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INVESTIGATION OF THE ANTI-FRICTION PROPERTIES OF A POLYMER FIBROUS MATERIAL

A significant need for anti-friction alloys, combined with their high cost and scarcity, necessitates the ongoing search for new materials suitable for manufacturing sliding bearings without the use of bronzes and babbitts. Any newly developed alloys, pseudo-alloys, or non-metallic materials for these friction assemblies must offer a broad spectrum of properties: satisfactory running-in behavior, a low coefficient of friction, high wear resistance, and minimal wear of the mating part [1–3], in order to ensure effective operational performance.

In the present study, the tribological characteristics of the polymer-fibrous material "Daklen" were examined with a view to its application in sliding bearings. A comparative test was conducted between this polymer and the anti-friction bronze CuSn10P under sliding friction conditions. Experiments were performed on an SMC-2 test rig using the "disk-pad" friction scheme [1], at a sliding speed of V = 0.78 m/s and lubricated with I-20A oil. The disk was made of C5 steel, while the blocks were of bronze and of the polymer. The polymer, in the form of a fabric, was bonded onto a steel backing. The coefficient of friction – one of the most critical indicators of the performance of a friction pair—served as the evaluation criterion.

Graphical dependencies of the friction coefficient f on the load P (contact pressure) were obtained for both materials. For bronze, as the load increased from P = 1 kN to P = 5 kN, the coefficient of friction decreased from f = 0.08 to f = 0.05, passing through a minimum. This behavior is consistent with the well-known empirical formula describing the coefficient of friction under elastic contact conditions, which also applies in this case. In contrast, the polymer material exhibited a different trend: during the initial loading phase (from 1 kN to 2.5 kN), f increased from 0.01 to 0.03, reaching its maximum value (f = 0.03), which remained nearly constant as the load continued to rise from 2.5kN to 4 kN. Upon further increase of the load, the coefficient of friction begins to decrease. Next, an intensive wear-in period ensues: the coefficient of friction rises sharply and the material becomes inoperative. This behavior is corroborated by the empirical formula for the coefficient of friction under plastic contact conditions.

Analysis of the obtained data shows that the anti-friction properties of the polymer "Daklen" surpass those of bronze BrO10F1 in the load range of 1–4 kN. Therefore, this material is economically justified for use in sliding bearings.

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