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IMPROVING OPERATIONAL PROPERTIES GREASES BY INJECTION LAYERED SOLID MATERIALS

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Annotation: *Currently, the automotive industry produces a huge number of modern cars, of various models, for the operation of which fuels and lubricants are needed. An important place in this case is occupied by lubricants - greases. Greases are greasy substances that have certain physico-chemical and operational properties. The purpose of this work is the possibility of using solid lubricants together with traditional ointment-like greases.*

Keywords: *lubricants, crystalline substances, graphite, molybdenum disulfide, specific load.*

Currently, the automotive industry produces a huge number of modern cars, of various models, for the operation of which fuel and lubricants (fuels and lubricants), special liquids, etc. are needed.

An important place in this case is occupied by lubricants - greases. Well-known greases are greasy substances that have certain physico-chemical and operational properties. However, recently, the designs of various car units have improved and, in this regard, the requirements for operational materials, including greases, have become stricter.

Today, lubricants with improved properties are already needed and relatively new ones can be attributed to them - solid lubricants with higher antifriction properties. Therefore, the study of the properties of solid greases is of particular interest for the prospect of their widespread use.

The purpose of this work is the possibility of using solid lubricants together with traditional ointment-like greases. A characteristic feature of solid and plastic lubricants is that these materials are in an aggregate state, excluding their leakage from the friction unit. Due to this, it is possible to lubricate unpressurized friction units, there is no need for continuous supply of lubricant. This provides such advantages in comparison with oils as: - reducing the consumption of lubricants; - simplifying the design, and therefore increasing the reliability and reducing the metal consumption of the mechanism; -reduction of operating costs.

Solid layered lubricants are crystalline substances with lubricating properties: graphite, molybdenum and tungsten disulfides, boron nitride, selenides and tellurides of tungsten, titanium, etc. Graphite is one of the most common dry lubricants. It is known as one of the allotropic states of carbon. It has a hexagonal structural lattice in which parallel layers of matter are located at a distance of 3.44 A. Graphite fills well the technological irregularities of the microprofile of the friction surface, forming a smooth mirror surface.

The speed of relative sliding has little effect on the coefficient of friction of graphite, while the specific load has a significant effect on it. With an increase in the specific load to 450-500 N/mm2, the coefficient of friction decreases rapidly (to about 0.03). The material of the rubbing parts is of great importance. Graphite AG-1500 works best in combination with cast iron and chromium, graphite E — with steel and chromium. The stronger the metal oxide film, the better graphite works. Graphite works the worst on copper. In this case, its wear is 18 times greater than when working on chrome, which is one of the reasons for the rapid wear of brushes of electric motors and generators.

Graphite is used as an additive to various lubricants, as a dry lubricant in the form of a fine powder or as a self-lubricating material. The properties of molybdenum disulfide as a lubricant were known as early as the 16th century. Recently, many studies have been conducted on the use of this compound as a lubricant. It has been established that MoS2, like graphite, has a hexagonal structure. The distance between the nearest molybdenum atoms in the lattice is 2.41 A, and between the sulfur atoms in the nearest layers is 3 A.

The coefficient of friction decreases with increasing specific load, reaching 0.02 (at 2800 MPa). It is used as a dry lubricant or as an additive in liquid and plastic lubricants. Graphite and molybdenum disulfide have a pronounced layered structure and have strong anisotropy of mechanical properties. On the friction surface, the particles of solid lubricants are oriented by the crystalline plane of the basis parallel to the direction of friction and, consequently, the direction of action of shear deformations, since the bonds between the parallel planes of the basis in the crystal lattices of the are weaker than between these planes.

Molybdenum disulfide MoS2 also has a hexagonal crystal lattice, with layers of molybdenum atoms alternating in parallel planes, each of which is surrounded on both sides by strongly bonded sulfur atoms. Since the bond between the two sulfur atoms is weak enough, the shear resistance along the plane of their separation is very small. At the same time, the adhesion of molybdenum disulfide particles to the metal surface is so great that small contact pressures of 0.4... 0.5 MPa with a relative shift are sufficient for these particles to form a strong film on the metal surface. To ensure high tribological characteristics, MoS2 does not require the presence of vapors or gases; therefore, it is widely used as a lubricant in friction units. In this regard, we conducted a number of experiments using molybdenum disulfide (MoS2) in the laboratory, taking into account its ability to form a strong film on the metal surface and a wide operating temperature range. From the above experimental data and analysis, we came to the conclusion that the presence of molybdenum disulfide in solidol significantly improves the quality of the lubricant, with an increase in the concentration of MoS2, the indicators differ significantly from the initial ones.

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