Environmental Influence on Petroleum Products Quality

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In the article is considered the regularities of microbiological damage of fuel - lubricants.

**Key words:** fuel, cars, operation, micro-organisms, interaction, humidity, vital activity, favorable environment.

To ensure reliable operation of cars, tractors and other equipment that consumes petroleum products (fuel - lubricants - FL), the quality of these materials, as well as their correct application is great importance.

In this regard, production workers, operators, as well as scientists should take into account that during the operation of cars, tractors and other equipment used FL, there are changes in their physico-chemical and operational properties due to the vital activity of various microorganisms present in the composition of FL, and also falling from outside.

The change in physico-chemical and operational properties of FL under the influence of microorganisms was first detected during storage and use of FL in conditions of high humidity and high temperature in many countries of temperate climate (England, Germany, USA).

An in-depth study of the relationship of microorganisms with FL led to the first practical results when a patent was issued in the United States in 1948, indicating deterioration in the quality of FL in contact with microorganisms [1].

For the first time in Uzbekistan, such phenomena were established in 1971 in the field testing of diesel engines of the Altai engine-building association in the Tashkent region (Pskent-1 state farm) in the plowing of rainfed lands [2,3].

The result of the vital activity of microorganisms in FL is a slight decrease in the amount of FL, but other consequences are more undesirable:
- color change;
- viscosity and acidity;
- formation of hydrogen sulfide;
- sulfides;
- jealous substances;
- peroxides;
- organic acids, etc.

Affected by microorganisms FL subsequently become unsuitable for their use for their intended purpose. Microbial mucus (biomass) clogs the surface (pores) of the filter elements and low-profile communication, preventing the delivery of FL to the fuel systems and engine lubrication systems.

The vital activity of microorganisms is inextricably linked with the conditions of FL storage, the operation of machines, with the environment, and depends on external factors that can be divided into physical, chemical and biological factors.

In connection with this, the processes of vital activity and damage to FL under the influence of various microorganisms must be studied taking into account the following factors:

Physical factors - the moisture of the environment, the concentration of substances in aqueous solutions, temperature, radiation. Humidity of the environment is the determining factor in the vital activity of many microorganisms. The temperature of the environment is the most important factor affecting the life of microorganisms. Each type of microorganism corresponds to its own temperature range and its optimum.

Chemical factors - the composition and reaction of the environment, as well as its oxidative reducing actions. In the environment, substances that stimulate or inhibit the vital activity of microorganisms can be contained. Stimulate the vital activity of microorganisms various pollution.

Biological factors take into account the relationship of microorganisms in the environment. They can be symbiotic and antagonistic. In symbiosis, species cohabiting support
the development of each other, gaining mutual benefit.

In car operation, tractors and other equipment - temperature regimes largely determine the existence and development of microorganisms in FL. Their meanings vary depending on the chemical composition and depth of FL cleaning. These temperature regimes are called cardinal and they are different for different microorganisms.

On the basis of cardinal regimes of vital activity of microorganisms, they can be divided into three groups:
- psychrophils (Greek psycria - cold) or cold-loving microorganisms, develop well at low temperatures from 10 to 15 °C. Some representatives of this group can develop both at low temperatures (up to 5 °C) and at optimal temperatures (35-40 °C);
- mesophylls (Greek mesos - medium, phileo - like) are microorganisms that grow at an optimum temperature of 25-50 °C. These include most common in nature bacteria, fungi, yeast;
- thermophiles (Greek thermes - heat, heat) or thermophilic microorganisms develop better at relatively high temperatures 50 - 95 °C. This group includes some bacilli, blue-green algae and mushrooms.

When the ambient temperature changes of environment below or above the optimal cardinal point, the rate of multiplication of microorganisms decreases (the microbes pass into the anabiotic state, i.e., the state of rest, and when they reach optimal temperatures and in favorable conditions, they return to active life again).

An increase in the temperature of the medium outside the biokinetic zone, i.e. (Bacillus subtilis, Clostridium botulinum, Bacillus cylindricus) are capable of withstanding the boiling point of 100-130 °C for several hours, above 100 °C. The biochemical basis causing the death of microorganisms at high and low temperatures is still not been sufficiently studied).

It has been established that in addition to temperature and other biological factors, the dust and organic contaminants that enter the FL in negligent handling (during storage and refueling) create an additional nutrient medium for them to influence the vital activity of microorganisms. Microorganisms create favorable conditions for intensive nutrition, consuming mainly hydrocarbons, or influencing them by the products of their metabolism, due to which the operating properties of FL (viscosity, acidity, alkalinity, etc.) change.

In addition with prolonged storage of FL, as well as in the operation of machines, especially in summer, when the difference between day and night temperatures reaches 25 °C or more, the internal walls of storage tanks, fuel tanks and oil systems intensively condense the vapors that contribute to the accumulation of water in containers, which creates favorable conditions for the life of microorganisms.

It is established that in the lower part of the tanks there is an intense sedimentation in the form of a sludge of a stable water-oil emulsion that includes organic and inorganic insoluble contamination products: 50% water, 40% fuel, 8% inorganic insoluble impurities, 2% organic. Of these, 30 to 67% of insoluble contaminants, 33 to 70% soluble, with half of the insoluble contamination products consisting of SiO₂ (quartz) and Al₂O₃ (alumina), half of Fe₂O₃ (iron oxide) and Zn (zinc). Therefore, the sources of FL contamination, in addition to insoluble impurities, are also themselves microorganisms and products of their vital activity, which appear under high temperature conditions in contact with water (insoluble resins and sludge).

Thus, the regional conditions of Central Asia, including Iran, Afghanistan, etc., encompassing unfavorable external factors - high temperature, low atmospheric pressure, high solar radiation, as well as greater dustiness of the environment - contribute to vital activity, intensive growth of various microorganisms that sharply affect changes in physico-chemical and operational properties of FL, thereby dramatically reducing their useful life.

References