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TRIBOLOGICAL AND RHEOLOGICAL INDICATORS OF SEMI-LIQUID SURKOV OILS AND THE OPERATIONAL REQUIREMENTS APPLIED TO THEM IN THE PREPARATION OF OILS

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Abstract: In this scientific article, the results of scientific research on the indicators of semi-liquid lubricating oils obtained from oil composition, the main requirements for them, mechanical stability at low and high temperatures, frictional viscosity and energy loss are presented. During this scientific research, the structural composition of the oil, the effect on its viscosity when loading in a dispersed environment, the dependence of the kinematic viscosity at different temperatures on the lubricating properties of the oil composition were also discussed.

Key words:dispersed medium , tribotechnics , loading , viscosity , wear , boundary friction , component , thermomechanics , useful coefficient , semi-liquid lubricating oil.

The transport service provided to enterprises, organizations and residents of our republic is of great importance in the development of the national economy of road transport in the independent state of Uzbekistan. The development of the transport complex is to increase its efficiency. Durability, reliability, efficiency, long-term reliable operation of cars mainly depends on the quality of materials used in its operation.

Fuel and oil products account for 20-30% of vehicle operating costs. In connection with the introduction of automobile production in our republic and the number of automobiles in our country increasing year by year, it is planned to deepen oil processing and obtain high-quality fuel and oils in the future.

In order to reduce the negative impact of cars, it is necessary to know the exact choice of the engine's operating mode, the methods of correct use of fuel and lubricants used in them. Because long-term reliable and efficient operation of automobile transport depends on the quality of oil products, their rational and economical use. In addition, in the conditions of limited energy resources, the moderation and economy of consumption in the transportation and distribution of operating materials helps to maintain the vehicle fleet at low costs.

It has been determined that the problems of structural and structural research of oil refining secondary lubricants, related works are scarce or limited in the scientific and technical literature. According to the results of scientific research, and the results of this work (polymeric, dispersed, thickener mixtures) work based on general laws. Rheological properties: a decrease in viscosity from the norm, with a tendency to recovery (deformation), the magnitude of the normal stress, Ge (t) (Ge-high modulus of elasticity, t-shear stress). In particular, this difference, the presence of an elastic wrinkle in the oil structural frame, causes the oil to change its oil class. The improvement of the colloidal dispersion system of the reducer lubricating oil is manifested in the 12% soap type. In particular, instead of reducing the concentration of soap in the lubricating oil composition, by adding polymer substances to its composition: it increases the strength limit, increases the structural property of the adhesive, reduces the strength of the structural framework, and

increases the elasticity property. It is known that in order to have good rheological properties of semi-liquid lubricating oils, it is necessary to include polymer concentration in the oil composition. The rheological parameters in the dispersed medium, the most suitable viscosity standards should be chosen according to the conflicting requirements, and its absorption boundary layer ability depends on its strength to vibration, as well as on the metal adhesion and cohesion of the structural elements of the framework. Selection of optimal viscosity based on the oil-based dispersion of semi-liquid lubricating oils leads to an increase in the useful coefficient of reducers at high loads.

Low temperature characteristic One of the most important functions of Surkov oils among petroleum products is their low temperature properties. In low temperature conditions, it should be sufficient to ensure light starting of mechanisms, increase the lubricating properties with minimum energy consumption, reduce the frictional environment through continuous lubrication. For the preparation of low-temperature lubricants, the dispersion medium must first be selected in order to ensure the ability to work in the high temperature range. In order to ensure the low temperature of semi-liquid lubricating oils at a high level, Dispers is currently doing the following:

- high-index, low-viscosity naphthen-paraffin-based petroleum oils, boiling at a temperature above 340 °C, are used;
- low-temperature synthetic oils capable of working at high temperatures;
- from mixtures of petroleum and synthetic oils:

The low temperature performance of petroleum-based soapy lubricants (mainly lithium) is excellent due to the fact that hydrocarbon semi-fluid lubricants 47 are made from almost viscous residual components. This does not bring a promising result in the preparation of a quality composition. Studying the low-temperature characteristics of all types of semi-liquid lubricating oils, foreign analogues revealed that the presence of synthetic oil derivatives in the composition increases the low-temperature characteristics of the oil. The rheological properties of semi-liquid lubricating oils depend on their specificity (the presence of a structural frame in the thickener). For example: it was determined that the viscosity of Transol-200 and Transol-300 semi-liquid lubricating oils does not change even at -20 °C.

