



ANALYSIS OF ABRASION DURABILITY OF GLAND SEALS IN HYDRAULIC EQUIPMENT FOR QUARRY EXCAVATION

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Annotation. *Effective operation of crankcase hydraulic excavators in a hydraulic system is significantly affected by temperature conditions. In the hydraulic system, a sharp increase in the temperature of the working fluid or of the parts on which the packing gaskets are applied leads to burning of the packing gaskets, resulting in a loss of their elasticity and an increase in their hardness.*

Keywords. *hydraulic systems, technical and technological solutions with high performance, hydraulic excavators, RH-40E.*

The practice of use of quarry hydraulic excavators in the world shows that the existing hydraulic system of excavators is considered to have a number of significant shortcomings, depending on the nature of operation. As the degree of contamination of hydraulic working fluids increases and their operational life decreases, scientific research is being conducted on intensive absorption of abrasive by hydraulic system parts. Malfunctions of parts of the hydraulic system of the quarry hydraulic excavator are divided into the following groups:

- faults of high-pressure hoses, pipes and fittings (fittings) in their connecting part;
- breach of tightness in the system (glands, seals);
- hydraulic pump malfunctions;
- hydraulic motor failures;
- failures in hydraulic drives;
- failures of control equipment;

- failures of hydraulic cylinders.

Materials and methods

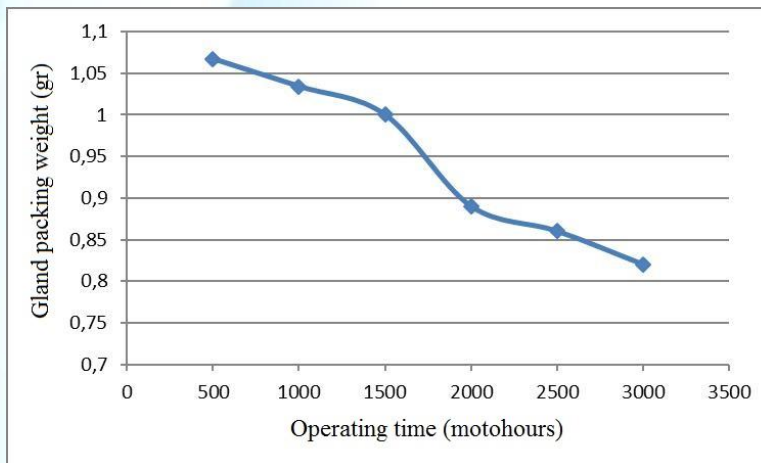


FIGURE 1. Graph of dependence of abrasive absorption capacity of the gland seal developed by domestic manufacturers on the duration of operation

The original weight of the gland seal developed by domestic manufacturers was 1.1 grams. After RH-40e was installed in the hydraulic system of branded excavators and worked for 500 engine hours, its weight was reduced by 3%, the operating time was increased to 2000 engine hours, and every 500 engine hours the weight of the packing gland seal began to decrease by 3%. And when the operating time exceeded 2000 motor-hours, the weight of the packing gland was reduced by 5÷6% every 500 motor-hours. A sharp decrease in the weight of the gland packing when the duration of operation exceeded 2000 motor-hours, is explained by the increase in the content of abrasive particles (dust, metal) in the hydraulic fluid.

In the experimental tests to investigate the abrasion resistance of the proposed gland seals, these gland seals also showed high performance. As can be seen from the graph shown in Figure 5, it had almost no weight loss when operated up to 1500 engine hours. When operation exceeded 1,500 motor-hours, every 500 motor-hours reduced weight by an average of 2% over the period of operation.

Factors affecting the absorption of packing densities by a hydraulic excavator include: the gravity of the fluid acting on the material, the resistance of the material, the volume of the fluid, the number of particles in the fluid, the temperature of the fluid, and temperatures acting on the surface of the material.

The effect on the intensive absorption of seals A.P. Based on Malyshev's theory, the similarity method and size is determined by the dependence function of a complex of dissimilar dimensions [4].

The intensive absorption of material and parts during waterproofing depends on the following expression:

$$I = \varphi(v, \rho, d, \alpha, H_a, H_m, m, \sigma_a, \sigma_m, O, T, t, A), \quad (1)$$

The initial weight of Caterpillar packing gland seal was 0.98 grams. This packing gland seal showed its efficiency in operation, practically did not lose weight in operation up to 1500 motor-hours. When the operation exceeded 2000 motor hours, every 500 motor hours began to lose weight by an average of 0.5 per cent during operation.

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