

TWO MEASUREMENT REPORTS · JUNE — OCTOBER 2002

Lathes 16K2F3 and 1M63N: truer parts, lower current on both machines

ZAO Dnipropetrovsk Diesel Locomotive Repair Plant, machine assembly shop · reports approved by chief engineer M. N. Todorov, measurements signed by shop mechanic G. A. Ivashina

Dnipropetrovsk, Ukraine · treatment 19.06.2002 · reports 19.09.2002 and 17.10.2002

PRODUCT

Treatment by XADO
technology

both machines treated
19.06.2002 · measurements
after 400 h of operation

TEST OBJECTS

Lathes in service

16K2F3 inv. No. 410-0271 ·
1M63N inv. No. 410-0084

DOCUMENT TYPE

Two reports on machine
parameter
measurements, signed and
stamped by the plant

MACHINE	OPERATION AFTER TREATMENT	WHAT WAS MEASURED	REPORT DATE
16K2F3, inv. No. 410-0271	400 h	Ovality and taper of the machined part, drive current, tooth thickness of four gears, spindle run-out and play, bearing and ball-screw clearances, noise	17.10.2002
1M63N, inv. No. 410-0084	400 h	Ovality, taper and surface finish of the machined part, drive current, tooth thickness of four gearbox gears	19.09.2002

Both machines were in service in the machine assembly shop; the treatment was performed on 19.06.2002, and the "after" measurements were taken following 400 hours of operation at the same settings as the "before" ones.

What was repeated on both machines

↓ **0.03 mm**

ovality of the machined part, 0.04 → 0.01 and 0.03 → 0 mm

↑ **0.25-0.45 mm**

gearbox gear tooth thickness, 3.3-4.85 → 3.75-5.15 mm

↓ **8-21 %**

drive motor current, 7.0 → 5.5-5.6 A and 14.2 → 12.5-13.0 A

Geometric accuracy of the machine — by a control turning pass on a blank

MACHINE	PARAMETER	BEFORE	AFTER	CHANGE
16K2F3	Ovality, mm	0.04	0.01	−0.03 mm
16K2F3	Taper over a 100 mm base, mm	0.03	0.02	−0.01 mm
1M63N	Ovality, mm	0.03	0	−0.03 mm
1M63N	Taper over a 100 mm base, mm	0.13	0.03	−0.10 mm
1M63N	Surface roughness, Ra	0.935	0.695	−0.24

Turning before and after treatment at one setting per machine: n = 500 rpm, t = 1 mm; feed 0.25 mm/rev on the 16K2F3 and 0.72 mm/rev on the 1M63N.

Tooth thickness of the gearbox gears

MACHINE	GEAR	BEFORE, MM	AFTER, MM	GAIN, MM
16K2F3	Z = 48, m = 3	4.0-4.05	4.25-4.3	+0.25-0.3
16K2F3	Z = 45, m = 3	3.7-3.75	3.95-4.05	+0.2-0.35
16K2F3	Z = 66, m = 3	3.6	3.95	+0.35
16K2F3	Z = 60, m = 3	4.7-4.75	4.8-4.85	+0.05-0.1
1M63N	Z = 88, m = 4	4.8-4.85	5.1-5.15	+0.25-0.35
1M63N	Z = 55, m = 4	3.6-3.7	4.3-4.35	+0.6-0.75

MACHINE	GEAR	BEFORE, MM	AFTER, MM	GAIN, MM
1M63N	Z = 55, m = 3	3.75-3.8	4.1-4.15	+0.35
1M63N	Z = 60, m = 3	3.3-3.35	3.75-3.8	+0.45-0.5

Measured at three tooth sections (S1-S3) on each gear; the table gives the spread across sections. The largest gain, 0.75 mm, is on gear Z = 55 of the 1M63N.

Drive motor current draw, by phase

MACHINE, MEASUREMENT SETTING	PHASE A	PHASE B	PHASE C
16K2F3, n = 500 rpm	7.0 → 5.6 A	7.0 → 5.5 A	7.0 → 5.5 A
1M63N, n = 1250 rpm	14.2 → 14.0 A	14.2 → 13.0 A	14.2 → 12.5 A

The machines have motors of different power, each measured at its own working speed: the trend within a machine is comparable, not the absolute current values between machines.

Machine 16K2F3: spindle, bearings, ball screw and noise

PARAMETER	BEFORE	AFTER	CHANGE
Spindle radial run-out, mm	0.03	0.015	−0.015 mm
Spindle radial play, mm	0.04	0.02	−0.02 mm
Spindle axial run-out, mm	0.02	0.005	−0.015 mm
Spindle axial play, mm	0.08	0.075	−0.005 mm
Clearance in the spindle roller bearing, mm	0.06	0.03	−0.03 mm
Clearance in the ball bearing, mm	0.04	0.025	−0.015 mm
Clearance in the small roller bearing, mm	0.04	0.025	−0.015 mm
Clearance in the longitudinal ball screw, three points, mm	0.68-0.73	0.56-0.66	−0.04-0.12 mm
Machine noise level, dBA	96.6	82	−14.6 dBA

The spindle unit, ball screw and noise were measured on the 16K2F3 only; these parameters were not taken on the 1M63N.

What the plant reports record

Before treatment both machines showed signs of wear: rust spots from exposure to moisture on the gear teeth and shafts of the 16K2F3, and scratches, score marks and dents on the gears of the 1M63N. The treatment was performed on 19.06.2002 and the measurements were taken after **400 hours** of operation. The report on the 1M63N records: "On the tooth surfaces of gears Z=88, Z=60, Z=55 there are no scratches, score marks or dents such as were found before the treatment by XADO technology. The tooth surface is smooth, even and clean." The report on the 16K2F3 records that the rust spots on the teeth and shafts are gone. Tooth thickness increased on all eight gears, bearing clearances and spindle play decreased — and both machines began holding size more accurately: ovality of the machined part **0.01** and **0 mm**, taper over a 100 mm base **0.02** and **0.03 mm**. Drive current fell on both machines at the same time.



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The results relate to the 16K2F3 and 1M63N lathes of the machine assembly shop at ZAO Dnipropetrovsk Diesel Locomotive Repair Plant, treated on 19.06.2002, with measurements taken after 400 hours of operation; on other equipment and at other settings the figures may differ. The originals of both reports, signed and stamped by the plant, are published in full and available for download.