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INVESTIGATING STEEL-MOLYBDENUM COATING STRUCTURE TO INCREASE DURABILITY OF PISTON RINGS

Increasing reliability and durability of machine components is one of major problems that modern engineering face. This problem can be solved by developing new technologies of processing machine parts that are subject to friction and depreciation.

The well-known strengthening technologies have some disadvantages, namely: strengthening can cause changes in the micro-geometry of parts, surface distortion and internal stresses, it also affects the operability of the machine and requires special and expensive conditions [1, p. 68].

This scientific research is devoted to investigating the structure and features of steel-molybdenum coated piston rings. In the course of investigation, the coatings were implemented to the piston rings made of high-strength cast iron. The piston rings have been arranged into groups of twenty to be covered with the steel-molybdenum coating. On the working surfaces of the piston ring groups, a special groove is made under the coating to improve the adhesion between the coating and the substrate [2, p. 97].

The technological process of applying the steel-molybdenum coating to the piston ring groups includes the following stages: preliminary cleaning, bead blasting treatment, spraying [3, p. 125].

Molybdenum and steel wires are supplied at a certain speed. The coating is deposited through an electric arc spray process. The molybdenum wire is connected to the positive terminal of the power source and the steel wire is connected to the negative terminal.

Steel-molybdenum coating structure has been investigated using a metallographic microscope with magnifications of X100, X300.

The microstructure of the coating has typical characteristics of gas thermal coatings layered with uniformly spaced pores.

The porosity of the coating contributes to an increased oil usage of the rings, which can positively influence both running-in procedure of the sleeve-the piston ring pair and the performance of the piston ring group.

The results indicate that the steel-molybdenum coating is more wear-resistant than chrome plated one. The steel-molybdenum coating has a low coefficient of friction.

The investigation of the structure of the steel-molybdenum coating has shown that it has a heterophane structure. The porosity of steel-molybdenum coating contributes to the increased oil usage of the rings. The coefficient of friction of the steel-molybdenum coating is 20% lower than that of the chrome plated coating for all the loads under consideration. The wear magnitude of the chrome ring is 2 times higher than that of the ring with a steel-molybdenum coating.

References

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