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NEW TECHNIQUES FOR TRACTOR WORK TRANSPORTATION BY TRUE TECHNICAL RESOURCES

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Abstract:

Periodic replacement of working oils in power transmission units is carried out based on the manufacturer's technical guidance, not on the current state of agricultural tractors. The consumption of petroleum products will be decreased, and the tractors will be able to ensure the appropriate operation of the power transmission equipment if the oils are replaced (renewed) in a timely way depending on the real contamination.

Keywords: Tractor, maintenance, diagnostics, power transmission devices, working oil, technical resource.

INTRODUCTION.

Petroleum products are delivered, transported, and distributed to tractors and combines used in agricultural production technical activities via rail at first, and then by truck and tractor tanks at later stages. The final step entails the installation and refurbishment of agricultural machinery from the storage and distribution locations of oil products in district branches of "Agrotexservis" LLC to the machines' power transmission equipment [1-2].

During routine maintenance, the engine oil in diesel tractors used in agricultural production will need to be replaced with new engine oil every 250 motor hours. When a tractor undertakes technological tasks in harsh conditions (e.g., plowing, harvesting), the engine oil in its diesel engine must be replaced every 200 to 220 moto-hours until it reaches 250 moto-hours. Similarly, during technological operations of tractors in light conditions (for example, cultivation, transport works), the engine oil in its diesel engine was increased to 250 moto-hours, after which it needed to be replaced after 280 - 300 moto-hours and more, as shown in a number of scientific studies.

As a result, replacing the mechanical shavings (mechanical particles) formed as a result of friction of the parts with each other in the composition of the running engine oil, depending on the actual quantitative composition, is not necessary in diesel engines of tractors engaged in agricultural technological operations every 250 motor hours as specified in the "Instructions for the use and maintenance of tractors." To accomplish so, they are provided to test engine oil from within the diesel engine and diagnose the quality of the oil using the proposed revolutionary methodology while the tractors are running.

CONDUCTED RESEARCHES.

According to studies, oil is less contaminated in the first stage of transportation of petroleum products. Intensive contamination occurs in the second to fourth stages, particularly in the storage stages. This minimizes the use of oil-based products and has a negative impact on agricultural machinery performance. Contaminated fuel, for example, increases the failure of fuel filters by 3-4 times during transit and storage, as well as the failure of lubricating parts by 2-3 times. The flow of tainted oil into internal combustion engines extends the service life of the cylinder-piston group and crankshaft mechanisms by an average of 5-7 times during transit and storage. The degradation of the quality of the oil put into the hydraulic system, in particular, is particularly hazardous [3-4].

It is well known that the technical and operational qualities of tractors can be improved if timely maintenance and diagnostics are performed. However, our observations while operating tractors reveal that some maintenance tasks are not completed in the field. Some maintenance tasks may not necessitate the use of a tractor of this sort. This is owing to the fact that the "average statistical" tractor is subjected to a number of maintenance activities that are stipulated in the standard and by the manufacturer. Because of the various circumstances in which tractors are used in agricultural production, such maintenance does not necessitate technological procedures.

In this circumstance, the frequency of tractor maintenance cannot be appropriate. As a result, there is an increase in tractor running expenses, as well as a decline in technical resources due to frequent breakdowns.

According to studies, the engine's power is lost by 12... 17 percent as a result of faulty adjustment and failure, resulting in a 15... 34 percent reduction in efficiency. This equates to an obligatory maintenance halt of 1.2 to 2.4 hours each shift.

It is obvious from the foregoing study that by performing timely maintenance technology operations on the tractor engine, it is possible to prevent failures and unforeseen failures, hence increasing the efficiency of tractor operation. The number of failures is reduced by 2.5 times when maintenance standards are followed. For example, the TTZ-80-11 tractor, which logged 1,000 moto-hours on the farms studied, had a maintenance capacity of 104 hours and a troubleshooting capacity of 133 hours. When only 128 hours are spent on maintenance, the time spent troubleshooting is cut in half, or 2.2 times. At the same period, the average tractor consumption per defect increases by 1.5 times, from 96.9 moto-hours to 140.9 moto-hours.

The preceding study reveals that gradually transitioning from a system of scheduled maintenance to a system of maintenance based on the actual technical condition of tractors is one method to lessen the growing workload for maintenance operations.

