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Justification for improving the choice of the frequency of engine oil replacement, taking into account the operating conditions

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Annotation. This article discusses the issues of the frequency of replacement of motor oils for car engines operated in urban conditions of Uzbekistan. It is established that the intensity of wear of parts depends on the quality of the engine oils used.

Keywords: Engine oils, operating conditions, rationing, frequency of replacement, energy-saving property, maximum permissible value, viscosity, flash point, base number.

Motor oils have a set of physical and chemical properties established by the relevant regulatory documents that characterize its operational purpose.

Viscosity-temperature properties have many-sided operational significance. The mode of lubrication of friction pairs, heat removal from the working surfaces and sealing of gaps, the amount of energy losses in the engine, its performance, the speed of engine start-up, pumping oil through the lubrication system, cooling rubbing parts and cleaning them from contamination largely depend on the viscosity.

Detergent-dispersing properties characterize the ability of the oil to provide the necessary cleanliness of engine parts, to maintain the products of oxidation and contamination in suspension. The higher the detergent-dispersing properties of the oil, the more insoluble substances (aging products) can be retained in the operating oil without precipitation, the less varnish-like deposits and carbon deposits form on hot parts, the higher the permissible temperature of the parts (the degree of engine boost) can be.

The antiwear properties of engine oil help to prevent wear of friction units, the formation of a strong film on the rubbing surfaces, which excludes direct contact of rubbing parts. Antiwear properties of oils depend on their viscosity and viscosity-temperature characteristics, lubricity, oil purity.

The anti-corrosion properties of motor oils depend on the composition of the base components, the concentration of anti-corrosion and antioxidant additives and metal deactivators. The corrosiveness of engine oils increases with aging. Oils from low-sulfur oils with a high content of paraffinic hydrocarbons, which form aggressive organic acids during oxidation processes, which interact with non-ferrous metals and their alloys, are more prone to an increase in corrosiveness.

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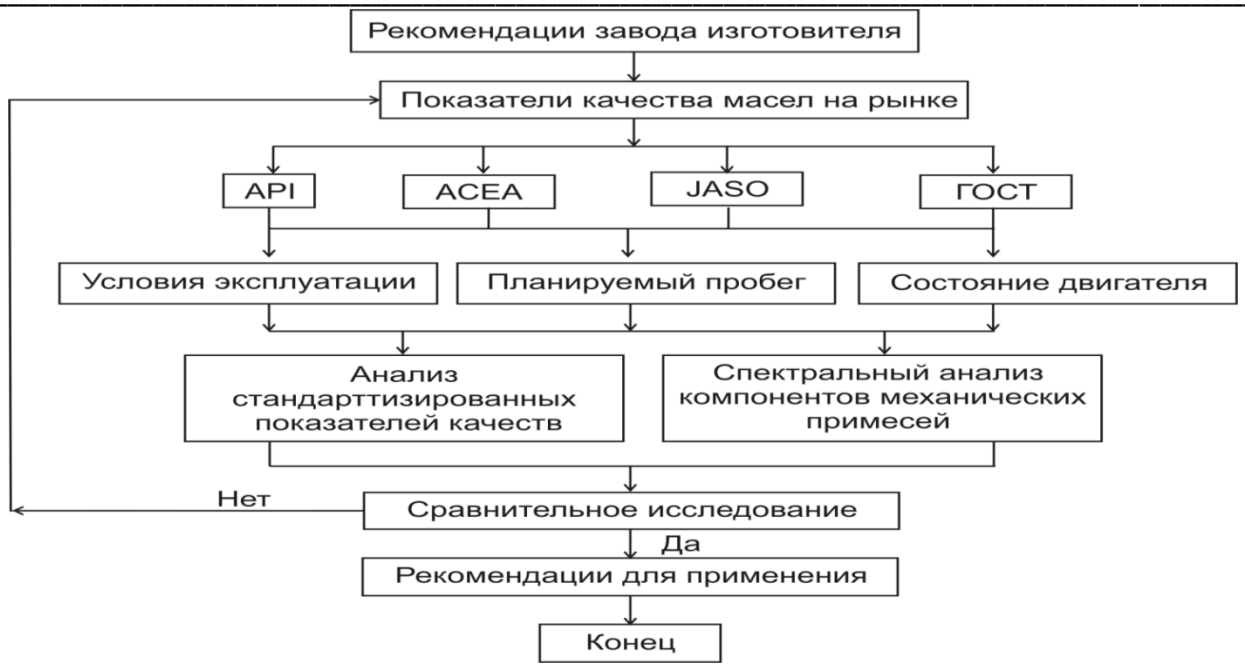

