TEST PROTOCOLS · MAY — JUNE 1998

T-3 car gearboxes: energy use cut both on the rig and in service

KhGKP Gorelektrotrans, Kominternovskoye tram depot · tests under the programme approved by the chief engineer of the enterprise, A. G. Matvienko

Kharkiv, Ukraine · road tests 12.05–02.06.1998 · rig tests 05–10.06.1998

PRODUCT

XADO RVS

treatment of the assembled unit without dismantling the gearbox

TEST OBJECT

Wheelset gearboxes

car T-3 No. 1829 in service · gearbox No. 283029 of car T-3M on the rig

DOCUMENT TYPE

Two depot protocols signed and stamped

OBJECT	TEST	WHAT WAS MEASURED
Car T-3 No. 1829, wheelset gearboxes	Road tests in service, 12.05–02.06.1998; five working shifts by the car's standard meter	Energy consumption per 1 km of run and per 1 hour of operation
Gearbox No. 283029, car T-3M	Rig tests, 5.5 kW drive, 05–10.06.1998; four run-ins of 4 hours each — two before and two after treatment	Energy consumption, phase currents, run-up and coast-down time, rotation speed

One unit and one XADO RVS treatment, verified in two ways. RVS is an obsolete XADO designation, zero-generation compounds; the current generation is revitalizants.

Key results

↓ 17 %

car energy consumption in service, 0.93 → 0.77 kWh/km

↓ 6.7 %

drive energy consumption on the rig, 27.82 → 25.97 kWh over 4 h

↓ 6.0 %

drive phase current on the rig, 4.82 → 4.53 A

↑ 8 %

free coast-down of the gearbox, 45 → 49 s

Energy consumption — both tests side by side

OBJECT AND MODE	BEFORE TREATMENT	AFTER TREATMENT	CHANGE
Car T-3 No. 1829 in service, per 1 km of run	0.93 kWh/km	0.77 kWh/km	−17 %
Car T-3 No. 1829 in service, per 1 hour of operation	12.89 kWh/h	10.44 kWh/h	−19 %
Gearbox No. 283029 on the rig, over 4 hours of run-in	27.82 kWh	25.97 kWh	−6.7 %

On the rig the percentage refers to the full consumption of the 5.5 kW drive; by the protocol's calculation the saving of the gearbox itself is 32 % (5.82 → 3.97 kWh over 4 h).

Road tests by shift — car T-3 No. 1829

SHIFT	DISTANCE	PER 1 KM	PER 1 HOUR
12.05.1998 — before treatment	355.6 km	1.03 kWh	12.42 kWh
13.05.1998 — before treatment	407.3 km	0.91 kWh	14.0 kWh
20.05.1998 — before treatment	248.5 km	0.84 kWh	12.26 kWh
29.05.1998 — after treatment	425.44 km	0.75 kWh	10.88 kWh
01.06.1998 — after treatment	372.76 km	0.79 kWh	9.99 kWh

Every shift after the treatment is more economical than any shift before it — both per kilometre of run and per hour of operation. Measured by the car's standard meter.

Rig — mechanics of gearbox No. 283029

PARAMETER	BEFORE TREATMENT	AFTER TREATMENT	CHANGE
Average current of one drive phase	4.82 A	4.53 A	−6.0 %
Free coast-down time after switch-off	45 s	49 s	+8 %
Run-up time to working speed	7.5 s	6.0 s	−20 %
Wheel rotation speed at the measurement mode	310 rpm	310 rpm	no change

The mode was identical in all four run-ins, so the readings are comparable. According to the conclusion of the protocol, run-up time was reduced by 27 %.

Conclusions of both protocols

Depot rig protocol: «Rig tests of the wheelset gearbox of a T-3M type tram car showed a positive economic effect from the application of RVS technology. Besides the restoration of friction pairs, the energy saving amounted to **32 %**, run-up time decreased by **27 %**, stopping time increased by **8 %**». Road test protocol for car No. 1829: «The road tests, on a par with the rig tests, showed a positive economic effect from the application of RVS technology... The expediency of introducing RVS technology is obvious». One unit, verified in two ways, gave a result in one direction: in service the depot meter showed **0.93 → 0.77 kWh/km**, on the rig — **27.82 → 25.97 kWh** over four hours of run-in at an unchanged **310 rpm**. The gearboxes were not dismantled for this: the compound is introduced into the assembled unit right at the depot.

XADO

The results relate to wheelset gearboxes of T-3 and T-3M tram cars under depot conditions and on a rig with a 5.5 kW drive; with other equipment and operating modes the figures may differ. The originals of both protocols, signed and stamped, are published in full and available for download. RVS is an obsolete XADO designation, zero-generation compounds; the current generation of products is revitalizants.