Mechanical stability at high temperatures (thermomechanical stability) Semi-liquid lubricating oils should provide not only rheological and low-temperature properties, but also mechanical stability at high temperatures. It is known from the literature that the mechanical stability of the effects of individual components (dispersion medium, thickeners, various types of additives and fillers) of lubricating oils has been studied. Studies show that the viscosity of petroleum oils varies from 40 to 115 mm2 /s, depending on the basis of preparation, it has a small effect on the thermomechanical stability of the lubricating oil. In determining this, the effect of its nature depends on the dispersed environment. The most favorable thermomechanical stability of reducer oil is made of lithium soap 12-OSK and aluminum soap complex. Although such lubricants are characterized by increased thermostability, 12-OSK lubricant with lithium soap helps to provide this issue. 48 Semi-liquid lubricating oils Lithium soap thickened with synthetic fatty acids significantly increases the thermostability of 12-oxidestearic acid in lubricating oil. Lithium-calcium soap mixtures do not provide reliable thermomechanical stability when thickeners are added to semi-liquid lubricating oils. The weak structural system for semi-liquid lubricating oils depends on the importance of the thickener in its composition, which, on the one hand, participates in ensuring the mobility of the contacting surfaces, and on the other hand, the structural stability of the frame. Adding a small amount of 1% polyethylene to the composition of semi-liquid spray oils leads to a significant increase in the thermomechanical stability of synthetic fatty acids. Its importance has been recognized in thickening lithium soap (12-oxystearic acid) and synthetic fatty acid soaps. The inclusion of DF-11 in the composition of semi-liquid lubricating oils has been proven to reduce thermomechanical stability.

Characteristic of stability to vibration The special feature of the frame structure of reducer lubricants determines their operational performance, in which reducers are made up of different structures, including vibration reduction, which is the main important feature of semi-liquid lubricants. When transmission oils are compared with semi-liquid transmission oils, it has been found that its vibration reduction properties are higher. In this, semi-liquid transmission oils differ from Newtonian fluids-transmission oils, and there are features of summation of return from deformation. There is a large accumulation of energy in its deformation aggregate, which increases the property of stability to vibration

during operational processes.

Tribotechnics feature The main function of semi-liquid lubricating oils is to prevent warping of the components. In particular, depending on the operating environment of the mechanisms, they may depend on (load, temperature, sliding speed). For example: Long-term high-load operation of the components of the unit should avoid bending and buckling of the components and shock forces. In this regard, the anti-scratch, anti-melting, deep melting properties of semi-liquid lubricating oils are considered.

The results of research on the anti-squeezing properties show that the technology of gear oil production is the same, and it has different dispersion medium. The oil-based semi-liquid coating has a serious effect on the anti-scratch properties due to the nature of the oils. The anti-scratch properties of synthetic oils and lubricants do not have a serious effect. The viscosity-dependent effect of the anti-friction properties of gear oil lubricants has been shown. (shown in Table 1)

Table 1

Delivery of Surkov oils to the dispersion medium effect on viscosity

Fire extinguisher type	Critical loading, R kr, N	Welding loading R p, N	Boiling index
Lithium soap	790	1540	33
Lithium Soap Synthetic Oil acid	790	1410	31
Lithium soap and a mixture of calcium soap	790	1780	33
Complex calcium soap, synthetic fatty acid and vinegar	890	2240	48
Complex calcium soap synthetic fatty acid	890	2000	42
Complex aluminum stearin soap	890	1260	37
Complex lithium soap and tetraboric acid	790	1410	33

