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CRITERIA FOR ASSESSING THE HARSHNESS OF THE OPERATING CONDITIONS OF THE LUBRICANT IN THE ENGINE

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Engine oil is an integral element of the engine and as a result determines the reliability of its operation. The influence of lubricant on the engine is ambiguous and very significant. Lubricant should provide liquid friction under normal operating conditions, and in transient conditions – limit friction and minimal possible wear. At the same time, the components of the lubricant, interacting with the engine parts and forming protective films, protect the parts from corrosion, modify the friction surfaces, have a preventive effect on deposits, and neutralize acidic products. At the same time, the aging of motor oil results in such harmful phenomena as wear, soot and varnish formation, corrosion of parts, formation of low-temperature deposits and foam.

In its turn, the type of engine, its structure, level of forcing, thermal stress, technical condition, structural features and parameters of lubricants, operating conditions, fuel quality affect the operating conditions and intensity of lubricant aging. It was established that in engines with almost the same parameters, the intensity of aging of the lubricant varies several times. The stiffness of the operating conditions of the lubricant can be characterized by the generalized index *A*, c.u., according to the formula

$$A = \frac{G_T}{F \cdot i \cdot n} \times \frac{N_E}{G_M} \cdot k_a \cdot k_B \cdot k_S \cdot k_П \cdot k_T , \quad (1)$$

where G_T – hourly fuel consumption, kg/h; F – the surface area of the oil film that perceives heat, m^2; i – number of cylinders; n – engine rotation frequency, min^{-1}; N_E – effective power, hp; G_M – volume of lubricant in the system, kg; k_α, k_B, k_S, $k_П$, k_T – are coefficients that take into account the composition of the working mixture, the cooling method, the sulfur content of the fuel, the periodicity of replacing the lubricant, and the technical condition of the engine, respectively.

The criterion for evaluating the rigidity of the lubrication operating conditions, based on taking into account the parameters of the work process and the characteristics of the lubrication system, does not give an opportunity to reveal the full variety of the effect of diesel on the lubricant. The aging process of motor oils is specific for each type of engine and each brand of lubricant, and in addition to the specified parameters, operating conditions must also be taken into account [1].

The harshness of the lubricant's operating conditions can be estimated by the amount of heat transferred to the oil film on the surfaces of the cylinder space of the engine. A specific amount of lubricant in the lubrication system, as well as the use of moderate supercharging with an excess pressure of 0,039 MPa leads to an increase in the amount of carbon deposits on the piston by 1,2 times (taken into account by the coefficient k_α). The method of engine cooling affects the contamination of the piston group, and therefore, the stiffness of the lubricant's operating conditions (k_B coefficient). When sulfur increases from 0,2 to 1%, the contamination of the piston group increases by 1,3 to 2,8 times, depending on the level of cleaning and neutralizing properties of the motor oil (k_S factor). An increase in the frequency of oil change by 2 times leads to an average 1,6 times increase in the contamination of engine parts (k_P coefficient). As a result of engine wear and an increase in the amount of gases breaking through to the crankcase, the contamination of the piston group (k_T coefficient) increases proportionally.

References.

1. Паливно-мастильні та інші експлуатаційні матеріали. Навчально-методичний комплекс : навчально-методичний посібник для студентів із напряму підготовки «Процеси, машини та обладнання агропромислового виробництва рівня «Бакалавр» / І. М. Бендера, В. І. Дуганець, М. І. Кизима та ін. Кам'янець-Подільський: ФОП Сисин Я. І., 2016. 420 с.

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