SERIES OF TWO REPORTS · TREATMENT APRIL–JUNE 2005

Dryer group gearboxes: thicker teeth, lower vibration and current — on both units

"DONETSK - VTORMA" LLC · reports approved by chief engineer A. V. Bakhmut; measurements taken by deputy chief mechanic P. P. Shlyakhov and senior foreman A. V. Volkov together with specialists of the XADO Holding Company

Donetsk, Ukraine · treatment 08.04–09.06.2005 · repeat measurements after 695 and 704 h of running time · reports dated 29.06.2005

PRODUCT

XADO revitalizants

full treatment cycle without disassembling the gearboxes, within the operating cycle of the plant

TEST OBJECT

Drive gearboxes of dryer groups No. 5 and No. 6

two-stage gear units: stage I m=2.5 mm · stage II m=3.75 mm · shafts No. 1–No. 3

DOCUMENT TYPE

Two technical reports by "DONETSK - VTORMA" LLC

OBJECT	CONDITION BEFORE TREATMENT	RUN TIME TO RE-MEASUREMENT	WHAT WAS MEASURED
Drive gearbox of dryer group No. 5	Scratches along the teeth of all wheels; on the stage I pinion shaft — dents up to 1.5 mm across and up to 0.4 mm deep	**695 h**	Tooth thickness, drive current and power, noise, vibration of the bearing housings
Drive gearbox of dryer group No. 6	Corrosion spots on the stage I teeth; the other working surfaces without visible damage	**704 h**	Tooth thickness, drive current and power, noise, vibration of the bearing housings

Both gearboxes were treated without disassembly, directly within the operating cycle of the plant; the repeat measurements were taken with the same instruments and by the same procedure as before the treatment.

What recurred on both gearboxes

↑ 0.05-0.15 mm

tooth thickness of the gear drives of both gearboxes

↓ 4.5-9 %

drive power consumption at no load, 1.12 → 1.07 and 1.56 → 1.42 kW

↓ 16-35 %

vibration velocity at the bearing housings, 2.8-7.5 → 2.3-6.2 mm/s

Tooth geometry — measured before treatment and after running time

GEARBOX	GEAR DRIVE	BEFORE, mm	AFTER, mm	GROWTH, mm
No. 5	Stage I, pinion shaft, shaft No. 1 (high speed)	2.85-2.90	2.90-2.95	0.05-0.10
No. 5	Stage I, gear wheel, shaft No. 2 (high speed)	3.15-3.20	3.20-3.25	0.05-0.10
No. 5	Stage I, pinion shaft, shaft No. 1 (low speed)	3.00-3.05	3.05-3.10	0.05-0.10
No. 5	Stage I, gear wheel, shaft No. 2 (low speed)	3.45-3.50	3.50-3.55	0.05-0.10
No. 5	Stage II, pinion shaft, shaft No. 2	4.55-4.60	4.65	0.05-0.10
No. 5	Stage II, gear wheel, shaft No. 3	4.45-4.50	4.55-4.60	0.10
No. 6	Stage II, pinion shaft, shaft No. 2	3.60-3.70	3.70-3.75	0.05-0.10
No. 6	Stage II, gear wheel, shaft No. 3	3.75-3.80	3.85-3.90	0.10-0.15

ShZN-18 gear tooth caliper, three teeth of each wheel at a constant height from the tip; for gearbox No. 6 the drives that ran under load are shown.

Drive power consumption and gearbox noise

PARAMETER	GEARBOX No. 5	GEARBOX No. 6	CHANGE
Current draw, no load	4.4 → 4.2 A	6.0 → 5.5 A	−4.5 % / −8.3 %
Power consumption, no load	1.12 → 1.07 kW	1.56 → 1.42 kW	−4.5 % / −9.0 %
Noise level	78.5 → 77.5 dB	94 → 92 dB	−1.0 / −2.0 dB

Standard ammeter and “ATK 2200” current clamps, “0024” sound level meter. The reports themselves state the drop in current and power as 4 % and 9 %.

Vibration velocity of the bearing housings, mm/s

MEASURING POINT	GEARBOX No. 5	GEARBOX No. 6
pt. 1 — shaft No. 1 bearing housing on the motor side	2.77-4.26 → 2.29-3.19	3.86-4.71 → 3.50-3.73
pt. 2 — shaft No. 3 bearing housing on the dryer unit side	3.19-4.41 → 2.49-2.62	4.21-7.51 → 2.91-3.86
pt. 3 — shaft No. 2 bearing housing on the dryer unit side	3.60-6.81 → 2.67-4.05	4.23-5.44 → 3.05-4.54
pt. 4 — shaft No. 2 bearing housing on the motor side	2.87-4.01 → 2.35-3.32	5.09-6.40 → 3.95-6.17

“SENDIG 911” vibrometer, three directions at each point — vertical, horizontal, axial; a reduction was recorded at all 24 points of both gearboxes.

Commission findings on both gearboxes

The plant commission, together with XADO specialists, recorded for the group No. 6 gearbox: the working surfaces of the teeth of the drives running under constant load improved; the tooth thickness of the loaded drives increased by **0.05 mm** to **0.15 mm**; the current draw and the power consumed by the electric motor at no load dropped by **9 %**; the noise level decreased and the vibration level of the bearing housings fell substantially. The group No. 5 gearbox came in for treatment with dents up to **0.4 mm** deep on the teeth of the pinion shaft — there the tooth thickness grew by **0.05-0.1 mm**, and the wear marks in the form of scratches on the contact patches disappeared completely; for full restoration of the geometry the commission recommended a repeat treatment with XADO compounds instead of a conventional repair with replacement of parts. The bottom line of both reports: XADO revitalizants make it possible to restore normal gearbox operation without disassembly and to increase the service life of its parts appreciably.

XADO

The results relate to two-stage gear reduction gearboxes of dryer unit drives treated with XADO revitalizants without disassembly under working operating conditions; on other units and duty modes the figures may differ. The originals of both reports dated 29.06.2005 bearing the commission's signatures are published in full and available for download. Representatives of the XADO Holding Company took part in the measurements together with the plant's specialists.