

CERTIFICATES OF TREATMENT RESULTS · 2002–2004

ChS-2 and ER1 gearboxes: tooth thickness grew, the gain holds for years

Main Locomotive Department of Ukrzaliznytsia · Dnipropetrovsk and Nikopol locomotive depots,
Prydniprovskaya Railway

Prydniprovskaya Railway, Ukraine · treatment May–June 2002 · control measurements November 2002
— July 2004

PRODUCT

XADO gel (revitalizant)
single fill into the gearbox oil
bath · 0.185 l per unit on ChS-2 ·
0.066 l on ER1

OBJECTS IN THE SERIES

ChS-2 electric locomotives
and ER1 electric trains
traction gear drives of the
wheel-motor units, operated on
the regular schedule

DOCUMENT TYPE

Certificates of treatment
results
under XADO Technology®
signed by depot commissions
(chief engineer, chief
technologist, deputy head for
repairs), company seals

MACHINE	TREATED UNITS	MILEAGE AFTER TREATMENT	CERTIFICATE DATE
ChS-2 electric locomotive No. 377	6 wheel-motor units — traction gearboxes	85 039 km	12 Nov 2002
ChS-2 electric locomotive No. 055	6 wheel-motor units — traction gearboxes	73 510 km	19 Mar 2003
ChS-2 electric locomotive No. 033	6 wheel-motor units — traction gearboxes	87 450 km	17 Apr 2003
ER1 electric train, section No. 1	4 wheel-motor units — traction gearboxes, axle-box liners	179 249 km	17 Dec 2003
ER1 electric train, section No. 3	4 wheel-motor units — traction gearboxes, axle-box liners	177 933 km	17 Dec 2003

MACHINE	TREATED UNITS	MILEAGE AFTER TREATMENT	CERTIFICATE DATE
ChS-2 electric locomotive No. 377 — repeat measurement	the same 6 wheel-motor units	238 451 km	13 Jan 2004
ChS-2 electric locomotive No. 377 — third measurement	the same 6 wheel-motor units	323 457 km	17 Jul 2004

Each machine was treated once, the gel poured into the gearbox oil bath. Locomotive No. 377 was measured three times: the depot came back to it two years running.

Key result

↑ 0.3-0.8 mm

gear wheel tooth thickness, 13.05-16.15 → 13.85-16.60 mm

Gear wheel tooth thickness — machine by machine across the series

MACHINE	MILEAGE	BEFORE TREATMENT, mm	AFTER THE RUN, mm	CHANGE, mm
ChS-2 electric locomotive No. 377	85 039 km	14.70-16.00	15.05-16.50	+0.30-0.65
ChS-2 electric locomotive No. 055	73 510 km	14.80-16.15	15.15-16.50	+0.15-0.60
ChS-2 electric locomotive No. 033	87 450 km	14.80-15.90	15.60-16.55	+0.50-0.80
ER1 electric train, section No. 1	179 249 km	13.05-14.80	13.85-15.45	+0.45-0.85
ER1 electric train, section No. 3	177 933 km	14.10-14.25	14.95-15.00	+0.75-0.90

Measured on five teeth of every wheel; the measuring height differs for ChS-2 and ER1, so between the two machine types it is the gain that is comparable, not the absolute thickness.

ChS-2 electric locomotive No. 377: three measurements over two years and 323 thousand km

DATE OF MEASUREMENT	MILEAGE AFTER TREATMENT	TOOTH THICKNESS, mm	GAIN OVER INITIAL, mm
16 May 2002, before treatment	—	14.70-16.00	initial measurement
12 Nov 2002	85 039 km	15.05-16.50	+0.30-0.65
13 Jan 2004	238 451 km	15.05-16.60	+0.25-0.70
17 Jul 2004	323 457 km	15.00-16.60	+0.20-0.70

The gel was poured in once, on 16 May 2002. All three control measurements were taken on the same six wheels and the same five teeth of each wheel.

Working surfaces of the teeth: what was there and what came out

MACHINE	BEFORE TREATMENT	AFTER THE RUN
ChS-2 electric locomotive No. 377	Clusters of pitting cavities up to 6 mm across and up to 0.7 mm deep; scratches and cavities up to 2 mm across and up to 0.4 mm deep	Cavities and scratches filled in, the contact patches are a smooth polished surface
ChS-2 electric locomotive No. 055	Fine scratches and cavities on the contact patches	Still visible through the metal-ceramic layer that has formed, but no longer felt by touch
ChS-2 electric locomotive No. 033	Pitting cavities across the whole contact patch, up to 3 mm across and 0.6-0.8 mm deep	Cavities and scratches gone, the surface has taken on the look of a smooth polished one
ER1 electric train, section No. 1	Transverse grooves across the full tooth width, up to 1.1 mm ; scratches 0.1-0.4 mm ; pitting up to 3 mm across and 0.4 mm deep	Scratches, dents and cavities gone, the contact patches are a smooth polished surface
ER1 electric train, section No. 3	Longitudinal grooves up to 0.7 mm ; scratches and dents 0.2-0.6 mm ; pitting up to 4 mm across and 0.5 mm deep	Cavities and scratches gone, the contact patches are a smooth polished surface

The sizes and depths of the defects are given as measured before treatment.

What the depot commissions put on record

The certificates are signed by the locomotive depot commissions, and the same thing is recorded on every machine. For the ER1 electric train: «the tooth thickness of the gear wheels increased by **0.45mm** to **0.85 mm**... In the contact patch zone of the gear wheels the scratches, dents and pitting cavities present before treatment have disappeared. The contact patch surfaces have taken on the appearance of a smooth polished surface». On ChS-2 locomotive No. 377 the observation ran for two years: «After a run of **323457 km** the tooth thickness attained is on the whole retained... On the contact patches of all the teeth a metal-ceramic layer is visually noticeable, which has removed all the fine cavities and scoring on the working surface of the teeth». Gear drives that had been running with pitting up to **0.8 mm** deep and grooves up to **1.1 mm** gained metal after a single fill of gel into the oil bath — without dismantling the wheel-motor unit.



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The results relate to the traction gear drives of the wheel-motor units of ChS-2 electric locomotives and ER1 electric trains of the Prydniprovskaya Railway; on other units, duty cycles and types of equipment the figures may differ. The original certificates bearing the depot commission signatures and seals are published in full and available for download.