

COMMISSION REPORT, HPP GROUP "RODOPI", NEK EAD

Hydro unit KhG-3 and lathe: cooler bearings, quieter gearing — no teardown

HPP Group "Rodopi", NEK EAD · plant commission: Eng. Adriyan Domyanov, Eng. Aleksandar Mishevski
HPP "Beli Izvor" and RMC Plovdiv, Bulgaria · report of 07.04.2003

PRODUCT

XADO gel for bearings and gearboxes

36 ml into the oil bath of the hydro unit bearings · 54 ml into the lathe gearbox

TEST OBJECTS

Hydro unit KhG-3 and a lathe

turbine NTA 176/44×14, built 1952 · lathe S 8 M, built 1970

DOCUMENT TYPE

Commission report
HPP Group "Rodopi", NEK EAD

OBJECT

AGE AND SPECIFICATIONS

WHAT WAS MEASURED

Hydro unit KhG-3, HPP "Beli Izvor"

Turbine NTA 176/44×14, **built 1952**; generator **745 kW, 6300 V, 428 rpm**

Temperature and vibration of bearings No. 1 and No. 2

Lathe S 8 M, RMC Plovdiv

built 1970, in normal service at the repair and machine shop

Gearbox noise level

The hydro unit bearings run in a 30 l oil bath. The compound was added in three stages 8 hours apart; the units were not taken out of service.

Key results

↓ **10-13 °C**

hydro unit bearing temperature after 18 h of operation, 47-51 → 37-38 °C

↓ **4 dB**

lathe gearbox noise after three months, 75 → 71 dB

Hydro unit KhG-3 — bearing temperature

BEARING	BEFORE TREATMENT	AFTER 18 H	FOURTH DAY
Bearing No. 1 (generator side)	47 °C	37 °C	43 °C
Bearing No. 2 (flywheel side)	51 °C	38 °C	45 °C

Readings taken with the unit running, two or three times a day; over the whole observation period no reading exceeded the initial level.

Hydro unit KhG-3 — bearing vibration 24 hours after treatment

MEASURING POINT	AMPLITUDE, μm	VIBRATION VELOCITY, mm/s
Bearing No. 1, X axis	8 → 7	0.1 → 0.1
Bearing No. 1, Y axis	7 → 6	0.1 → 0.1
Bearing No. 1, Z axis	4 → 3	—
Bearing No. 2, X axis	7 → 6	0.12 → 0.1
Bearing No. 2, Y axis	6 → 5	0.11 → 0.1
Bearing No. 2, Z axis	3 → 2	—

Measured with a "SCHENK" vibrometer; "before" and "after" were taken at the same unit load of 0.5 MW.

Lathe S 8 M — gearbox noise

MEASUREMENT	GEARBOX NOISE LEVEL
Before treatment, 28.03.2003	75 dB
After three months of operation	71 dB

The compound was added in three stages, 8 hours of machine operation apart; the gearbox was not disassembled.

Commission conclusion

The tests ran on equipment half a century old: a hydro unit built in 1952 and a lathe built in 1970, both in normal service, without disassembly and without being taken out of operation. Based on the measurements, the commission of HPP Group "Rodopi", NEK EAD recorded: "On the basis of the experiments carried out at HPP "Byal Izvor" and RMC Plovdiv and the attached measurement results, we propose to introduce the XADO technology for treating reduction gears, gearboxes and rolling bearings. Trials with the treatment of plain bearings of small hydro units and substations should continue, and once good results are confirmed the technology should gradually be introduced on larger hydro units as well." The commission attributes the lower gear noise to the increased contact surface and the reduced backlash between the teeth — running-in improved thanks to the ceramic layer formed on the tooth surfaces.



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The results refer to the plain bearings of hydro unit KhG-3 at HPP "Beli Izvor" and to the gearbox of lathe S 8 M; on other units and duty cycles the figures may differ. The treatment was performed by MAY Ltd., Plovdiv — a XADO distributor. The original report of 07.04.2003 bearing the signatures of the commission members is published in full and available for download.