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Research Article

THE ADVANTAGES OF DIAGNOSING WHILE DRIVING AND REPAIRING CAR ENGINES

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ABSTRACT

Over the past decades, the efficiency of industrial vehicles, their power, economic and environmental performance, reliability and durability have increased significantly. Despite this, fleet operating experience shows that a significant proportion of vehicles are operated with malfunctions that lead to a decrease in their performance.

KEYWORDS

Injector, fuel pump, vehicles, the nozzle sprayer.

INTRODUCTION

Particularly relevant at the present time is the improvement of diesel diagnostic systems. At present, diagnostic systems are widely used, both in the form of stationary instrument complexes and embedded

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diagnostic systems. However, the use of built-in diagnostics increases the cost of vehicles using computer-based engine control systems by 2-5 percent [1-3].

Existing methods and instrumental complexes built on their basis are characterized by high labor intensity of diagnosing, high price and complexity, therefore they are not available to motor transport enterprises (MTE) of small capacity [4-7].

MATERIALS AND METHODS

The complexity of diagnosing diesel engines, and especially fuel equipment, determines the need to use a large set of methods and tools for diagnosing engines in the practice of operating vehicles. The use of existing built-in diagnostic tools for automotive diesel engines is not economically feasible due to the high cost of diagnostic equipment. For the comprehensive diagnosis of automotive diesel engines at small and medium-sized MTEs, as well as convoys operating in isolation from production bases, it is advisable to develop an effective methodology for troubleshooting diesel engines, which is promising in terms of mass implementation, as in the means external and built-in diagnostics [8-11]. In connection with the foregoing, studies related to the development of a methodology for determining the technical condition of diesel engines of trucks and determining, on its basis, the optimal frequency of prevention of diesel elements, are relevant. The practical significance lies in the development of a probabilistic-logical method for monitoring performance, detecting faults and an integrated system for diagnosing diesel engines based on it, as well as the structure and algorithm for detecting faults, the introduction of which into the technological process of maintenance and repair will improve the efficiency of vehicle operation.

The technical condition of the diesel power supply system is subject to special requirements which guarantee the trouble-free and reliable operation of the fuel equipment. This is due to the fact that the plunger pairs of high-pressure fuel pumps and the needle with the nozzle sprayer body (in pairs) are machined and lapped with high precision and are precision pairs in which the replacement of one of the parts with a part from another pair is not allowed [8-11].

To date, as we all know, up to 10% of all faults in vehicles equipped with diesel engines fall on the diesel power system. Typical failures for refueling are wear of delicate parts and parts of the piston drive mechanism. The authors also pay attention to the sealing, especially high-pressure fuel lines; pollution of air and fuel filters; wear and misalignment of piston pairs of high pressure pump; loss of stiffness by the nozzles and a drop in pressure at the beginning of the needle lift; wear of nozzle outlets, their coking. Air has entered the fuel system [13-17]. The filter elements of the fine fuel filter have lost their capacity due to contamination. Injector nozzles clogged. The fuel pump is out of adjustment. There is no fuel supply to the fuel fine filter. Engine does not start or runs rough. Injectors adjusted. The air cleaner is clogged. Fuel start angle set incorrectly. The fuel pump is out of adjustment. Using fuel that does not meet factory recommendations. The engine smokes. Black smoke comes out of the exhaust pipe. Full fuel supply is not ensured due to misalignment of the length of the fuel pump control rod. Lost throughput filter elements of the fuel filter. Injectors misadjusted (injection pressure, quality of fuel atomization, atomizers coked) [15-18]. Fuel start angle set incorrectly. The air cleaner is clogged. The fuel pump is misadjusted (fuel supply has decreased). The engine does not develop power. Too early fuel supply

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(large injection advance angle). The engine runs "hard", sharp knocks at the top of the cylinder block. The fuel pump is out of adjustment. Worsened fuel spray injectors Engine overheats.

The listed malfunctions lead to a change in the advance angle of the fuel supply, deviations in pressure values, uneven operation of the fuel pump and the amount of fuel supplied, deviation of the cyclic supply from normal values, an increase in the unevenness of the adjustment parameters for the engine cylinders, which causes an increase in exhaust smoke and leads to a slight increase in consumption fuel and reduce engine power by 3-5%. Analyzing the signs of malfunctions of diesel engines, we come to the conclusion that malfunctions associated with the fuel system are more common. The repair and maintenance of these systems is very expensive, based on the criterion of lack of equipment and qualified specialists. Too early injection significantly increases the ignition delay period due to the low temperature of the charge in the engine cylinder. At the same time, the combustion process is shifted relative to TDC in such a way that the maximum pressure Pg is reached before the piston arrives at TDC. This is accompanied by an increase in compression work, a decrease in expansion work, a drop in indicator values and, accordingly, an increase in fuel consumption and exhaust smoke. Late injection, in which the combustion process develops on the expansion stroke, leads to a decrease in useful work, an increase in heat loss to the cooling system, and, as a result, to a drop in indicator values and an increase in diesel exhaust smoke.