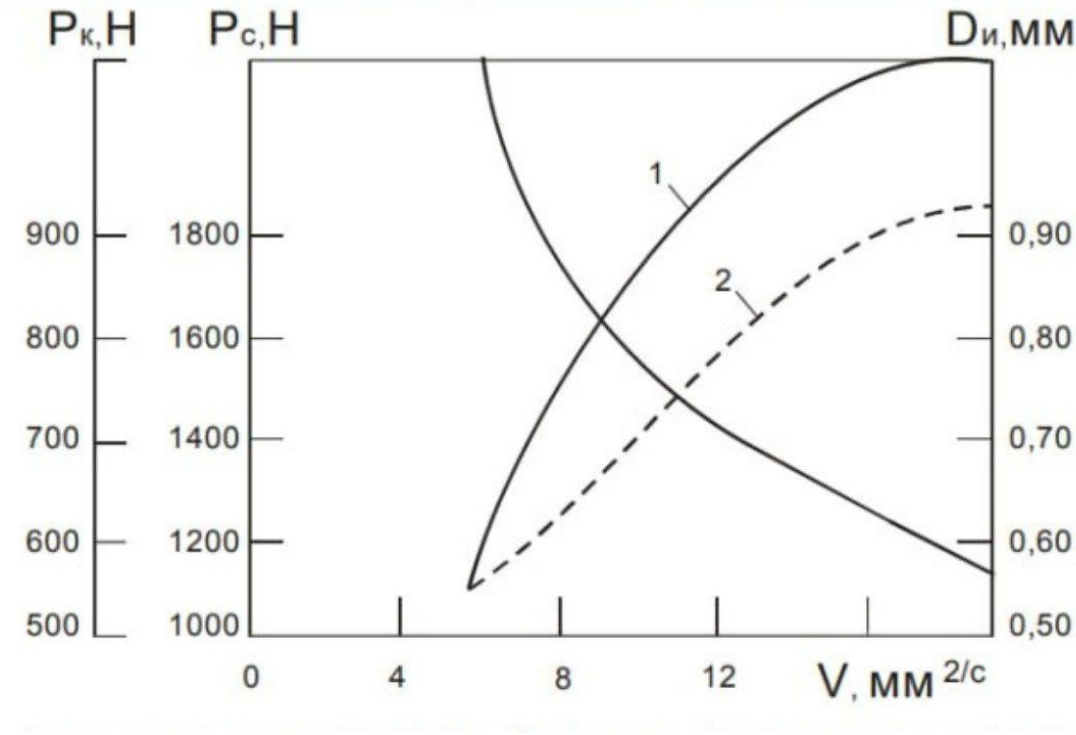
The technology of production of medium-viscosity oils from petroleum oils (V=75 mm2 /c) and their characteristics are exactly similar to the thickening lithium, lithium-calcium and lithium complex anti-friction properties of semi-liquid lubricating oils. When complex aluminum lubricants were observed, it was found that some aspects have anti-friction properties, while complex calcium lubricants have high anti-friction properties.

Lubricants made with thickening sodium soap have low water stability and thermostability, unlike calcium lubricants, they do not give promising results when used in high temperature (+70 °C) environments. But the most effective and promising task is the use of compounds as an addition to the composition of lubricating oils.

