XADO

TECHNICAL REPORT | SHIPPING | DIESEL GENERATORS · CYLINDER-PISTON GROUP

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6VAN-22 diesel generators: restoration without teardown cheaper than standard repair

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m/v "Omega", port of registry Yalta, Ukraine · diagnostics 18–19.12.2001, verification measurements 05.02.2002

PRODUCT

XADO technology of restoration without disassembly

treatment of the cylinder-piston group and of the plain bearings of the crankshaft and camshaft

TEST OBJECT

Auxiliary diesel generators 6VAN-22

DG No.1 and DG No.2 — treated · DG No.3 — control, conventional repair

DOCUMENT TYPE

Report signed and stamped by the laboratory

DIESEL	OPERATING HOURS AT START OF TESTS	WHAT WAS MEASURED
DG No.1, 6VAN-22 — treated	**65 584 h** since installation, **3 129 h** since factory overhaul	compression and combustion pressure, metals in oil, oil pressure, vibration
DG No.2, 6VAN-22 — treated	**64 282 h** since installation, **2 854 h** since factory overhaul	same; treatment with the cylinder heads removed at the crew's request
DG No.3, 6VAN-22 — control	**68 052 h** since installation, **4 752 h** since factory overhaul	same; conventional running repair with replacement of valves and bearing shells

ZGODA-SULZER diesels, 375 hp, 500 rpm, installed on the vessel in 1965. Measurements at N=150 kW, n=500 rpm.

Key results

↑ 20-33 %

compression pressure across cylinders, 27-31 → 35-40 kgf/cm²

↓ 22-44 %

iron in wear debris, 38-75 → 29.5-42 g/t

↓ 4.4×

cost of one hour of restored service life, 7.17 → 1.64 UAH/h

Compression pressure Pc by cylinder, kgf/cm²

CYLINDER	DG No.1 BEFORE	DG No.1 AFTER	DG No.2 BEFORE	DG No.2 AFTER
1	30	36	30	38
2	30	38	30	39
3	29	38	27	35
4	30	40	31	38
5	29	37	30	36
6	30	40	30	36

Average gain — **8.5 kgf/cm²** (DG No.1) and **7.3 kgf/cm²** (DG No.2); the permissible Pc value for this diesel type is **44 kgf/cm²**.

Iron in wear debris — treated diesels versus the control one

DIESEL	BEFORE	AFTER	CHANGE	HOURS RUN AFTER REPAIR
DG No.1 — XADO technology	75.0 g/t	42.0 g/t	−44 %	285 h
DG No.2 — XADO technology	38.0 g/t	29.5 g/t	−22 %	499 h
DG No.3 — conventional repair	43.0 g/t	37.0 g/t	−14 %	54 h

X-ray spectral analysis of oil samples; the maximum permissible iron content is **100 g/t**. In the control diesel, chromium and nickel appeared after the repair.

Cost of restored service life

DIESEL	TECHNOLOGY	COST	RESTORED SERVICE LIFE	HOUR OF SERVICE LIFE
DG No.1	XADO technology without disassembly	**6 576 UAH**	**4 000 h**	**1.64 UAH/h**
DG No.2	XADO technology with the cylinder heads removed at the crew's request	**20 921 UAH**	**4 000 h**	**5.23 UAH/h**
DG No.3	Conventional running repair	**14 345 UAH**	**2 000 h**	**7.17 UAH/h**

The restored service life was calculated by the laboratory from the rate of iron accumulation in the oil; the costs are given without the cost of the replaced parts and spares.

Laboratory calculation from the measured gain in compression pressure

DIESEL	GAIN IN EFFECTIVE POWER	FUEL SAVING
DG No.1 — XADO technology	**+6 kW**	**37.5 kg/day**
DG No.2 — XADO technology	**+5 kW**	**31 kg/day**

Laboratory calculation from the measured Pc gain: effective efficiency **0.4**, hourly fuel consumption **67.7 kg/h**.

Conclusions of the Laboratory of Technical Diagnostics

Two diesel generators with more than **64 000 hours** of operation were treated without taking the vessel out of service; the third one, found unfit for further work, was repaired conventionally and served as the control. The laboratory recorded:

1. The use of the restoration technology without disassembly ensured the restoration of the technical parameters and a reduction in the wear rate of the cylinder-piston group parts of diesels DG1,
2.
2. The cost of restoring one hour of service life of a 6VAN-22 type diesel by the new technology without disassembly is **4.4×** lower than with the conventional repair method (without accounting for the cost of the spares consumed).
3. The use of the new technology of restoration of ship machinery without disassembly makes it possible to carry out their scheduled repair without disassembly in shorter time and without taking them out of service, with the repair cost reduced approximately **4×** and the consumption of spares reduced by approximately **70-80%**.

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The results refer to the auxiliary marine diesel generators 6VAN-22 (ZGODA-SULZER) of the m/v “Omega” with more than 64 000 hours of operation; on other units and under different operating conditions the figures may differ. The original report with signatures and stamp is published in full and is available for download.