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SPECIAL ASPECTS OF FUEL SAVING OF AGRICULTURAL EQUIPMENT AND ITS ENVIRONMENTAL INFLUENCE ON OIL

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Abstract. *The national economy of the country uses various machines and mechanisms, the vast majority of which are road transport, operated in various sectors of the Republic. Due to the factthat they operate in the severe operating conditions associated with off-road and high dusty environment, there is an intensive lubricant contamination of transmission units. This article studies the rates of fuel consumption when using agricultural machinery, such parameters asfuel and lubricant efficiency, flammability, motor ability of agricultural machinery, speed. In addition, the article presents the results of bench tests to determine the quantitative and qualitative indicators of abrasive particles that enter the oil composition from the environment when using agricultural machinery. When replacing the transmission oil, it was found that witha level of abrasive particle contamination of 0.25-0.30%, a fixed operating time of gear wheelsin the unit is provided, for rolling bearings this amount should not exceed 0.1%. During thetests, the DZ-99 motor graders were selected and the calculation results of the fractionalabrasive particle composition in the aggregate oil were obtained by the concentration ofabrasive particles from the operation duration, as shown in the table. It is believed that a complete comprehension of the interplay between these processes and products with the environment will aid producing companies as well as governments of producing countries make better decisions on the strategies to minimize the effects of production activities on the environment and health of a nation.*

Keywords: *fuel economy, abrasive particles, cleaning type, environment, oil composition, bubbles, evaporation, power supply of parts, transmission, dust, bearings, seal cracks, wind load.*

INTRODUCTION. Fuel saving is a feature that determines the fuel consumption when performing work with a tractor or combine in various operating conditions. It is determined by the following engine parameters: fuel consumption per hour G_T, kg / h, specific fuel consumption g_e, g / kWh (mass of fuel consumption per hour of the engine block).

Performance indicators are determined as a result of special research studies and generalization and analysis of the experience of use [1,2]. Operation knowledge of the design features of agricultural machinery allows you to use the experience of technical operation.

Description of agricultural machinery maintaining the aforementioned performance indicators at the level of its own regulatory requirements serves to maintain a high technical condition of agricultural machinery for a long period.

Research results show that with an increase in the service life of agricultural machinery, its technical condition gradually deteriorates as a result of wear of parts and irregularities: engine power and speed decrease, fuel consumption and its consumption increase, control comfort deteriorates, and the volume of maintenance and repair work increases. , permeability decreases [3].

The main requirement for fuels and lubricants is compliance with GOSTs and engine designs, as well as climatic conditions and the procedure for using agricultural machinery. Thus,

in terms of fuel function (for carburetors and diesel engines, summer and winter) and quality (octane and cetane number), the numbers) are divided into models.

MATERIAL AND METHODS. Fuels and lubricants affect the quality of the agricultural machinery used, such as fuel economy, durability, engine power, speed. Maintaining the quality of fuels and lubricants is very important during transportation, storage, distribution and lubrication.

The properties of diesel fuel, such as cetane number, viscosity, volatility, corrosive properties and the presence of mechanical impurities, affect the performance of agricultural machinery [4,5]. If the cetane number has a strong impact on engine longevity and fuel consumption, the viscosity of the fuel causes it to atomize, form and burn with air and corrode fine vapors in the fuel apparatus.

The corrosive properties of diesel fuel depend on the amount of sulfur contained in it: the more it is, the more corrosion-mechanical wear of engine cylinders and piston rings. Erosion increases, especially at low engine temperatures. The presence of mechanical impurities in diesel fuel leads to the consumption of fine vapor in the fuel supply equipment. The easiest way to separate mechanical mixtures from diesel fuel is to soak it for several days [6].

Gas fuels are of high performance. Their use reduces engine wear, ensures detonation- free operation, reduces the toxicity of exhaust gases, and extends the life of engine oil. During operation, the fuel is used in accordance with the design of the engine, natural and climatic conditions and regulatory requirements, storage, transportation and it is necessary to prevent evaporation during distribution, ensure the absence of mechanical impurities and water.

