Nano- and ultradisperse powders of superhard materials as modifiers of liquid lubricant

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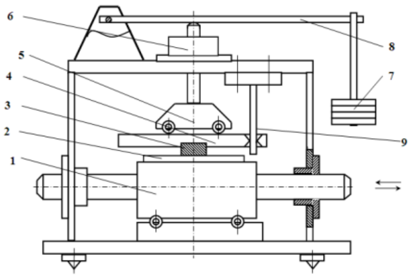
Resource and mobility of tribocoupling of machine components depend not only on the type and quality of materials, careful manufacturing details from them, operation conditions, but also on the lubricants used in their work. The initial period of running-in of friction pair elements is a particularly crucial moment, and formed favorable conditions for their contacting form in the future.

Structural, technological and operational features of assembly units are very diverse, so it is recommended to use a specific lubricant for each particular case. Such a recommendation is advisable to use depending on the period of operation of the mechanism since interaction conditions of tribological conditions are continuously changing therein over time.

Properties of lubricants are regulated by the introduction of certain additives to the base oil that can help to reduce friction and wear of the assembly parts. Tribological tests were performed on an automated lubrication tribometer.



a

b

Fig. Plot (*a*) and appearance (*b*) of automated tribometer

The purpose of this work was to investigate in terms of the oil I 40 the effect of the additives of synthetic diamond nanodisperse (7–8 nm) powders and silicon carbide ultradisperse (7–12µm) powders on the running-in and lubricant ability. Diamond as well as silicon carbide has extremely high hardness (10.0 and 9.8 scores on Mohs scale, respectively).

However as it has been established during AFM analysis due to extremely high dispersion, the abrasive properties of the first one are virtually absent, and in the second one they are expressed to a small extent. Whereas the particle size of the powder modifiers is less or equal the size of the surface irregularities the process of components breaking-in at the presence of oil with these powders additives occurs mainly not by the removal of microroughness on their surface, but by filling roughness of the relief and leveling the surface. This provides an increase in the bearing area of twin contact and more uniform load distribution over the surface. As a result, a specific load in tribocontact decreases. Furthermore this mechanism of breaking-in of tribocouplings, that is implemented by modifying the oil with these dispersions, provides a significant (1.5–2 times in comparison with the oil without additives) reduce of its duration and also affects on the wear resistance of the friction pair and the coefficient of friction.

The most notable reduction of the linear wear and friction coefficient are recorded using diamond nanomodifier.