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THE EFFECT OF CHANGES IN THE VISCOSITY PARAMETERS OF ENGINE OILS ON THE OPERATION OF ENGINE PARTS

Alimova Zebo Khamidullaevna[1]
[1]Candidate of Technical Sciences, professor, Tashkent State Transport University, Uzbekistan
Makhamajanov Makhamat-Ibrahim Akhmatjanovich[2]
[2]Ph.D., associate professor, Tashkent State Transport University, Uzbekistan
Karimulla Irgashevich Magdiev[3]
[3]Senior Lecturer, Tashkent State Transport University, Uzbekistan
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ABSTRACT

This article discusses the effect of changes in the viscosity properties of motor oils on the operation of engine parts. The quality of engine oils, especially viscosity indicators significantly affect the reliability of the engine, fuel consumption and other parameters. Therefore, high-quality selection and use of motor oils is very important. Operational factors, such as the speed of starting the engine, pumping oil through the lubrication system, cooling of rubbing parts and cleaning them from contamination, are most dependent on the viscosity of the oil. The coefficient of friction depends on the viscosity, and consequently, the reliability and efficiency of the machine, aggregates and friction units.

Without the use of high-quality lubricants for various purposes, it is impossible to achieve reliable and long-term operation of vehicles. The efficiency of the internal combustion engine ranges from 25 to 30%. Theoretically, without changing the basic design of the internal combustion engine, it is possible to increase the efficiency up to 40%. An increase in efficiency by 1% leads to an increase in engine power by about 4%, since 25% efficiency corresponds to 100% engine power. Experts have calculated that friction and leaks account for 25-50% of all mechanical losses in the car engine, and losses in the piston ring-cylinder wall friction pair account for 9-15% of engine power. Another possibility to reduce friction is the use of improved lubricants.

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The oil viscosity may increase and decrease during engine operation. The viscosity increases as a result of evaporation of light fractions and accumulation of incomplete combustion products in the oil in the form

of soot and oxidation of hydrocarbons. Also, an increase in the viscosity of ordinary, non-condensed mineral oil occurs during normal operation of the engine, when products of oxidation, polymerization, wear and combustion accumulate in it.

The less the viscosity changes with temperature changes, the better its starting qualities. During normal operation of the engine, due to the accumulation of oxidation products, combustion and wear, the viscosity of the oil increases. At the same time, the oil supply to the friction pairs deteriorates, the efficiency of the oil filtration system decreases and the starting properties of the engine deteriorate. Due to incomplete combustion of fuel or due to leaks from the power supply system, it can get into the oil of a running engine, as a result of which the viscosity of the oil decreases and it liquefies. This leads to wear of the crankshaft sliding bearings.

To ensure minimal wear of engine parts, it is better to use oils of higher viscosity. However, such an increase, especially for engines not warmed up to operating temperature, in addition to wear, causes deterioration of fuel and economic indicators. The pumpability of oils decreases, and the lower the pumpability, the higher the wear and the lower the reliability of the engine. Thickened engine oils have a sufficient level of viscosity at operating temperatures and low viscosity at negative starting temperatures.

In case of incomplete combustion of fuel or due to its leaks from the power system, it can get into the oil. As a result, the viscosity of the oil will noticeably decrease (Table 1.), its oxidation will occur faster, the lubricity will deteriorate, deposits will increase and the mode of liquid friction will be disrupted.

Table 1.

Changing the viscosity of oil diluted with gasoline during engine operation

Name of the sample	Gasoline content in oil, %	Oil viscosity at 50 °C, cst
Fresh oil	0,0	41,0
Oil diluted with gasoline	10,0	17,5
after 5 minutes of work	7,5	19,0
after 10 minutes of work	6,4	20,6
after 30 minutes of work	3,5	25,9
after 60 minutes of work	1,9	32,0
after a day of work	0,8	35,7
Used oils (according to operational data)	-	35-38

An increase in the economic characteristics of the engine is achieved by a light start-up, rapid warming-up, reduction of mechanical losses and an increase in power up to 7% .

A significant increase in the viscosity of the oil is undesirable, since at the same time its flow to the friction pairs decreases, the starting properties of the engine

deteriorate and the wear of the piston rings of the automobile engine increases.

Figure 1 shows the dependence of the wear of the piston rings of an automobile engine on the viscosity of the oil.