Viscosity and energy loss during friction In Surkov oils, the temperature viscosity property is very important in increasing the operational parameters. The reduction of friction force depends on the viscosity, which ensures the durability of the lubricating property in the mechanism nodes. Strong friction in

mechanisms is caused by direct loading of parts relative to each other. It is known that in the working zones of reducers, the oil becomes more viscous, and the internal friction causes less energy consumption, leading to an increase in FIK. If the total amount of energy loss in almost reducers is 25%, the viscosity of the oil performs the task of reducing its sharp reduction to 12.5%. If the viscosity in the working zone of the mechanism is less than the specified amount, it causes rapid failure of the surfaces of the parts due to friction and negative consequences for the mechanism. A decrease in the viscosity of the oil at high load sharply reduces its thickening, anti-pitting, anti-warping properties. If the standard level of oil viscosity is not provided, it delays the start-up time of the mechanism in cold temperature environment and also causes high energy consumption.

Lubricating properties One of the associated functions of oil-based surkov moylarining is this moylovchi property. The characteristics of this function are the increase in the number of users and the users of the user, and the use of the user's message. (shown in Figure 1).



1st critical load Pk,N; 2nd welding loading Rs,N; 3rd bending spot diameter DI

Figure 1. Dependence of the kinematic viscosity at a temperature of 100 °C on the lubricating properties of the oil composition

Lubrication ability of reducer gear oil is evaluated by friction oil base (thickness of oil layer) under the influence of hydrodynamic force. In particular, friction 56 under the influence of hydrodynamic force occurs only on the edges of gears. This process is directly observed in boundary friction and mixed regimes of contact zones.

The boundary friction regime appears under the influence of high temperature and loading. The inclusion of sulfur-phosphorus-boron preservatives in the lubricating oil provides anti-scratch and corrosion properties and strong protection against corrosion and corrosion.

In the limit friction mode, the oil layer of the thrust oils is too thin, the rapid heating of the gear wheels at high temperature affects the melting of the oils. In such processes, by introducing active elements into the oil composition, it is achieved by reducing the chemical effect on metal surfaces and forming a modified oil layer. This modified oil layer contains sulfides, oxides, phosphates or iron phosphites (oil composition, quality of installation). The modified oil layer should immediately prevent the gears from staining. It is necessary to prevent and reduce the loads falling on the teeth of the gears, to prevent the destruction of the oil layer during the rapid rise in temperature in the working zone. In short, it should be said that increasing

the mechanical effect of the installation against bending and warping also depends on the components included in the gear oil.

The demand for high-quality coating materials requires the optimization of the extraction technology from the composition of petroleum oils and other bases according to the nature of the raw material. Therefore, it is urgent to create new technologies for obtaining high-quality petroleum oils, secondary products of oil-oil enterprises based on local raw materials, to master them and to produce high-quality oils. Coating materials protect the rubbing surface from the effects of various aggressive liquids, gases, vapors and various abrasive materials (dust, mud, etc.). Almost all coating materials protect the surface of details from corrosion. When creating the main lubricating materials and adding various additives to their composition, the operational characteristics of lubricating oils are considered to be decisive:

- esistance to scratching, erosion and oxidation and high rheological properties (temperature dependence of viscosity) are required;
- The applied lubricants must protect the surface of the parts from erosion and wear;
- It should reduce frictional energy;
- It should absorb frictional energy from its surface;
- It should reduce the noise and vibrations in the gears and withstand impact forces.

The colloidal structure of lubricating oils and the physico-chemical and mechanical properties characteristic of colloidal systems are the main characteristics (indicators) that distinguish consistent (thick) lubricating oils from other lubricating oils.

Lubricating oils are not obtained from paraffins obtained from petroleum, but are completely oxidized to obtain synthetic fatty acids or are used for other purposes. Fatty acids and natural oils are almost not used in the use of soap-based lubricants. However, technical stearin, castor and cottonseed oil, oleic acid and salamos are used in some lubricating oils.

Studying the composition and properties of Surkov oils leads to the following conclusions and recommendations. The introduction of synthetic components into the composition of oil-based lubricants improves the surface and volume characteristics of lubricants. It is possible to reduce the amount of functional groups in the composition and, as a result, to improve the operational properties of lubricating oils. Under the influence of synthetic substances, stability of the main operating properties of lubricating oils is ensured.

