

RESEARCH AND DEVELOPMENT REPORT, 1998

Electric locomotive VL80T: worn traction gear drive restored without disassembly

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Kharkiv, Ukraine · experiment 15.04–24.07.1998, Znamianka locomotive depot, Odesa Railway · report 1998

PRODUCT

XADO RVS tribotechnical compound
3 % in the standard sulphurized grease of the traction gear case

TEST OBJECT

Electric locomotive VL80T-1433
Traction gear drive: two treated gear pairs and one control pair on the same locomotive

DOCUMENT TYPE

Research and development report,
signatures and stamps

OBJECT

Electric locomotive VL80T-1433, freight train haulage Znamianka – Piatykhvatky and Znamianka – Myronivka

CONDITION AT START OF TESTS

864,000 km since major overhaul, average daily run **400 km**

WHAT WAS MEASURED

Mileage during the experiment
33,988 km over 100 days

Gear pair of the 3rd wheelset, left — treated

Pinion wear **97.0 %** of the maximum allowable

Tooth thickness at constant chord, wear as share of maximum allowable

Gear pair of the 5th wheelset, left — treated

Gear wheel tooth thickness **12.27 mm**, pinion **14.67 mm**

Tooth thickness at constant chord

Gear pair of the 5th wheelset, right — control

Gear wheel tooth thickness **13.80 mm**, pinion **14.22 mm**

Same mileage, standard grease, measurements on the same days

The XADO RVS tribotechnical compound was added at 3 % into the standard sulphurized grease of the gear case (4 kg). The locomotive stayed in regular service throughout, without being withdrawn from operation.

Key results

↓ **52.1**pp

pinion tooth wear as share of the maximum allowable, 97.0 → 44.9 %

↑ **0.39-0.55** mm

tooth thickness of the treated gear wheels, 12.27-12.33 → 12.72-12.82 mm

↓ **0.42** mm

tooth thickness of the untreated gear wheel over the same mileage, 13.80 → 13.38 mm

Tooth thickness at constant chord — treated pairs and the control pair

COMPONENT	AT START, mm	21,000 KM	34,000 KM	CHANGE
Pinion of the 3rd wheelset — treated	14.25	14.92	15.28	+1.03 mm
Gear wheel of the 3rd wheelset — treated	12.33	12.72	12.72	+0.39 mm
Pinion of the 5th wheelset — treated	14.67	14.72	14.80	+0.13 mm
Gear wheel of the 5th wheelset — treated	12.27	12.68	12.82	+0.55 mm
Pinion of the 5th wheelset, right — control	14.22	13.98	14.00	−0.22 mm
Gear wheel of the 5th wheelset, right — control	13.80	13.46	13.38	−0.42 mm

Reference gear tooth caliper, averaging over 3 centre-punched pinion teeth and 5 gear wheel teeth; measurements taken at scheduled maintenance and current repairs. The control pair ran on the standard grease of the same locomotive.

Tooth wear as share of the maximum allowable — 3rd wheelset

COMPONENT	NOMINAL	WEAR LIMIT	WEAR BEFORE	WEAR AFTER
Small pinion, 21 teeth	16.16 mm	14.20 mm	97.0 %	44.9 %

COMPONENT	NOMINAL	WEAR LIMIT	WEAR BEFORE	WEAR AFTER
Large gear wheel, 88 teeth	14.58 mm	11.80 mm	82 %	66.9 %

The nominal value and the wear limit are the component's rated data as quoted in the report. At the start the pinion stood practically at the scrapping limit.

Conclusion of the certification body

The State Enterprise "Kharkiv Certification Body for Railway Transport" recorded the following upon completion of the experiment: "The aim of the experiment, partial restoration and hardening of the tooth surface with a metal-ceramic coating, has been achieved." The measurements showed that "on the experimental pinions and gear wheels the tooth thickness increases, while on the control ones wear continues." The pinion of the 3rd wheelset, which at the start stood practically at the scrapping limit, regained half of the allowable wear — without disassembling the unit and without withdrawing the locomotive from service. The report found the use of the technology on traction gearboxes expedient and recommended an extended experiment on metro rolling stock: 15 experimental and 15 control cars with an observation period of 12 months.



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The results apply to the traction gear drive of VL80T mainline electric locomotives in freight service; with other components and duty cycles the figures may differ. RVS is an obsolete XADO designation for the zero-generation compounds; the current product generation is revitalizants. The original report with signatures and stamps is published in full and available for download.