
kgf/cm<sup>2</sup>

## Compression per cylinder — both engines

| VEHICLE     | CYLINDER | BEFORE, kgf/cm <sup>2</sup> | AFTER, kgf/cm <sup>2</sup> | CHANGE, kgf/cm <sup>2</sup> |
|-------------|----------|-----------------------------|----------------------------|-----------------------------|
| LAZ 52528   | I        | 28.0                        | 29.0                       | +1.0                        |
| LAZ 52528   | II       | 28.5                        | 29.0                       | +0.5                        |
| LAZ 52528   | III      | 28.3                        | 29.0                       | +0.7                        |
| LAZ 52528   | IV       | 28.0                        | 29.5                       | +1.5                        |
| LAZ 52528   | V        | 28.0                        | 28.0                       | 0                           |
| LAZ 52528   | VI       | 22.8                        | 28.0                       | +5.2                        |
| TOYOTA HACE | I        | 23.6                        | 27.4                       | +3.8                        |
| TOYOTA HACE | II       | 24.8                        | 27.5                       | +2.7                        |
| TOYOTA HACE | III      | 28.6                        | 29.0                       | +0.4                        |
| TOYOTA HACE | IV       | 22.5                        | 27.4                       | +4.9                        |

The largest gain is on the most worn cylinders: the coating builds up where the wear is, and compression does not rise above the factory nominal.

## Evening out of compression between cylinders

| VEHICLE                 | SPREAD BEFORE           | SPREAD AFTER            | CHANGE |
|-------------------------|-------------------------|-------------------------|--------|
| LAZ 52528, AE 3644 AA   | 5.7 kgf/cm <sup>2</sup> | 1.5 kgf/cm <sup>2</sup> | 3.8×   |
| TOYOTA HACE, AE 3149 AT | 6.1 kgf/cm <sup>2</sup> | 1.6 kgf/cm <sup>2</sup> | 3.8×   |

Even compression means even engine running. According to the conclusions of the reports, evening it out removes crankshaft imbalance and extends the service life until overhaul.

# Conclusions of the company commission

The commission of ArcelorMittal Kryvyi Rih JSC recorded on both vehicles: after the full treatment cycle with XADO revitalizant compounds the compression "evened out and increased on practically all cylinders" — by **0.5-5.2 kgf/cm<sup>2</sup>** on the LAZ 52528 and by **0.4-4.9 kgf/cm<sup>2</sup>** on the TOYOTA HACE, while the spread between cylinders fell from **5.7-6.1** to **1.5-1.6 kgf/cm<sup>2</sup>**. The reports explain the rise in compression by "the formation of minimal thermal clearances in the cylinder-piston group owing to the build-up of a layer of XADO metal ceramics on the working surfaces of the parts", which helps optimise fuel combustion and increase engine power; the evening out, according to the commission's conclusion, removes crankshaft imbalance and extends engine service life by at least **1.5-2×**, while the cost of the treatment pays back within **2-4.5 months** of operation. Both vehicles completed the cycle on the plant's regular runs — without dismantling the engines and without taking the vehicles out of service.



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The results relate to the diesel engines of the LAZ 52528 and TOYOTA HACE vehicles under the operating conditions of ArcelorMittal Kryvyi Rih JSC; on other equipment and in other duty cycles the figures may differ. The estimates of service-life gain and payback periods are taken from the conclusions of the reports and are the calculations of their authors. The original reports dated 20.03.2009 are published in full and available for download.