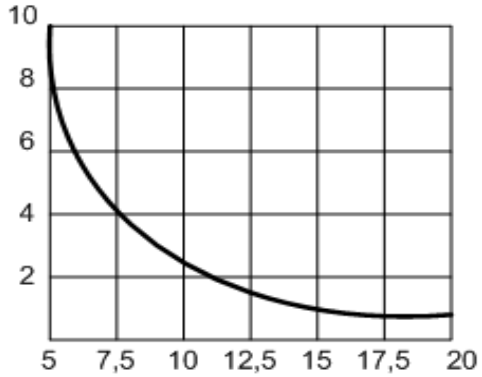

Fig. 1. Dependence of wear of piston rings of an automobile engine on oil viscosity

To improve the viscosity-temperature characteristics, viscous additives are used. Viscous additives are substances that, when mixed with low-viscosity oils, significantly increase their viscosity at positive temperatures and do not have a significant effect at negative temperatures. Their action is based on the suppression of gelation at low temperature as a result of crystallization of paraffin. They increase the fluidity of oils at low temperatures and stabilize the viscosity at high temperatures. This is achieved by the introduction of polymer thickeners. A variety of polymers with very high viscosity are used as viscous additives. Polymers with a molecular weight of 15,000 to 25,000 have become the most widespread. Polymer molecules of such molecular weight have better solubility in oils and greater thermal stability than higher molecular samples.

References:

1. Dzherikhov V.B. Automotive operational materials: textbook. St. Petersburg: SPGASU, 2009.
2. Magerramov A.M., Akhmedova R.A., Akhmedova N.F. Petrochemistry and Oil Refining: A Textbook for Higher Educational Institutions. - Baku: Baki Universiteti, 2009.
3. Ostrikov V.V. O. A. Kleimenov, V. M. Bautin. Lubricants and their quality control in the agro-industrial complex - M.: Rosinformatekh, 2008, 172 p.
4. Alimova Z. Research of change of quality of motor oils when operating the engine and improving their. Industrial Technology and Engineering. 2020, 3 (36): p.11-17.
5. Alimova Z. and oth. Improvement of properties of oils used in hydraulic systems of road-construction equipment/ IOP Conference Series: Materials Science and Engineering №3 (2020) 883-012167.

7. Alimova Z. Ways to improve the properties of lubricants used in vehicles - T.: “VNESHINVESTROM”, – 2020.
8. Alimova Z. The Influence of the Process Off Oxidation of Engine Oils on Engine Performance and Improving Antioxidant Properties //Acta of Turin Polytechnic University in Tashkent. – 2018. – Т. 8. – №. 1. – С. 17.
9. Alimova, Z., Kholikova N., & Xolova S. (2020). Ways to improve the performance of hydraulic oils for agricultural machinery Research Archive (30).
10. Khamidullaevna, A. Z., & Parpiyevna, N. G. (2022). Ways to Improve the Operational Properties of Hydraulic Oils for Agricultural Machinery. Texas Journal of Engineering and Technology, 8, 20-22.
11. Khamidullaevna, A. Z. (2022). Studies of anticorrosive properties motor oils and ways to improve. European International Journal of Multidisciplinary Research and Management Studies, 2(06), 6-12.
12. Xamidullayevna, A. Z., & Parpiyevna, N. G. (2022). Research of the mechanism of action of the protective properties of inhibited compositions. The American Journal of Engineering and Technology, 4(02), 19-22.
13. Xamidullayevna, A. Z., & Ahmatjanovich, M. M. I. (2021). Study of Anti-Corrosion Properties of Lubricants and Ways to Improve them. Design Engineering, 3811-3819.
14. Khamidullayeva, A. Z., & Narinbaevna, I. M. (2021). Improving the Lubricating Properties of Gear Oils Used in Agricultural Machinery by Adding Additives. Design Engineering, 4197-4204.
15. Khamidullaevna, A. Z., & Akhmatjanovich, M. M. I. (2021). Environmental Safety in use Flammable Lubricants. Middle European Scientific Bulletin, 19, 83-85.
16. Alimova, Z. K., Makhamajanov, M., Akhmatjanovich, I., & Magdiev, K. I. (2021). Research Of Anti-Corrosion Properties Of Engine Oils When The Engine Is Running. The American Journal of Agriculture and Biomedical Engineering, 3(11), 28-33.