PROPENSITY OF MOTOR OILS TO SEDIMENTATION WITH THE ENGINE RUNNING

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Annotation
In the high temperature zone, the oil burns completely or carbonaceous particles remain, which cannot remain on the surface devoid of a binding medium. The greatest danger of varnish deposition is for piston rings. By filling the gaps formed by the piston rings and the grooves drilled in the pistons, it reduces the mobility of the rings.. To reduce or prevent the formation of carbon deposits, special surfactants called detergent-dispersing additives are introduced into engine oils.
Keywords: engine oils, sedimentation, additives, oxidation, varnish deposits, carbonaceous particles.

To ensure reliable lubrication of the engine during its operation, it is required to continuously supply lubricating oil to the rubbing surfaces of the parts. In this case, the oil can be in a volume and a thin layer. The rate and nature of oil oxidation are different. The highest requirements for stability in a thin layer are imposed on oils for the piston-cylinder friction unit. Here the oil works in a thin layer, at high temperature, in contact with oxygen in the air and in conditions when the catalytic effect of the metal is most pronounced.

Modern oils with a high content of additives, getting into the combustion chamber, in the process of natural fumes burn with the formation of ash deposits. Deposited on the parts, these deposits worsen the heat sink, which leads to melting, cracking and burning of the pistons and exhaust valves (the intake valves are cooled by the incoming combustible mixture). Oils that are unstable to oxidation form precipitation faster and to a greater extent than stable oils.

In the high temperature zone of the engine, hydrocarbons and other components of oils are oxidized and form poorly evaporating, highly viscous, practically insoluble in oil oxy-acids, asphaltenes and acid resins, which are deposited on the parts in the form of a thin shiny layer called a varnish deposit. Lacquer deposits are carbon-rich substances that form as deposits in the grooves under the piston rings, on the skirts and inner walls of the pistons. The deposition of varnish causes the piston rings to burn and the parts on which these deposits were formed to overheat. The combustion of the rings promotes the penetration of oil into the combustion chamber and increases its consumption. Burnt rings reduce engine compression, this leads to a breakthrough of gases into the crankcase and a decrease in engine power, and also causes excessive friction, increased wear and tear of the cylinder mirror, ring breakage, and sometimes jamming of the piston in the cylinder. The lacquer film on the parts acts like a layer of thermal insulation, which leads to an increase in the temperature of the parts and further stimulation of varnish formation. The temperature, the oxidation time, the quantity and

quality of the supplied oil (the thickness of the oil layer), and the catalytic effect of the metal affect the varnish formation most strongly.

The accumulation of carbonaceous deposits on the cylinder walls, pistons, rings, valves occurs not only due to oxidation products, but also as a result of purely thermal transformations of polycyclic hydrocarbons and resinous substances. At the same time, engine oil consumption increases significantly, wear increases, even bullying on cylinder mirrors and piston rings breakage with piston jamming are possible.

The presence of precipitation in the engine is a great danger. They can clog oil ducts, oil pipelines and filters. If the oil pump receiver and oil lines are clogged with sediments, then the normal oil supply will be disrupted. As a result, melting of bearing liners, bully of crankshaft necks and even engine failure may occur. If the oil filter is clogged with sediments, then uncleaned contaminated oil enters the rubbing parts, as a result of which the wear of parts increases sharply, there is a danger of burning piston rings, etc.

In the high temperature zone, the oil burns completely or carbonaceous particles remain, which cannot remain on the surface devoid of a binding medium. The products of deep oxidative polymerization, which differ in high temperature zones and flow back into the crankcase, as well as other precipitated deposits, continue to have a negative effect on the oil.

The greatest danger of varnish deposition is for piston rings. By filling the gaps formed by the piston rings and the grooves drilled in the pistons, it reduces the mobility of the rings. It is here that high-carbon compounds are formed, which are deposited in the grooves in the form of films.

If there is precipitation in the engine, the quality of freshly poured oil deteriorates sharply. In addition, sediments can condense and harden over time so that it is difficult to clean parts from them even by mechanical means.

The duration of the oil in the engine depends on its chemical stability, which is understood as the ability of the oil to retain its original properties and resist external influences at normal temperatures.

The oxidation products of the oil are organic acids that are partially converted into acidic resins in the form of conglomerates up to 30-40 microns. Particles are formed from them, which, under the action of their own mass, precipitate, forming ointment-like clots deposited on the walls of the crankcase pan, on the inner side of the cylinder head cover, in oil filters and in oil pipelines, as a result of which it is possible to stop the oil supply to the rubbing surfaces of engine parts. The composition of precipitation is variable and largely depends on the conditions under which it is formed.

precipitation usually consists of:

oil – 50-80%,

water – 5 35%

oxy–acid - 2 15 %;

carbenes and carboides – 2÷10 %;

asphaltenes – 0.1-15%, as well as mechanical impurities of various origin. The ingress of water into the crankcase oil is the main cause of precipitation.

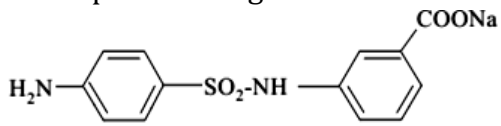
A very significant factor affecting the appearance of precipitation is also the mode of operation of the engine. Working in light modes is the most dangerous. Since this creates the most favorable conditions for sedimentation.

The operation of the vehicle in low-speed modes, with insignificant loads, frequent and prolonged stops, prolonged idling of the engine leads to lower operating temperatures in the engine, more severe contamination of the crankcase oil by products of incomplete combustion of fuel, oil liquefaction by fuel.

When idling for a long time, in order to reduce precipitation, it is recommended to maintain the coolant temperature at about 70 ° C.

The formation of ointment-like precipitation occurs with a reduced thermal mode of engine operation, when the fuel combustion process worsens and its incomplete combustion products get into the crankcase.

To reduce or prevent the formation of carbon deposits, special surfactants called detergent-dispersing additives are introduced into engine oils. Of the substances containing sulfur and nitrogen in the molecule at the same time and having very effective anti-oxidative properties, a large group of sulfonamide compounds should be noted. Testing of several dozen of these compounds as additives to oils has shown that they are very effective not only in fresh oils, but in spent and regenerated ones. Sulfantrol proved to be particularly effective



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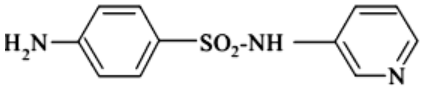

The disadvantage of sulfonamide compounds as additives is their poor solubility in oils.

Currently, work is underway to create motor oils with ash-free dispersing additives. The effect of such additives is based on their ability to loosen, wash off deposits from the surface of parts and transfer insoluble substances into suspension and keep these particles in this state without enlargement.

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