



INVESTIGATION OF CHANGES IN THE QUALITY OF MOTOR OILS WHEN OPERATING ENGINES

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Annotation

The purpose of this work is an experimental study of changes in the quality of oil and the establishment of the period of its replacement when compared with the defective indicators. During engine operation, engine oils undergo chemical changes under the influence of temperature and oxygen in the air – they are oxidized. In order to achieve this goal, we, by agreement with the bus fleet, took samples of motor oils of 15W-40 buses every 2500 km of mileage and were analyzed according to the main quality indicators. The experimental data obtained by us on the change in the base number are taken into account, we recommend introducing detergent additives into the engine oil when the bus mileage reaches 7500 km.

Keywords: engine oils, deposits, viscosity, loads in the friction unit, oil film, carbon deposits.

Introduction

During engine operation, engine oils undergo chemical changes under the influence of temperature and oxygen in the air – they are oxidized. The stability of oils against oxidation is an important operational characteristic. As a result of oxidation, their chemical properties change, resins are formed, precipitation in the cylinder piston group. Along with oxidation, the oils are watered, polluted with mechanical impurities. As a result, the quality of the oil deteriorates and it must be replaced. The purpose of this work is an experimental study of changes in the quality of oil and the establishment of the period of its replacement when compared with the defective indicators.



In order to achieve this goal, we, by agreement with the bus fleet, took samples of motor oils of 15W-40 buses every 2500 km of mileage and were analyzed according to the main quality indicators. Previously, fresh engine oil of the same brand was tested for comparison. The test results are shown in the table.

Experimental data on the quality indicators of fresh and working engine oil brand 15W-40

Indicators	15w-40	1000 (KM)	2500 (KM)	5000 (KM)	7500 (KM)	10000 (KM)
1. Kinematic viscosity cSt at 40°C	104,521	104,29	101,31	100,94	100,9	99,4
2. Kinematic viscosity cSt at 100°C	14,76	14,24	13,91	13,57	13,02	12,97
3. Viscosity index	129	126	126	123	122	122
4. Alkaline number mg. KOH	5,36	5,0	4,82	3,72	3,34	1,38
5. Density kg/l at 20°C	0,872	0,872	0,872	0,872	0,872	0,872

As follows from the table, the quality indicators of oil when the bus runs 2500 km. in comparison with fresh oil, they practically do not change.

Viscosity deviations became noticeable when the bus ran 5000 km or more. The alkaline number decreased from 5.36 to 3.72, and when running 10,000 km, its value took the value of 1.38, i.e. decreased by more than 2 times. It is known from operational experience and literature sources that when the alkaline number changes by more than 50%, the oil must be replaced.

The ability to wash away dirt inside the engine is one of the most important characteristics of modern oil, since trouble-free operation of the engine during prolonged operation is possible only if all its parts are kept clean. The annular grooves of the pistons must be clean so that the rings do not lose mobility, the pistons themselves to ensure heat removal, as well as oil channels, valve gear, cams and other rubbing parts.

The service life of the oil is mainly due to its washing properties, therefore, in almost all motor tests, great attention is paid to the washing properties.

The engine is polluted due to the intense oxidation of oil in contact with hot surfaces of parts.



The oil should prevent the formation of oxidation products and prevent their deposition on the surfaces of parts.

The engine oil must have a certain alkalinity to preserve the detergent properties, the ability to neutralize acids and suppress corrosion processes. The higher the base number, the greater the amount of acids formed during the oxidation of oil and the combustion of fuel can be converted into neutral compounds. Otherwise, these acids cause corrosive wear of engine parts and enhance the formation of deposits.

When the oil is running in the engine, the alkaline number inevitably decreases, neutralizing additives are triggered. Such a reduction has acceptable limits, upon reaching which the oil is considered to have lost its working capacity. It is believed that when the alkalinity of the oil decreases by about 50% of the initial value, the oil should be replaced.

The experimental data obtained by us on the change in the base number are taken into account, we recommend introducing detergent additives into the engine oil when the bus mileage reaches 7500 km.

Currently, research is continuing on the effectiveness of the influence of nature and the concentration of detergent additives on the alkaline number of the working oil.

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