

TECHNICAL INSPECTION REPORT OF RECONSTRUCTION OF HYDRAULIC MOTOR A2F BY MEANS OF HADO-TECHNOLOGY

*The hydraulic motor was furnished within the framework of cooperation with company "COLUMBIA CHIPMANAGEMENT LTD" LIMASSOL – CYPRUS providing the services of repair and restoration of marine and harbour equipment.
Tanker "NATA", port of registry – Marshall Islands.*

On 21 September 2001, a hydraulic motor (of type A2F) was furnished by firm "TERRANOVA" for the purpose of flaw detection and determination of wear coefficient of the cylinder-piston group, bearings and high-precision couples. Having carried out complete dismantling of the hydraulic motor, the committee, comprised by the Technical Director of SIA "SimSS AUTO" Ilmar **AUSEKLIS**, Technical Director of SIA "A.C.B." Yevgeniy **SALTANOVICH**, and a representative of SIA "TERRANOVA" Sergey **SOKOLOV**, came to the following conclusions:

1. The surfaces of high-precision couples along with the cylinder-piston group have been subjected to intensive wear and exhibit deep blisters, scuffings and scratches presumably resulting from the influence of corrosive medium and the ingress of solid particles.
2. The bearing's condition may be described as satisfactory, although a certain noise becomes audible during its rotation.
3. The gland is absent.

The task was set to restore the worn-out sections of the unit using HADO-technology and to prepare the hydraulic motor for service.

For this purpose, the hydraulic motor was mounted onto a stand used for the reconstruction of hydraulic systems, and on 25 September of the current year its treatment was commenced.

Oil leakage indications had been read beforehand using the high-precision couples and the cylinder-piston group, and the motor's operating temperature measured.

At the first stage of the treatment, oil leakage amounted to 21,7 litres within 30 minutes of operation. The motor's temperature was not measured but apparently exceeded its norm.

The total volume of the stand's oil system constitutes 20 litres. The oil grade is HLP-46.

The treatment was carried out in three stages as per formula 2+3+2 (number of tubes per one stage). According to the instruction, every treatment stage was implemented after 8 hours of the unit's operation.

After 18 hours of operation, oil cross-over values were measured. The cross-over amounted to 7 litres within 30 minutes, i.e. decreased by more than three times. The motor's temperature fell considerably and returned into its normal state.

After 40 hours of running on the stand, the hydraulic motor was demounted off the stand and subjected to partial dismantling. It was visually determined that blisters and scratches on the working surfaces on the end face of the cylinder block, hydrodistributor and the cylinder-piston group had practically disappeared. The surfaces exhibited mirror shine, typical of metal ceramics. The sites of metal

processing were practically even and smooth to the touch. However, the deepest blisters on the working surfaces of the cylinder block end and the hydrodistributor had not been entirely removed.

After the inspection, the motor was mounted back onto the stand for further operation. In 60 hours of operation after the onset of treatment, oil cross-over dropped to 6 litres. Thereupon the motor was dismantled completely for examination. Blisters and scratches on the surfaces of high-precision couples had practically disappeared. The surface was even and smooth. Metal ceramic layer was discovered at the sites of the closest mating of details. Walls of cylinders contained visually detectable scratches. However, the cylinders' surfaces appeared perfectly smooth to the touch due to possessing a metal ceramic layer. The pistons revealed metal ceramic layers as well, which was particularly noticeable in their upper parts, exposed to the maximum load. During rotation, the bearing no longer produced the noise which was audible before the treatment.

The motor is fit for operation in the design mode.

At the request of the representatives of firm "TERRANOVA", the experimental treatment of the hydraulic motor was continued. The experiment's essence consisted in the following: working surfaces of the end face of cylinder block and hydrodistributor were additionally ground on a grinding machine to achieve their maximum fitting to one another. The treatment of the hydraulic motor was then continued on the stand using HADO-technology during 15 hours. This resulted in the oil cross-over dropping to 5,4 litres.

The experiment results allowed to conclude that treatment of the hydraulic motor by means of HADO-technology without its dismantling in the design operating mode provides an absolutely positive effect. When conducting the procedure on a stand, it is advisable to execute preliminary grinding of the surfaces to be processed (except the cylinder-piston group and the bearings) and to implement the HADO-treatment afterwards, which enables the formation of metal ceramics on previously prepared surfaces and brings them into the optimal condition.

