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Changes in the Efficiency of Modern Tractor Engine Oils

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ABSTRACT: The article provides information on the formation of organic contaminants in the form of water and sludge in the oil at low temperatures, and oxidation products at high temperatures, as well as changes in the basic performance of motor oil during its use in engines. The CLAAS ARION630C tractor engine lubrication system works in conjunction with high temperature voltage, high specific pressure, various metals, air and fuel combustion products. When operating at low temperatures, there is a possibility of water and sludge (oily sediment) in the oil, and at high temperatures oxidation products are formed. Under the influence of temperature, pressure and air, the oil is partially decomposed and oxidized, and when not completely burned - burns, dryness, the formation of laxatives and the formation of sediments in engine parts.Analyzes show that the sulfur content in the fuel should not exceed 0.1% for tractors manufactured abroad, which means that the oil change time in such fuel should be 250 moto-hours. In our conditions, along with high dust content and high air temperature, the amount of sulfur in the fuel also accelerates the aging process of the oil. Analysis of the work done in the field of contamination and purification of motor oils shows that motor oil can be rapidly contaminated with organic contaminants in the form of oxidation products during storage, transportation and operation, the total amount of which can reach 1.2%. the cylinder leads to the erosion of the piston group and the gas distribution mechanism.

KEY WORDS: combustion chamber, oxidation, laxative, mixture, structure, sulfur, neutralization, concentration, hydrocarbon molecule, centrifuge, viscosity, alkali, zones, contamination, dispersion, sludge, sediment, organic impurities, quantity, ugar, detergent destruction.

I. INTRODUCTION

In the agricultural sector of the country, the influx of high-performance, powerful tractors, cars, land reclamation and construction machinery is growing. For example, today the total number of vehicles manufactured by CLAAS in the country is 5435. The role of lubricants for the long-term reliable and uninterrupted operation of modern tractors in the hot climate of the country is invaluable. CLAAS tractors use motor oils approved by the American SAE and ASTM societies. It is recommended to use mainly oils of CE, CF, CD and SS groups of API in imported tractors in our country [1].

We know that in technical conditions the presence of mechanical impurities and water in the engine oil of modern tractors is strictly limited by technical conditions and standards [2,4]

The CLAAS ARION630C tractor engine lubrication system works in conjunction with high temperature voltage, high specific pressure, various metals, air and fuel combustion products. When operating at low temperatures, there is a possibility of water and sludge (oily sediment) in the oil, and at high temperatures oxidation products are formed. Under the influence of temperature, pressure and air, the oil is partially decomposed and oxidized, and when not completely burned - burns, dryness, the formation of laxatives and the formation of sediments in engine parts [1,7].

The higher the temperature and pressure of the oil in the crankcase, the faster the oxidation process. Oxidation of fats results in the formation of complex organic acids, which have a detrimental effect on metals, especially non-ferrous and some other metals and alloys, i.e., corrosion occurs in these metals [4].

II. MATERIALS AND METHODS

In order to determine the service life of CLAAS Agrimot SDX 15w40 motor oil on the ARION-630C tractor manufactured by CLAAS in Uzbekistan, the viscosity and alkalinity of the oil were analyzed. The main purpose of the tests is to determine the service life of these oils in engines used in Uzbekistan [1].

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The dynamics of changes in the composition of engine oil, mechanical impurities, water content, alkali content and viscosity are given in the following graphs.

As can be seen from the graphs in Figure 1, the contamination of engine oil in different zones varies slightly from one to another.

III. RESULTS AND DISCUSSION

The high temperature and dust in the air of Surkhandarya region had a negative impact on the quality of the oil, as a result of which the normal amount of mechanical impurities in the oil in Surkhandarya region increased sharply after an average of 250 motor hours.[9]

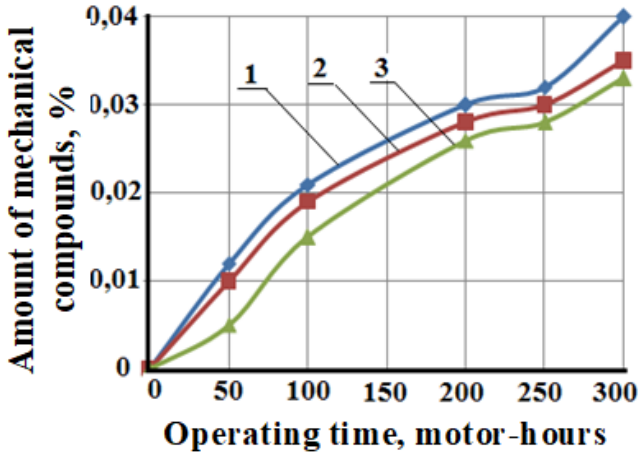

Figure 1. When using Agrimot SDX 15w-40 motor oil in the engine "in different climatic conditions", the dynamics of changes in its composition of mechanical mixtures. 1 - Surkhandarya region;2 - Fergana region;3 – Tashkent region

It was found that the normal content of mechanical mixtures in the composition of Fergana and Tashkent regions is less than in the hot regions.Lebedev O.V., Morozov G.A., Nikiforov A.N ,.Kovalenko V.P., Sharipov Q.A.and many other scientists believe that when any engine is running, its oil content changes significantly in terms of quality.

