## EFFECT OF LONG-TERM STORAGE AND FLOWING SEAWATER ON DYNAMIC CHARACTERISTICS OF ALUMINUM BRONZE

G. G. Savenkov<sup>1, 2</sup>, M. S. Smakovsky<sup>1</sup>, E. V. Koptyaev<sup>1</sup>, E. A. Itin<sup>3</sup>, A. K. Lomunov<sup>4</sup>

<sup>1</sup>Machine-Building Plant "Armalit", St. Petersburg, Russia

<sup>2</sup>Saint-Petersburg State Institute of Technology, St. Petersburg, Russia

<sup>3</sup>Central Design Bureau for Marine Engineering "Rubin", St. Petersburg, Russia

<sup>4</sup>Research Institute for Mechanics, National Research Lobachevsky State University of Nizhny Novgorod, Nizhny Novgorod, Russia

Aluminum bronze of BrAZhNMts 9-4-4-1 GOST 18175-78 grade, used in marine engineering for manufacturing elements of ship and ship fittings, was studied after storage in an unheated warehouse for 30 years. Standard mechanical characteristics (according to GOST 1497) of the bronze under study in the baseline state were as follows:  $\sigma_{0.2} = 385 \pm 15$  MPa,  $\sigma_B = 725 \pm 5$  MPa,  $\delta_5 = 35 \pm 1\%$ ,  $\psi = 36 \pm 1\%$ .

Aluminum bronze samples after storage were kept in containers with running water (simulating sea water) for 75 and 135 days. The scheme of corrosion tests is shown in Fig. 1. The water circulation speed was 6 m/s. The water temperature was 25°C. A 30 dm<sup>3</sup> container was filled with seawater with a salt content of 33 ppm.



Fig. 1. Scheme of experiment:

1-J ebao AP-300 pump, 2-test samples, 3-container (arrows indicate the direction of water flow)

All samples after storage were tested by the Kolsky method using the split Hopkinson rod technique on the RSG-20 [1]. The test results of the samples from the bronze under study after 30 years of storage, but not treated by flowing seawater are given in Table 1, those treated by flowing seawater – Table 2.

Table 1

Deformation rate $\dot{\epsilon}$ , s <sup>-1</sup>	Yield strength $\sigma_{Sd}$ , MPa	Tensile strength $\sigma_{bd}$ , MPa	Ultimate elongation $\delta_d$ , %	Relative constriction $\psi_d, \%$
1200	$225\pm25$	$360\pm60$	$21.5\pm6.5$	$22.5 \pm 1.5$
1500	$300\pm20$	$365\pm50$	$22.5\pm4.5$	$23.5\pm5.5$
1900	$290\pm10$	$345\pm30$	$19.5\pm0.5$	$15.5 \pm 2.5$

Xesuits of dynamic tests of DIAZINWIZ 9-4-4-1 after storage
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Table 2

<b>1</b>		0 0		0
Deformation rate $\dot{\epsilon}$ , s <sup>-1</sup>	Yield strength $\sigma_{Sd}$ , MPa	Tensile strength $\sigma_{bd}$ , MPa	Ultimate elongation $\delta_d, \%$	Relative constriction $\Psi_d$ , %
1000	$200 \pm 20$	$240\pm5$	$22.5 \pm 2.5$	$22.5 \pm 2.5$
	$\overline{190\pm40}$	$245 \pm 25$	$21.5 \pm 4.5$	$22 \pm 2.5$
1200	$190 \pm 25$	$265 \pm 15$	$21.5 \pm 3.5$	$20.5 \pm 3.5$
	$\overline{175\pm30}$	$240\pm5$	$19 \pm 1.0$	$\overline{15.5\pm2.0}$
1500	$245 \pm 25$	$290\pm25$	$20.5 \pm 3.$	$18.5\pm2.5$
	$\overline{195 \pm 15}$	$245 \pm 5$	$17.5 \pm 5.0$	$\overline{12.5\pm3.5}$

Experimental results after storage and holding of bronze in flowing sea water

Note: in the numerator are results after aging 75 days, in the denominator - after 135 days.

Analyzing the results presented in Table 1 and comparing them with the results presented in Table 2 and paper [2] showed that:

1. After storage, both dynamic strength characteristics (yield strength and tensile strength) dropped sharply by a factor of 2 and dynamic plasticity characteristics (ultimate elongation and relative contraction) by a factor of 1.5.

2. Exposure to flowing seawater resulted in a slight decrease in dynamic strength characteristics, with virtually no change in ultimate elongation values and a 10–20% decrease in dynamic relative elongation values.

3. Exposure to flowing sea water led to stabilization of the properties of the bronze under study (the scatter of characteristic values became much smaller).

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## References

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