Lubricants (like fuel) are also classified and standardized by function (crankcase oils for carburetor and diesel engines, transmission oils), quality (type of cleaning, viscosity, additives, etc.) [7,8,9]. Lubricants and lubricants are used to provide liquid or boundary friction, reduce friction work and wear, remove heat from friction pairs, wear products from cracks, seal cracks, and protect lubricated surfaces from corrosion.

Engine oil works at high temperatures and certain pressures. This can lead to the formation of rust products, gum (chewing gum, tar) and tar. Its main performance properties are viscosity, resistance to washing and corrosion, mechanical impurities and lack of water. Improving the performance of engine oils is achieved by adding various chemicals (compounds) to them. The hinges reduce the wear rate of rubbing parts by at least half.

Transmission oils work in very difficult conditions, since during the operation of transmission units, high specific pressure arises on the friction surfaces of parts. This condition can lead to friction, scratches and severe abrasions. In addition, transmission oils leak during the winter months, as a result of which frictional resistance in the unit‟s increases, transmission efficiency decreases and fuel consumption increases [10]. An oil spill will impair the oil supply to the gearboxes of the units. Therefore, transmission oils must have high viscosity-temperature, anti-corrosion and stable properties, preventing the formation of deposits and deposits.

Grease oils, in addition to their anti-friction and storage functions, also act as sealants in friction couples (eg spring pins, pivot pin). Consistent oils are mineral oils thickened with sodium or calcium soaps [11]. Depending on the operating conditions, they are divided into groups that are more difficult to dissolve (drop temperature 140 ° S, constant) and less difficultto dissolve (drop temperature 100 ° S, solid particles). These properties of the oils ensure that they will not leak out of cracks when the temperature rises.

In addition, the engine cooling system uses coolants such as antifreeze and water. The most commonly used antifreezes based on ethylene glycol are divided into grades 65 and 45 with freezing temperatures of minus 65 and minus 45 ° S, respectively. Ethylene glycol-based antifreeze is toxic and has a high volumetric expansion coefficient when heated. It tends to foam when petroleum products get on it [12,13].

If water is used in the engine cooling system, the spark will accumulate, reducing the thermal conductivity of the cylinder walls and, as a result, the engine will overheat, wear rate and

fuel consumption will increase, detonation will occur, and engine power will decrease; The oatmeal is washed using special chemical solutions.

The resistance to motion is determined by the rolling resistance coefficient and the slope of the ground. The roughness of the field leads to an increase in rolling resistance and dynamic loads on the mechanisms of agricultural machinery. This, in turn, accelerates wear processes, increases fuel consumption, and reduces travel speed [14].

The technical condition of agricultural machinery is influenced by the following factors related to field conditions:

- an increase in the friction path of some key parts;
- increased load on the mechanisms of agricultural machinery and its frequent changes;
- mixing of abrasives.

With the deterioration of field conditions, an increase in the friction path of engine and transmission parts occurs due to the forced transition to lower gears. As the drag coefficient increases, the load on agricultural machinery parts increases. The load depends on the frequency of changing the operating modes of the gears and brakes of agricultural machinery. These changes are due to interruptions in the movement of agricultural machinery and uneven fields.

The worse the field conditions, the more dust (abrasive) and other hard rocks formed as a result of the action of agricultural machinery will adversely affect its technical condition. The qualityof the powder depends on its chemical composition and size, i.e. the size of the particles. Silicon oxide makes up 60-85% of dust. Its hardness is higher than that of many car parts. The amount of dust entering the engine cylinders depends on its amount in the air, the volume of air inhaled by the engine and the degree of cleaning with an air cleaner.