The economic effect is unquestionable. Whilst the price of a traditional repair of the hydraulic motor reaches 300 lats, reconstruction by means of HADO-technology cost as much as 102 lats. The savings amounted to 66 %.

Signatures of the committee members:

I. AUSEKLIS _____ *SIGNATURE*

Y. SALTANOVICH _____ *SIGNATURE*

S. SOKOLOV _____ *SIGNATURE*

10 October 2001

Seals applied

"Approved"
Director of Productive-Commercial
Enterprise "Serna"

SIGNATURE A. I. Yershov

Seal

"Approved"
Deputy Manager of Government Enterprise
"Ukrvodput"

SIGNATURE G. N. Medvedev

Seal

ACT

The present act is drawn up to certify that according to Agreement 19 of 11.04.01, productive-commercial enterprise "Serna" has carried out a treatment of motor 4Ch 8, 5/11, mounted on "SZ – 16", using repair and reconstruction practices of HADO-technology in the operating mode.

The results of the performed works are as follows:

Name of parameter	Before the treatment	After the treatment
Oil pressure at t = 78 °C (kg/cm ²); at 800 rev/min at 1400 rev/min	0,6 1,25	1,5 2,0
Duration of the motor's service with 50 ml of fuel (sec) at 825 rev/min with unloaded screw at 1450 rev/min with loaded screw	157 28	162 33
Dimensions of the cylinders (mm): 1 2 3 4	85, 068 85, 062 85, 140 85, 090	85, 030 85, 030 85, 110 85, 060
Pressure in the cylinders (kg/cm ²): 1 2 3 4	25,5 24,0 24,0 25,5	26,0 26,0 26,0 26,5

The motor's noisiness was abated and the acceleration capacity improved.

Since the treatment is considered accomplished after 50 hours of the motor's operation, and the concerned motor has been running for only 16 hours after the completion of its repair and reconstruction, further improvement of its parameters shall take place during subsequent operation.

The results of applying repair and reconstructive technology for the reconstruction of the internal-combustion engine in the operating mode render it expedient to be used instead of the traditional reconstructive repair procedure.

Head of the Marine Economy Service *SIGNATURE* A. Y. Vilchuk

Linear Mechanical Engineer *SIGNATURE* A. N. Snegur

Commander of Hydraulic Dredge DS-63 *SIGNATURE* N. P. Vut

Introduction Department Chief *SIGNATURE* V. E. Timoshenkov

"Approved"
Director of Productive-Commercial
Enterprise "Serna"
SIGNATURE A. I. Yershov
Seal

"Approved"
Deputy Manager of Government Enterprise
"Ukrvodput"
SIGNATURE G. N. Medvedev
Seal

ACT

The present act is drawn up to certify that according to Agreement 3 of 4.07.01, production-commercial enterprise "Serna" has carried out treatment of motor 64N 18/22, mounted on DK hydraulic dredge "Y. Kolodochka", using repair and reconstructive practices of HADO-technology in the operation mode.

The results of the performed works are as follows:

Name of parameter	Before the treatment	After the treatment (100 h)	After the treatment (500 h)
Oil pressure at $t = 65\text{ }^{\circ}\text{C}$ (kg/cm ²): at 750 rev/min	2,8	3,4	3,4
Duration of the motor's service with 3,5 l of fuel at 750 rev/min, the generator being loaded, sec	492	528	557
Fuel consumption under the load, kg/h	21,5	20,04	19,0
Pressure in the cylinders, kg/cm ² :			
1	24,3	26,0	29,0
2	24,0	26,0	30,0
3	24,3	28,0	31,0
4	24,8	28,0	31,0
5	22,6	24,0	31,0
6	24,0	24,0	30,0

On completion of the treatment, the parameters were measured after 100 and 500 hours of the motor's operation.

Noisiness and vibration of the motor were reduced, and its launch improved.

The results of applying repair and reconstructive technology for the restoration of marine motors in the operating mode instead of the traditional repair procedure is to be considered positive.

Head of the Marine Economy Service SIGNATURE A. Y. Vilchuk

Introduction Department Chief
of Productive-Commercial
Enterprise "Serna"

SIGNATURE V. Z. Timoshenkov