The reason for the change in quantity is the loss of oil during processing due to ugar (15-20%) [3].Changes in oil quality are also affected by various physical and chemical processes that take place in the engine.

Figure 2 shows the dynamics of the change of organic contaminants in the engine oil of the ARION630C tractor engine.

Analysis of the dynamics of the accumulation of organic impurities in the oil shows that in the conditions of high temperature and dust in Surkhandarya region the amount of organic impurities is 7-9% higher than in Fergana region and 16-18% higher than in Tashkent region.

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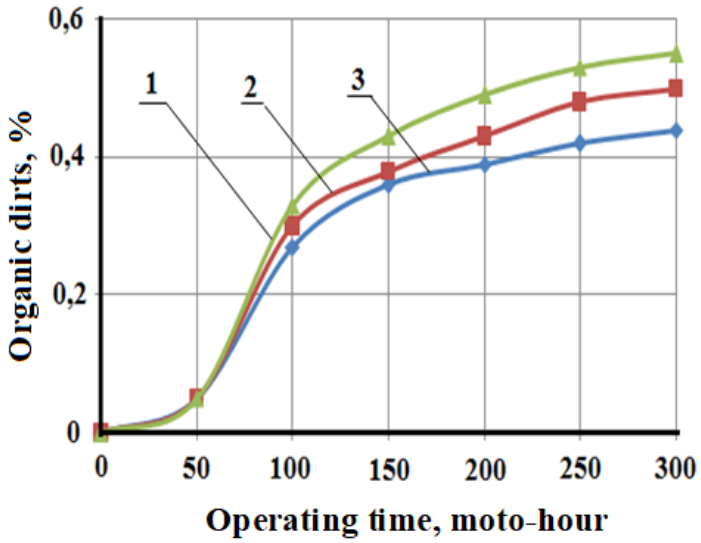

Figure 2. Dynamics of change of organic impurities in oil. 1 - Surkhandarya region;2 - Fergana region;3 – Tashkent region

According to special calculations, the presence of contaminants in the oil, including a decrease in its detergent concentration during use, leads to a decrease in its quality.The decrease in detergent concentration is due not only to the presence of contaminants in the oil, but also to the rate of addition of additives (V), as well as due to filtration (Qx) of contaminants in the oil (Qs).

$$\Delta C = \frac{V}{Q_C}\left[1 - \frac{\Delta X \cdot Q_x}{1-a}\right]^{Q_c / Q_x}$$

Along with the decomposition and oxidation of fat, its compaction (polymerization) also takes place, i.e., the hydrocarbon molecules of the oil combine into larger and more complex molecules.In the process of these changes, a transition from smaller molecules to larger molecules is observed [2].

This situation leads to the deterioration of oil quality during the operation of modern internal combustion engines, the intensification of various negative processes, the result of which has a negative impact on the reliability of the engine.This situation limits the ability of oils to work under operating conditions.

Reliable engine performance is inextricably linked to the quality of the lubricant. Analysis of the work in the field of oil wear shows that the criteria for assessing the main performance properties of the oil can be taken as the failure of active additives in the oil and the intensity of wear of engine parts. It is known that the loss of active additives in the oil is inextricably linked with the wear of details. Therefore, an in-depth study of the process of loss of active additives, in turn, allows to assess the condition of the engine. Hence, a comprehensive assessment of the properties of the oil during use is one of the solutions to the problem. For example, depending on the type and amount of metal in the oil, it is possible to estimate how much the specific part of the engine is worn and its service life. Similarly, depending on the amount of elements such as barium, zinc, calcium, phosphorus in the oil, it is possible to assess the oxidation resistance of the oil and the resource of its active elements.[15,17]

In addition, the performance of the engine oil is also affected by its level of contamination, in particular, the presence of external contaminants in it.

IV. CONCLUSION

1. Analyzes show that the sulfur content in the fuel should not exceed 0.1% for tractors manufactured abroad, which means that the oil change time in such fuel should be 250 moto-hours.
2. So, in our conditions, along with high dust content and high air temperature, the amount of sulfur in the fuel also accelerates the aging process of the oil.

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3. Analysis of the work done in the field of contamination and purification of motor oils shows that motor oil can be rapidly contaminated with organic contaminants in the form of oxidation products during storage, transportation and operation, the total amount of which can reach 1.2%. the cylinder leads to the erosion of the piston group and the gas distribution mechanism.

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