It is well known that the manufacturer's technical instructions ("Instructions for the operation and maintenance of tractors") are followed rather than the current condition of agricultural tractors when changing oils in power transmission devices (engine, gearbox, transmission, hydraulic cylinder). The consumption of petroleum products will be decreased, and the tractors will assure the appropriate operation of the power transmission equipment, if the oils are replaced in a timely manner based on the real pollution. The wear rate of tractor power transmission equipment increases when there is too much oil pollution [5-7].

RESEARCH MATERIALS AND METHODS.

In this context, we created and advocated a unique methodology for scientifically based diagnosis in order to detect the level of oil contamination in tractor power transmission systems.

Figure-1. LCD-902 device, designed to detect mechanical particles in the working oil of tractors and combines power transmission devices.

THE RESEARCH RESULTS.

In order to use the innovative method of the proposed diagnostic injection, a working sample of 100 cm³ of working oil is taken from the crankcase of the power unit of the tractor performing agricultural work.

The sample of oil obtained in the amount of 100 cm³ in the diagnostic laboratory of the regional machine tractor-park (MTP) branches of "Agrotexservis" LLC in the regions using a device LCD-902 (fig.-1) in the range of two dimensions (5-10 μm and 10-25 μm) is determined by the amount of contamination "**X**" with mechanical debris (particles). The value of the amount of mechanical debris generated by the friction of the details identified by the device LCD-902 on the vertical axis of the coordination graph "**X**" was placed (Fig. 2). Here, a straight line is drawn parallel to the "**Y**" axis on the coordination graph until it intersects with the functional lines **Y=R(x)**. From this point, we determine the degree of contamination of the oil as a percentage (%) by drawing a dashed line (**Y**) on the coordination graph. If this amount is equal to or greater than **1%**, it means that the service life of the used oil on the basis of the sample obtained is exhausted, it is necessary to take measures to replace it with a new one through maintenance (see Figure 2!).

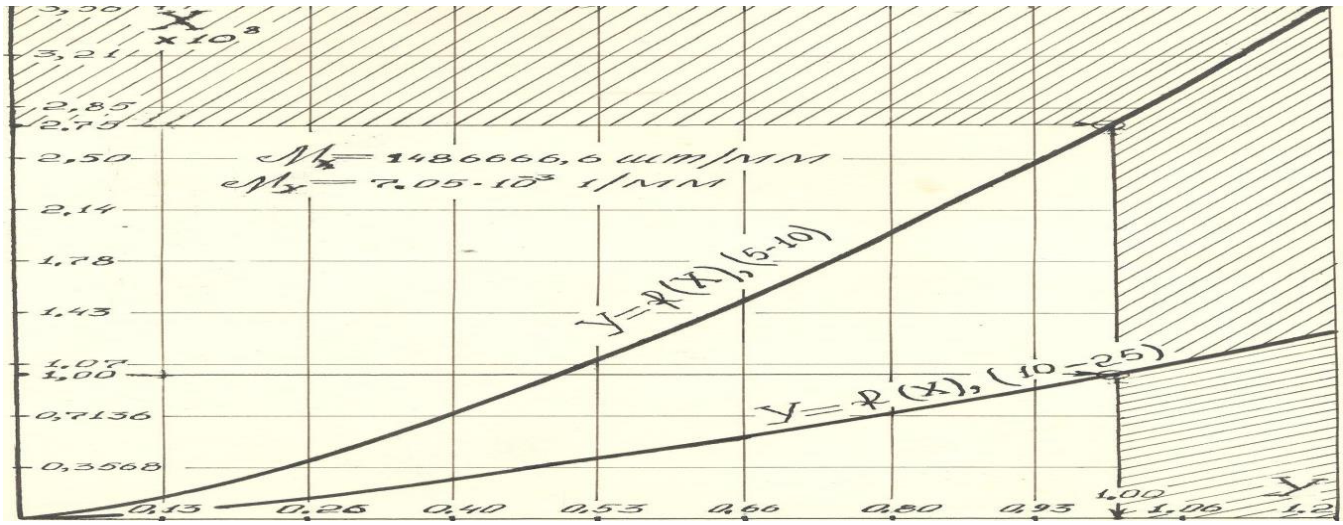

Figure-2. Nomogram to determine the suitability of the proposed diagnostic injection method for subsequent use of tractor power transmission oils.

The application of this proposed innovation method in the use of petroleum products provides good economic efficiency in the conditions of economic accounting irrigated by a market economy, resulting in minimal capital and labor costs.

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