95 ... 98% of the dust of the air inhaled by the engine is retained in the air cleaner, and 2 ... 5% gets into the engine cylinders [15]. One-sixth of the dust entering the cylinders is escaped with the exhaust gases, while the remainder mixes with the oil, causing abrasive wear. The dust first corrodes the cylinder, piston and piston rings, and then, hitting the engine track, eats the crankshaft mechanism. This means that the degree of wear of mechanisms, assemblies and engine parts largely depends on the efficient operation of the air cleaner. If the characteristics of the air purifier (degree of purification and air resistance) and the amount of dust in the air for certain operating conditions, as well as the degree of purification and permissible limits of the resistance of the air cleaner, you can determine the frequency of its flushing. The main parameters of the natural climate that affect the technical condition of the machine and determineit are: ambient air temperature and the range of its change; humidity; wind load; solar radiation levels; barometric pressure. The ambient temperature greatly affects the technical condition of agricultural machinery. The air temperature ranges from +50 to + 200C is sufficient for the normal operation of agricultural machinery. During this period, it is possible to maintain the optimal thermal state of the units and parts of agricultural machinery and ensure their serviceability. High temperatures increase the thermal load on critical engine parts and cause it tooverheat. The engine overheats as a result of an imbalance between the amount of heat generatedand the amount of heat generated.

In diesel engines, high air temperatures also lead to reduced power output, increased fuel consumption and increased exhaust emissions. In other agricultural machinery, the corrosion rate increases as the amount of dust in the air increases, and the lubrication conditions deteriorate as the oil viscosity decreases.

Control the amount of fluid in the cooling system to prevent engine overheating, clean the radiator surfaces, clean the cooling system from deposits and debris, properly install the ignition, ensure fan belt tension, control the thermostat, and other work needs to be done.

Bench tests were carried out to determine the quantity and quality of abrasive particles entering the tractor transmission. When replacing transmission oil, if the degree of its contamination with abrasive particles is 0.25-0.30%, the specified service life of the gears in the unit is ensured, for rolling bearings this amount should not exceed 0.1%.

The results of tests carried out at the stand showed that the wear of gearbox parts operating in oil with dusting of 0.8–2.4% exceeded the wear of the same parts in pure oil by 1.5–5.5 times. During the operation of the machine, the level of contamination when changing the oil in the transmission units averages 1.3%.

When inspecting the bearings of tracked tractors, 3–7% of all bearing defects are associated with fatigue damage, and 57–61% - with extreme radial cracks. The average percentage of transmission bearings that fail as a result of severe wear reaches 50%. Gearbox bearings fail due to abrasive particles, fatigue wear, ring twisting and rupture. Excessive wear occurs as a result of fatigue changes in the final drive, while bearing cage fracture and ring twisting are less common. Abrasive wear is more common in the bearings of wheeled and tracked tractors, since these compounds come into contact with the soil during operation.

Table 1.

Change in the fractional composition of abrasive particles in the oil of the aggregates of the DZ-99 motor grader, from the duration of operation

Sample№	Abrasive particle concentration	Fractional composition of abrasive particles, μm					
		8	2	16	30	25	40
1	2	3	4	5	6	7	8
Rear axle after 280 hours of operation							
1	0,25	55,1	26,0	7,6	6,6	2,5	2,2
2	0,20	51,1	29,1	8,0	7,2	2,7	1,9
3	0,24	48,1	32,2	8,4	6,8	2,4	2,1
4	0,22	51,0	29,2	8,2	6,8	2,8	2,0
Average	0,23	51,3	29,1	8,1	6,8	2,6	2,1
Rear axle after 960 hours of operation							
1	1,28	63,9	24,2	6,7	6,1	2,1	1,5
2	1,25	55,4	27,2	7,0	6,2	2,4	1,8
3	1,31	54,9	29,1	7,2	5,7	1,9	2,2
4	1,28	57,7	25,8	7,4	5,7	2,3	1,7
Average	1,28	56,5	26,6	7,0	5,9	2,2	1,8
Onboard balancer after 280 hours of operation							
1	0,21	65,3	17,8	7,0	5	2,4	2,3
2	0,23	63,9	19,3	6,4	5,6	2,3	2,5
3	0,19	63,5	17,8	7,0	6,1	2,9	2,7
4	0,25	64,8	18,6	6,6	5,3	2,6	2,1
Average	0,22	64,4	18,4	6,7	5,6	2,5	2,4
Onboard balancer after 280 hours of operation							
1	1,25	72,1	13,6	6,3	4,2	2,0	1,8
2	1,32	71,9	14,3	5,3	4,5	1,9	1,9
3	1,28	72,2	12,8	5,8	4,8	2,1	2,3
4	1,35	70,4	15,1	6,0	4,5	2,0	2,0
Average	1,30	71,6	14,0	5,9	4,5	2,0	2,0

