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IMPROVING THE QUALITY OF GLANCING THE FRICTION SURFACES OF AUTOMOTOR ENGINE PARTS: PARAMETERS, METHODS, AND OPTIMAL CONDITIONS.

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Abstract: The quality of smoothing the friction surfaces of engine parts is important for its long-term and efficient operation. In the current literature, the methods of grinding are insufficiently covered, and a unified system of indicators has not been developed. The quality of grinding is influenced by the physical and mechanical properties of the materials, the quality of processing, the lubricating material, and the conditions of friction. Taking these factors into account, optimizing the grinding process extends the service life of engine parts and increases operational efficiency.
Keywords: engine, friction surface, grinding, physical and mechanical properties, lubrication, processing

Introduction. The issue of improving the quality of friction surfaces depends on the quality of grinding the mechanism consisting of these friction parts, since as a result of grinding, the wear of engine parts ydecreases significantly even during the period of stable wear yof the engine's subsequent operation period.
Despite the above, the methodology for polishing engine parts is not sufficiently covered in the current literature. At the same time, a unified system of indicators characterizing the quality and methods of grinding engine parts has not been developed. This circumstance can be explained by the difficulty of choosing grinding parameters and the lack of justification for the optimal conditions for its implementation [1].
Based on the above analysis, the following main factors affecting the grinding of engine parts can be identified:

1. Physico-mechanical properties of materials on friction surfaces;

2. Quality of machining of friction parts (purity of the surface, deviation from the geometric shape, etc.);

3. Type of machining of working surfaces of parts (thermal, chemical-thermal, electrical, chemical, etc.);

4. Quality of assembly of contact surfaces (deviations from alignment and perpendicularity);

5. Quality of lubricating material (viscosity, degree of acidity or alkalinity, type and amount of additive in the oil, presence of foreign mechanical impurities, their types and sizes) [2];

- ambient temperature (temperature of friction surfaces, coolant, lubricant, and oil pressure;
- the speed of movement of friction surfaces relative to each other, their compatibility and their change over time;
- the amount of specific pressure (load) acting on the friction surface, the nature of their application, and their change over time;
- stagedness or continuity of grinding in terms of friction speed and load;
- Rolling stages: cold, hot in no-load mode, hot under load.

Methodology. From the above, it can be seen that, despite many years of experience of engine manufacturers and repair enterprises, the issue of engine grinding is organized on the basis of practical experience.
In recent decades, some research has been conducted on the issue of engine grinding. They are mainly devoted to the selection of lubricant used for grinding engine parts and the justification of the grinding stage.
A.L. Khokhlov, V.V. Varonkov used low-viscosity (industrial grade 12) oil in their research on the grinding of the Zil engine, as a result of which the grinding time was reduced from 55 minutes to 31 minutes, and the wear resistance of the friction surfaces during grinding on the stand increased by two timesa [3].
Research has shown that grinding engines at low speeds is not advisable, since in the initial period of grinding (5-10 minutes), the wear of friction surfaces increases hundreds of times compared to high speeds. Syrbakov A.P. emphasized that cold grinding of engines without loading is an unnecessary process. At the same time, they showed that during the grinding period, at a coolant temperature of 25oC, the wear in the engine is 5 times higher than at normal temperatures, and at 50oC, the wear is 1.6 times higher [4].
At the same time, great attention is paid to cold grinding of engines. According to S.P. Bazhenov, B.N. Kazmin, and S.V. Nosov, cold grinding of the friction surfaces of cylinder-piston group parts is of great importance for increasing their service life [14;92-b]. However, in most repair enterprises, repaired engines are not subjected to cold running-in, or even if they are, they are run-in using the oil used in operating conditions. In cold rolling , the viscosity of such oils is tens of times higher than the viscosity of oils recommended for grinding. If we consider that cold grinding is carried out at low crankshaft speeds (100-300 rpm), then after repair in newly assembled engines, due to insufficient oil pressure and small gaps between the friction surfaces, the wear rate of the parts yincreases.
It should be noted here that cold rolling of engines often is carried out with the cylinder head removed, which is, of course, a mistake, since when the head is fixed in place after grinding, deformation of the cylinder and liner (up to 20 μm) occurs, which, in turn, leads to additional costs and measures to eliminate it.
The authors emphasized that cold grinding of engines without loading is an unnecessary process [13; 110-b]. At the same time, they showed that during the grinding period, at a coolant temperature of 25oC, ywear in the engine y is 5 times higher than at a normal temperature, and at 50oC, the wear is 1.6 times higher.
Result and discussion. Studies conducted in Russia have shown that a reduction in rolling time can be achieved by changing its modes and the viscosity of the oil. For example, the rolling time of a

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passenger car engine using a mixture of motor oil (50%) and industrial oil 12 (50%) was reduced from 165 minutes to 80 minutes (see Table 1).

1-table

Methods of surface treatment of parts

No	Cutting method	Initial accuracy, quality	Achieved accuracy, quality	Surface roughness, μm
1.	Grinding	16...18	15...16	greater than 100
2.	Primary processing	15...16	12...14	75...125
3.	Semi-clean processing	12...14	11...12	40...60
4.	Finishing	11...12	8...11	10-15
5.	Fine processing	8...11	7...8	2.5
6.	Finishing	7...8	6...7	0.63
7.	Honing	6...7	4...6	0.16
8.	Smoothing	4...6	up to 5	up to 0.05

Conclusion. The transition from a rough initial state to a smooth working state during processing involves complex mechanical, physical, and chemical processes.

In the process of polishing ICE parts with a porcelain cutter, the geometric and other characteristics of the parts change, i.e., they wear out, the cause of which is friction. This type of friction affects both the workpiece being machined and the porcelain cutter. The wear resistance of parts due to friction against the fastened porcelain cutter depends on their hardness.

One of such pairs in automobile engines is the crankshaft journal, which should not only handle the largest loads but also be able to operate under maximum increased voltage during startup.

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