

REPORT ON MEASUREMENT OF ENGINE OPERATING PARAMETERS, 26.08.2008

# TGM6A shunting locomotive: compression, oil pressure and vibration — without teardown

Kurganinsk branch of OAO MIR, Promzheldortrans transport company · measurements: health, safety and traffic safety engineer Yu. V. Zaika, lead engineer of XADO LLC I. N. Sharaykin · approved by branch director V. P. Surmilo

Krasnodar Territory, Kurganinsk District, Russia · work carried out 4 June — 26 August 2008 · report dated 26.08.2008

**PRODUCT**

XADO revitalizant  
compounds

full treatment cycle: engine · oil  
system · fuel system

**TEST SUBJECT**

TGM6A shunting  
locomotive No. 2059

eight-cylinder diesel engine, 22  
314 h of service at the start of  
the work

**DOCUMENT TYPE**

Report on measurement of  
engine operating  
parameters

approved by the branch  
director, round company seal

**EQUIPMENT**

TGM6A shunting locomotive  
No. 2059, eight-cylinder  
diesel engine

**CONDITION AT THE  
START OF THE WORK**

22 314 h of service,  
machine built in 1985

**WHAT WAS MEASURED**

Compression and peak combustion pressure in  
all eight cylinders at 360, 480 and 700 rpm; oil  
pressure at the same speeds; block vibration at  
six points on each side

Repeat measurements were taken after 518 hours of service, at the same engine speeds and at the same oil temperature of 70 °C.

## Key results

↑ **4-21 %**

compression across the cylinders at  
360 rpm, 19-25 → 21-27 kgf/cm<sup>2</sup>

↓ **20-47 %**

vibration velocity of the engine  
block, 2.91-8.29 → 1.56-6.81 mm/s

↑ **33-40 %**

oil pressure in the lubrication  
system, 1.8-3.6 → 2.4-4.9 kgf/cm<sup>2</sup>

## Compression by cylinder at three engine speeds, kgf/cm<sup>2</sup>

| CYLINDER     | 360 RPM | 480 RPM | 700 RPM |
|--------------|---------|---------|---------|
| I · left     | 20 → 21 | 24 → 25 | 24 → 26 |
| II · left    | 23 → 24 | 23 → 25 | 24 → 26 |
| III · left   | 23 → 24 | 24 → 25 | 24 → 26 |
| IV · left    | 21 → 24 | 22 → 25 | 24 → 26 |
| V · right    | 24 → 25 | 25 → 26 | 25 → 26 |
| VI · right   | 25 → 26 | 28 → 29 | 30 → 31 |
| VII · right  | 24 → 27 | 26 → 28 | 27 → 29 |
| VIII · right | 19 → 23 | 26 → 28 | 30 → 32 |

The most worn cylinders gained the most: VIII (19 → 23) and IV (21 → 24) at 360 rpm. Compression rises towards the factory nominal value and levels off against it.

## Peak combustion pressure by cylinder, kgf/cm<sup>2</sup>

| CYLINDER     | 360 RPM | 480 RPM | 700 RPM |
|--------------|---------|---------|---------|
| I · left     | 32 → 34 | 26 → 30 | 32 → 34 |
| II · left    | 28 → 30 | 23 → 29 | 32 → 36 |
| III · left   | 40 → 42 | 38 → 40 | 36 → 38 |
| IV · left    | 36 → 38 | 38 → 40 | 37 → 40 |
| V · right    | 41 → 43 | 36 → 37 | 36 → 37 |
| VI · right   | 36 → 42 | 30 → 40 | 33 → 43 |
| VII · right  | 32 → 35 | 36 → 37 | 40 → 42 |
| VIII · right | 24 → 33 | 23 → 34 | 26 → 36 |

According to the conclusions of the report, peak combustion pressure increased in every cylinder of the engine by 1-10 kgf/cm<sup>2</sup>.

## Vibration velocity of the engine block, mm/s

| MEASUREMENT POINT ON THE BLOCK | LEFT SIDE   | RIGHT SIDE  |
|--------------------------------|-------------|-------------|
| 1 · vertical, front end        | 3.33 → 2.68 | 3.6 → 2.75  |
| 2 · horizontal, front end      | 5.71 → 3.82 | 4.91 → 2.79 |
| 3 · axial direction, front end | 3.94 → 1.56 | 3.13 → 2.18 |
| 4 · vertical, rear end         | 4.32 → 2.19 | 2.91 → 1.74 |
| 5 · horizontal, rear end       | 4.72 → 4.67 | 8.29 → 6.81 |
| 6 · axial direction, rear end  | 2.93 → 1.56 | 3.34 → 2.78 |

Vibration velocity, mm/s, at six points on each side of the block. A reduction was recorded at all twelve; vibration acceleration at the same points fell by 10-76 %.

## Oil pressure in the lubrication system

| ENGINE SPEED | OIL PRESSURE, KGF/CM <sup>2</sup> | CHANGE |
|--------------|-----------------------------------|--------|
| 360 rpm      | 1.8 → 2.4                         | +33 %  |
| 480 rpm      | 2.5 → 3.5                         | +40 %  |
| 700 rpm      | 3.6 → 4.9                         | +36 %  |

Measurements before and after treatment were taken at the same oil temperature of 70 °C. According to the conclusions of the report, pressure increased by 0.6-1.3 kgf/cm<sup>2</sup>.

# Conclusions of the company commission

The commission of the Kurganinsk branch of OAO MIR, Promzheldortrans transport company, recorded in the report of 26.08.2008: «after the full treatment cycle and a total of 518 hours of engine service, the maximum compression pressure evened out across all cylinders and increased by 1-4 kgf/cm<sup>2</sup>, and the peak combustion pressure increased in every cylinder of the engine by 1-10 kgf/cm<sup>2</sup>»; «as a result of treating the engine oil system with XADO revitalizant compounds, oil pressure increased at various engine speeds by 0.6-1.3 kgf/cm<sup>2</sup>»; «the peak combustion pressure stabilised in cylinders II, VI and VII» — before treatment the combustion pressure in these three cylinders drifted over time by 2-4 kgf/cm<sup>2</sup>. The commission's forecast: the improvement in operating parameters «will make it possible to extend its service life until major overhaul by not less than 1.5×».



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The results apply to TGM6A shunting locomotive No. 2059 and its diesel engine at the stated hours of service and measurement conditions; on other equipment and under other operating conditions the figures may differ. The original report of 26.08.2008 bearing the signatures and the company seal is published in full and available for download.