The injector nozzle needle lift start pressure has a significant effect on fuel atomization, which improves with increasing injector spring tightening force. Reducing the pressure of the start of lifting the needle of the atomizer by 12% against the optimal one increases the specific fuel consumption by 2.5%, and the smoke of the exhaust gases by 1.5 times. With an increase in the cyclic fuel supply, the duration of the injection increases in time, and most of the fuel burns out on the expansion stroke, which increases the opacity of the exhaust gas and increases fuel consumption. The uneven supply of fuel through the engine cylinders (5H) also has a significant impact on its performance []. A particularly sharp effect of uneven fuel supply begins when it increases above 10%. The reason for the high failure rate of injector atomizers due to coking of atomizers is their high thermal stress, as well as violation of fuel equipment adjustments. The adjustment of the fuel equipment has a significant effect on the state of the injection valves of the high-pressure fuel pump sections. Failures of high-pressure fuel lines are associated with increased pressure amplitude in them. Thus, maintaining the normal performance of transport diesel engines in operation is largely determined by timely and high-quality maintenance and repair of the fuel supply system, which requires adjustment more often than other diesel systems. According to a number of modern researchers (E. A. Nikitin, L. V. Stanislavsky, E. A. Ulanovsky, L. V. Dronov), special attention should be paid to the quality of fuel during the operation of diesel engines. The fuel must meet the requirements of the technical specifications, be clean and pre-settled. The tightness of the entire power supply system must be ensured, excluding the ingress of air into the system through gaps in the connections, which can cause interruptions in the operation of the engine.

One of the most important measures to save fuel is the constant monitoring of the technical condition of the diesel engine fuel equipment, the timely maintenance of the power supply system. During maintenance of the diesel engine power system, special attention is paid to the cleanliness of the power devices, tightness

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connections of fuel lines and devices of the power supply system; check the condition and operation of the drives by supplying fuel; sediment is drained from coarse and fine fuel filters; change the oil in the fuel injection advance clutch and in the high pressure fuel pump. Vehicles with a diesel engine are increasingly being operated with malfunctions due to insufficient attention to the diesel fuel supply system. It is necessary to correctly diagnose this system in order to reduce the volume of subsequent malfunctions and system failures, which in turn will significantly save money spent on restoring the system's performance.

The role of diagnostics in improving the efficiency of technical operation of automotive diesel engines. The problem lies in the fact that the efficiency of using the rolling stock of road transport can be solved by solving the problem of managing the technical condition of cars, using the most accurate possibilities of its use during operation. Analysis of publications by such authors as C.B. Kryuchkov, A.I. Kudrin, A.M. Lukyanov, C.B. Pakhomov shows that the essence of the problem lies in the fact that due to the high variety of resources of aggregates and mechanisms of cars (for a diesel power system, for example, the coefficient of resource variation is 0.26...0, 78) their individual properties are partially realized with a preventive-planning system. As a result of this fact, there are significant losses of labor and material resources due to untimely control of failures, premature prevention and low level of organization of production, as well as insufficient individual information about the state of each car.

Thus, the volume of current car repairs, which consists in eliminating failures due to improper detection of faults, is more than 48% of the total labor costs for car maintenance. The most effective strategy for maintaining a car in good condition is maintenance and current repairs according to the condition of the diagnostic indicators. When searching for defects, diagnostic methods make it possible to identify the type and cause of the defect. According to diagnostic parameters, all methods are divided into three groups by working process parameters that allow you to check the output indicators (fuel pressure in the high pressure line, the stroke of the nozzle atomizer needle, etc.). The accuracy of the measurement data is high, since a direct measurement of the controlled value is carried out:

By the parameters of accompanying processes is less reliable, but still allows us to indirectly determine the parameters of work processes (vibration, heating, noise).

CONCLUSION

By structural parameters, which are based on the measurement of wear of parts (high-pressure fuel pump housings, precision pairs, camshaft, etc.) It should be noted that each method is designed to control a specific physical process. Therefore, the maintenance and repair of a car in modern conditions is irrational without control and diagnostic work, the share of which has already exceeded 30% of the labor intensity of maintenance and repair. Analyzing the above, we understand that the problem of reducing labor costs when performing diagnostics is of great importance. We will solve this problem in two directions: Increasing the efficiency of external stationary diagnostics by improving its methods and means, in combination with the introduction of automated control systems for the production of TO and R; increased control over the suitability of vehicles and the development of built-in diagnostic tools that allow you to carry out and analyze continuous monitoring of the technical condition of the car at minimal cost. In short, it is very important to set up the

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diagnostic work correctly in order to solve in time the problems that may occur during the movement and repair of vehicles. This is because timely and accurate diagnostics can help reduce the cost of repairing cars. In addition, the reliability of the car engine will also increase, the resource path of the car will increase. In a word, sudden failures are prevented.

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