As a result of abrasive wear, all bearing elements quickly erode, changing their geometric shape and size. This in the radial and axial direction of the bearing, respectively, directed cracks exceed the norm and accelerate the wear of the bearings. Abrasive corrosion has been observed

in bearings on coal conveyors, agricultural machinery and other machine assemblies used in dusty environments that are not adequately protected from the penetration of more soil and dust. Rapid wear of rolling bearings due to abrasive particles actively participating in the friction process leads to machine stops, which requires certain measures to be taken to reduce wear of rolling bearings due to abrasive particles.

The impact of low air temperatures on agricultural machinery is manifested in cold engine start, increased consumption, deterioration of temperature conditions and high fuel consumption. Starting a cold engine is caused by a deterioration in fuel evaporation, an increase in the density of cold air, a decrease in Jikler conductivity due to an increase in fuel viscosity, a decrease in spark power during ignition flashes, and other reasons. The mixture is liquefied, the current consumption and battery voltage increase, and the voltage at the lightning electrodes increases.

Operating conditions can accelerate or slow down the change in the parameters of their technical condition, affecting the technical condition of agricultural machinery, operating mode of the unit and parts. The values of the precision indicators of agricultural machinery differ from each other in different operating conditions, which is also reflected in the change in the indicators of the efficiency of technical operation. Taking into account the operating conditionsis necessary when determining the needs for the production and technical base, personnel, spare parts, operating materials, etc. Terms of use are divided into field, climatic and seasonal.

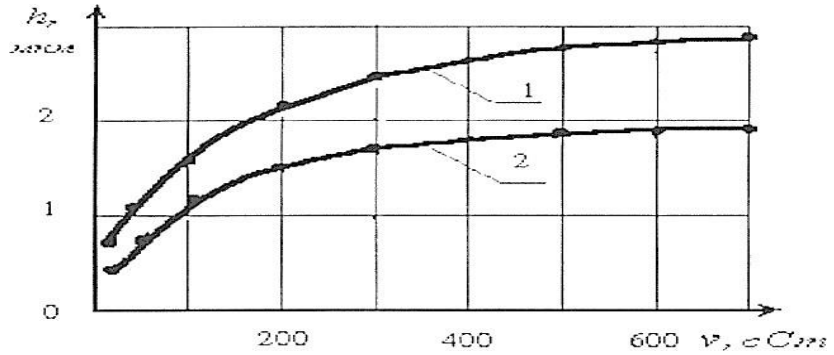

Figure 1. Change in the thickness of the oil film between samples Steel 45X - Steel 45, on the viscosity of the oil, at contact pressure p-1200 MPa: I - total rolling speed 5.5 m / s, sliding speed 0.2 m / s; 2 - total rolling speed 3.2 m / s, speed slip 0.75 m / s

Field conditions: travel speed, stride length, engine power utilization, trailer utilization. Natural and climatic conditions: atmospheric air, temperature, humidity, wind load, level of solar radiation.

Seasonal conditions are due to changes in air temperature, the seasonal nature of field conditions, changes are estimated by the influence of some factors (for example, dust, moisture and impurities) on the intensity of changes in the parameters of the technical condition of agricultural machinery. Environmental aggression is associated with high corrosiveness of the air, which is typical for the Aral Sea region. Such conditions lead to rapid corrosion of agricultural machinery parts, an increase in maintenance and repair work and the need for spare parts, and reduce the service life and frequency of maintenance of agricultural machinery.

CONCLUSION. Fuels and lubricants affect the quality of the agricultural machinery used, such as fuel economy, durability, engine power, speed. The impact of low air temperatures on agricultural machinery leads to cold engine starts, increased wear, deterioration of temperature conditions and higher fuel consumption. The test results show that the wear of gearbox parts operating on oil with a dust content of 0.8–2.4% was 1.5–5.5 times higher than the wear of the

same parts operating on pure oil. During the operation of the machine, the level of contamination when changing the oil in the transmission units averages 1.3%.

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