Fig. 1. Algorithm for pre-selection of engine oils for vehicles operated in mountainous conditions

The described procedure for choosing motor oils for cars operated in urban conditions can be represented graphically in the form of an algorithm (Fig. 1).

If you have a choice, preference should be given to those brands of engine oils that are approved by a particular car manufacturer or meet the requirements of its specifications. This is natural, since they take into account all the main factors affecting the reliability of the engine.

If there are no brands of engine oils on the market that are recommended for a given car by its manufacturer, comparative studies are carried out and recommendations for use are developed.

In the second stage, the limiting states of the quality indicators of the studied oil are determined. For this, the method for assessing the differential and integral indicators of oil quality proposed by N.S. Zakharov has been improved, which takes into account the operation of the engine during stopping on horizontal platforms of a mountain road to reduce the temperature of the coolant and oil:

$$Y_i = \frac{dY_i}{d(L - L_0)} \qquad (1)$$

where Yi is the maximum permissible concentration of mechanical impurities in used engine oils,
L - vehicle mileage, km
L0- is the conditional mileage of the car that would have traveled during the standstill time to lower the engine oil temperature.

ATS operating in urban conditions when the engine overheats is stopped for a certain time to reduce the engine temperature to a normal value. This time lasts from 10 minutes to 30 minutes.

The conditional mileage of the car can be determined by the expression

$$L_0 = t_0 \cdot V_{cp} \qquad (2)$$

where t0 is the parking time to lower the engine oil temperature, min.
Vav - average speed of movement.

Integral indicators assess the achieved level of properties in contrast to the initial values

$$Y_i = Y_i + \int_0^L \acute{O} \cdot dL \qquad (3)$$

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where Yн is the initial (nominal) value of the indicator.

The resource is the operating time during which the quality indicator changes from the initial value Ynd to the limiting Ynp.

Thus, the works substantiate the existence of a group of quality indicators that can be called resource. These indicators are closely related to differential and integral equations. If we designate the resource quality indicator Lpr, then

$$\bar{Ó} = \frac{Y_{í} - Y_{ïð}}{L_{ïð}}$$

$$L_{ïð} = \frac{Y_{í} - Y_{ïð}}{\bar{Ó}} \qquad (4)$$

In addition, it is proposed to evaluate the quality of oil indicators by generalized parameters of technical and operational properties, which reflects the cumulative effect of parameters of technical and operational properties.

$$V = f(x_1, x_2, \ldots, x_n), \qquad (5)$$

where x1, x2, ..., xn are the most important technical and operational parameters of engine oil.

The generalized parameter of the technical and operational properties of engine oil includes the following values:

K40 - kinematic viscosity at 40 ° C, mm2 / s;
K100 - kinematic viscosity at 100 ° C, mm2 / s;
TB is the flash point determined in an open crucible, ° C;
MF - mass fraction of phosphorus, %;
C3 - sulphated ash content, %;
BN - alkaline number, mg KOH per 1 g of oil.

In fact, the generalized parameter of the technical and operational properties of engine oil includes all parameters of the technical and operational properties of engine oil, designated by GOST R 51634-2000. However, taking into account our proposals, i.e., taking into account energy-saving properties determines the use of simultaneous analysis of the content of mechanical impurities.

Thus, the generalized parameter of the technical and operational properties of engine oil (Vm) can be considered as a complex measure of the quality of engine oil and used both in assessing the technical and operational properties of engine oils and when comparing various engine oils.

Literature

1. Kuznetsov E.S. Technical maintenance of cars. -M .: Transport, 2018.-416 p.
2. Mezny I.Yu. Maintenance and repair of automobile engines. -Magnitagorsk: ITs MSTU, 2019.-127 p.