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RESULTS OF ANALYSIS OF RELIABILITY INDICATORS OF AXIAL-PISTON HYDRAULIC MACHINES

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A detailed analysis of the reliability indicators of axial-piston hydraulic machines shows that a significant share (44%) of all malfunctions is caused by the pumping units of the pump and motor. Judging by the type and nature of wear of parts of the pumping unit, it can be said that they are caused mainly by hydro abrasive and cavitation wear, which are caused by the content of mechanical particles and dissolved air in the working fluid [1, 2]. Under the influence of impurities, high temperature and the presence of air in the working fluid, the acid number changes, and the additives in the fluid are destroyed. The dustiness of the air during the operation of mobile agricultural machines and directly in the area of the hydraulic drive elements is so high that after 50-60 hours of operation of the machine, the contamination of the working fluid exceeds the 10th class, and after 200-300 hours of operation, the contamination is 8-15 times higher than the limit value. Atmospheric dust enters the hydraulic system through the sealing of hydraulic cylinders, air cleaning devices (breather filter) and when topping up the working fluid. When machines are put into operation, all friction pairs in hydraulic units are run-in, which in the first 50-60 hours of their operation causes contamination of the working fluid with run-in residues. The concentration of contaminants in the working fluid, which is used in the technological process of repairing the hydraulic drive of construction and road machines, exceeds the permissible limit: in baths by 20-27 times; in stands 6-16 times; in the liquid fed into the hydraulic drive, 3-10 times [1, 2]. Mechanical contaminants that have entered the working fluid are in a suspended state and move with it along the hydraulic flow. Getting into the gap between the surfaces by friction pairs, dirt particles can lead to increased wear of the parts of the couplings, an increase in the force of movement of the parts, and their jamming, acceleration of the oxidation process of the working fluid and deterioration of its operational properties [3]. The increased concentration of mechanical impurities in the working fluid has a negative effect primarily on hydraulic machines, which include precision pairs, in particular volumetric axial-piston hydraulic pumps and hydraulic motors. Volumetric hydraulic machines (DSTU 17752-2001) include pumps and pump-motors, the working process of which is based on alternately filling

the working chamber with the working fluid and squeezing it out of the working chamber. Running-in of hydraulic machine parts is primarily carried out by idling with gradual loading in order to prevent damage to the friction surfaces of the parts at the beginning of their operation. One of the main indicators of run-in is the transition of the surface quality characteristics from the initial state after the final technological treatment to operational roughness. Run-in [3] refers to the process of changing the geometry of the friction surface and the physical and mechanical properties of the surface layers of the material in the initial period of friction, which usually manifests itself under constant external conditions in the reduction of friction work, temperature and wear intensity. As a result of running-in, the biggest irregularities that appear are smoothed out, the original ones are partially or completely destroyed and new ones are formed, different from the original ones in terms of shape and size. At the end of running-in, the roughness is established, which does not depend on the size and nature of the initial roughness obtained during mechanical processing, but depends on the wear conditions (the material of the friction pairs, pressure, temperature on the friction surface, lubrication conditions, the presence of impurities in the lubricating fluid, etc.). This roughness is optimal for the given friction conditions and ensures minimal wear. It can be both more and less than the original. In the period of stationary wear, which occurs after running-in, this roughness is reproduced in the entire subsequent process of normal operation of the friction pair. The hydraulic drive is an integral part of the mobile machine, therefore its reliability depends on the efficiency of its work, the timely performance of the specified amount of work and the costs due to downtime and repairs. The reliability of the hydraulic drive is established at the design stage, and is maintained at a given level during the operation of the machines. The reliability of the hydraulic drive during operation is realized. In addition to the parameters and conditions laid down in the design and production process, the reliability indicators are influenced by the methods and conditions of operation, the adopted system of maintenance and repairs, modes of operation and the qualifications of the service personnel.

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