To improve the rheological properties of lubricating oils, the concentration of the thickener can be reduced by 1-2%. It is possible to lower the temperature of thermomechanical treatment by 10-15°C in the preparation of soapy lubricating oils, as a result of which the composition and technological properties can be positively affected. Additives improve the operational properties of oils. Requirements for them:

* Solubility in fats;
* Low volatility;
* Water hydrolysis and water solubility tolerance;

One component should be mixed with all natural compounds. Additives are added to lubricating oils to improve their properties. Additives are otherwise called 45 modifiers or peptizers. Soap is some additives to the hydrocarbon system: water, aliphatic acids, alcohols, glycerin, glycols, phenols, rosin, these additives facilitate the appearance, solubility and crystallization of oils.

Lubricating oil should have a thick layer of oil on the contacting surfaces at high loads compared to normal. It is necessary for the oil layer to withstand high loads, reduce the load and increase the useful coefficient of the gears. The semi-liquid lubricating oil should have a light leakage from the hard friction zone, tribotechnical properties and good viscosity, thermomechanical and colloidal stability, anti-corrosion, anti-oxidation properties.

In conclusion, it can be said that in this scientific article, the strength of semi-liquid lubricating oils prepared on the basis of local raw materials, which can ensure minimum shear stress during the breakdown of the grid formed on the basis of condensers in the lubrication of networks, was based and studied. It is the same as the strength limit of semi-liquid lubricating oils (working conditions are the same) in order to determine which of the two types of lubricating oil is appropriate to use, it is necessary to compare their viscosity and it was found necessary to choose the oil with a lower viscosity, based on the above-mentioned

opinions on the limits and viscosity of lubricating oils, the requirements for their mechanical properties are known for lubricating oils it was determined that it should have the minimum possible viscosity for the strength limit and the given working conditions.

REFERENCES:

1. Djiyanbaev S.V., Khamidov B.N., Ubaydullaev B.Kh., Ganieva S.Kh. Determining the operational characteristics of reductant grease and viscosity-temperature characteristics // (International scientific and technical conference "Constitution and perspective innovative ideas and technological and oil industry", October 15-16, Fergana, 2015)
2. Djiyanbaev S.V., Ubaidullaev B.Kh., Kadiraliev S.A. The development of semi-automatic gear reducer grease for traction reducers of locomotives // (International Scientific and Technical Conference "Constitution and Prospective Innovative Ideas and Technological and Oblast Neftekhimii", October 15-16, Fergana, 2015)
3. Djiyanbaev S.V. Possibilities of development and introduction of new surkov oils //(Collection of abstracts of the scientific-practical conference of the Republic of "Young Scientists", Tashkent, December 22, 2015.)
4. Djiyanbaev S.V., Yarbabaev A.A. Neobhodimost razvitiya proizvodstva smazochnyx materialov v Uzbekistana // ("Prospects of using innovative technologies in the fields of architecture and construction" International scientific and technical conference. Samarkand-2016)
5. Djiyanbaev S.V., Hamidov Sh.B., Yarbabaev A.A. The possibility of obtaining the composition of reducer lubricating oil based on local raw materials // ("Prospects of the development of composite and nanocomposite materials" Republican scientific and technical conference GUP "science and development" Tashkent November 11-12, 2016)
6. Khamidov B.N., Saidakhmedov Sh.M., Ubaidullaev B.Kh., Djiyanbaev S.V. Main directions of production of lubricants using local raw materials // Uzbek journal of oil and gas. Special. issue 2015.
7. Ivanov, V.A. Basic physical and chemical properties of lubricants / V.A. Ivanov, M.P. Lyabin, S.M. Moskvichev. - Volgograd: Polytechnic, 2001.
8. Sterkhov A.V. Research and development of oils for worm gearboxes based on mixtures of polyglycols. Diss. Cand. Tech. Sci. - M.: 1996.