THE NEED FOR SYSTEMATIC QUALITY CONTROL FOR WORKING MOTOR OILS

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In conditions of ordinary use, the lifetime of lube oils is a function of their properties and the technical state and conditions of use of the machine. In severe conditions of use, the oil can exhaust its lifetime and consequently lose its work capacity long before the factory-recommended time for changing it. In favorable conditions, it can work for two or more periods. It is possible to implement a strategy for changing oils based on their actual state if their quality is periodically controlled.

When an internal combustion engine (ICE) is not in good operating condition, the oil can lose its efficiency in a very short time and become the cause of breakdowns. Malfunctions that contaminate the oil with cooling fluid, fuel, and abrasive particles are the most dangerous.

Wear of ICE parts sharply increases as a result (Figs. 1 and 2) [1, 2]. Contamination by abrasive particles is assessed in instrumental diagnostics based on the concentration of silicon – the basic element in abrasive particles – in the oil (Fig. 3) [3, 4].

The oil ages gradually in standard operation of ICE. Its efficiency is usually assessed with the limiting values of a group of individual quality indexes. Accumulated practical experience and the results of many studies indicate that the viscosity, dispersing-stabilizing power (DSP), overall contamination with oil-insoluble products, including abrasive particles, and the hydrogen index should be included in any group of such indexes [1, 2, 5].

Periodic monitoring of these indexes will allow changing working oils based on the actual state and thus significantly reducing the need for fresh oils, detecting malfunctions in engine systems, and preventing high wear of engine parts.

In conditions of routine operation, input control of fresh and periodic control of working oils are not conducted in most cases because of the belief that the oil is simultaneously in contact with all surfaces of

![Graph](image)

Fig. 1. Weight loss of connecting-rod liners vs. duration of testing ICE in oil:
1) with ethylene glycol and water; 2) with water; 3) with no cooling fluid.

movably joined parts of the mechanism. In the efficient state, the oil ensures a regular friction conditions in the connections of the parts. For this reason, the life of the mechanism set out in its design in planning and manufacture is rationally utilized. Inefficient oil becomes the basic cause of increased part wear and premature expiration of this lifetime.

We will demonstrate the necessity of systematic quality control for working oils based on the results of assessing their actual condition. More than 60 oil samples were randomly collected from the crankcases of diesel and gasoline ICE in imported and domestic, private and company vehicles during routine operation in rural and urban conditions.

The samples were collected from the dipstick immediately after the ICE was shut off using the dipcan in a portable KDMP-2 kit. The quality of the oils was assessed by the method in [5]. The brand and viscosity group were determined by questioning the drivers. Since the overwhelming majority could not tell us anything specific, the actual viscosity of the working oils was not determined.

A brief analysis of the results of assessing a series of indexes in the working oils, presented as histograms in Fig. 4, is reported below.

Concentration of cooling fluid (see Fig. 4a). Cooling fluid was detected in 72% of the oil samples. The concentration varied from 0 to 3%. The most probable values were within 0-0.5%. According to this index, 47% of the oils studied were deemed suitable, and 53% were judged to be unsuitable for further use.

The probability of cooling fluid being present in oil from gasoline and diesel ICE was approximately the same. The type of cooling fluid was not taken into account in statistical processing due to the lack of reliable information.

Concentration of fuel (see Fig. 4b, c). The proportion of oil samples contaminated with fuel was 60%. The condition of the oils on this index differed significantly in gasoline and diesel ICE: fuel was present in 98 and 30% of the samples, respectively.

The concentration of fuel in the oil from gasoline engines was 0-5% and the most probable values fell within the range of 0.5-2%. With respect to this index, 19% of the oils investigated were deemed suitable for further use.

The concentration of fuel in the oil from diesels was 0-3% and the most probable values were within the range of 0-0.5%. Here 94% of the oils investigated were judged suitable for further use with respect to this index.