OPTIMIZATION OF THE COMPOSITION OF HYDRAULIC OILS

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Abstract: *Modern experience in the creation of oils of optimal composition indicates the use of strictly balanced packages of additives for various functional purposes, introduced into high-index base oils. In this thesis, questions of increasing the efficiency of oil composition optimization are considered.*

Keywords: *Oil, oils, optimization, composition, lubricating oils, anti-friction, anti-wear, extreme pressure, properties, additive.*

Modern experience in creating oils of optimal composition indicates the use of strictly balanced additive packages of various functional purposes, introduced into high-index base oils that contain polymer additives with high thickening capacity. As a result, universal all-season oils of various groups and different viscosity classes enter the market. Competition between manufacturers of oils and additive packages contributes to the high quality of such products and their use worldwide.

The main secrets of the companies are not so much the compositions of the additive packages, as the ratio of the components and the technology of their mixing.

The compositions contain additives that give the oils high lubricating (antifriction, anti-wear and extreme pressure) efficiency, high anti-fire, and antioxidant and anticorrosive properties, thermal and colloidal stability. Modern copolymer thickening additives allow the use of low-viscosity base oils that provide good starting properties, pumpability at negative temperatures and minimal friction losses at operating temperatures of friction units in the hydrodynamic lubrication mode. In combination with additives that reduce friction in the boundary lubrication mode, thickening polymers contribute to fuel economy during engine operation, both at startup and in operating modes. Modern thickeners, along with polymethacrylate, are copolymers of styrene with butadiene and isoprene, ethylene with propylene, etc. Super alkaline detergents (alkylsalicylates, phenolates, sulfonates) were used as antifriction additives, gradually replacing environmentally unsafe molybdenum compounds. The most effective anti-wear additives are zinc dialkyldithiophosphates. They are able to act only at a certain minimum concentration in the base oil, depending on its group composition, i.e. the micelles of these additives include components of the base oil. Micelles of dithiophosphates form polymolecular boundary layers on the chemically modified metal surface during friction, which contribute to reducing adhesive and corrosion wear of steel parts. As follows from modern ideas about the mechanism of lubricating action, it is quite possible to enhance the positive effect when combining dithiophosphate additives with alkaline detergents capable of strengthening the polymolecular layer and increasing the temperature limit of effective lubricating action. Anti-wear effects are often attributed to chemically active sulfur-containing extreme pressure additives, although such additives, even at a relatively low temperature, cause significant corrosion wear. At the same time, the products of such wear are highly dispersed, do not have high hardness, leading to abrasive wear, and therefore extreme pressure additives have an effective working ability and can be used in first-fill oils. Dithiophosphate additives, on the other hand, do not contribute to rapid run-in, and their often practiced introduction into working oils cannot be considered successful.

The anticorrosive effect of additives and their compositions should be considered from the standpoint of the difference of factors causing corrosion destruction of different structural materials. The main type of corrosion destruction of various structural materials. The main type of corrosion destruction is corrosion – mechanical wear of parts of the cylinder – piston group of engines. The main method of protection in this case is the use of alkaline detergents that neutralize acids from fuel combustion products. Corrosion wear increases when using oils with sulfur-containing additives. To protect copper and steel from this type of corrosion, so-called metal deactivators are used, a useful role in this case is also played by oil oxidation products, which, however, cause intense corrosion of lead. Sulfur compounds and neutralizing alkaline detergents help protect lead from corrosion.

The increase in the anti-impact properties of oils is achieved by an optimal combination of detergents, dispersing and antioxidant additives, taking into account the synergism of the components and the choice of the base oil with the best pick-up to this composition. The issue of the use of low-temperature dispersants (usually succinimides) common for automotive oils in oils for forced diesels is debated. Such additives, transferring soot to a highly dispersed state, at the same time, reduce the effectiveness of fine oil filters.

Developing the composition of additive packages is a very complex process that requires taking into account all aspects of the mechanism of action of individual components and optimal ratios between them, possible chemical and colloidal interactions, as well as the use of informative laboratory methods. The methodology of development and manufacturing technology of the additive package is the basis of corporate secrets. When creating additive compositions, it should be taken into account that inter-component interactions lead to the emergence of an aggregatively stable colloidal system. In this case, the order of introduction of the components and the temperature of their mixing is of paramount importance. The same additive compositions obtained by different technologies, as a rule, have different aggregate stability, and their stability during storage turns out to be different.

An important role is played by the choice of base oil, its group composition. Antioxidants are more effective in highly refined oils. The addition of residual components, somewhat increasing the antioxidant properties of oils, leads to a decrease in their thermal stability, and may lead to the combustion of piston rings during application. Thus, solving the problem of optimizing the composition of oils requires taking into account a number of rather contradictory factors and should be carried out by highly qualified specialists.

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