

Research of Power Plants of Road-Building Machines under Operation Conditions

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Abstract. This article analyzes one of the most important areas for the development of the road construction industry - increasing the level of its technical equipment.

Key words: modernization, road construction industry, raising the level, technical equipment.

Introduction

The most important direction in the development of the road construction industry is to increase the level of its technical equipment, the rapid implementation of scientific achievements and world experience. Modern world problems of limited raw material resources and the need to save fuel and energy reserves bring to the fore the tasks of developing and creating resource-saving and energy-saving equipment and technologies [4,5,6,7,8].

Main Part

The main studies of power plants of road construction machines are focused on the study of dynamic processes occurring in different operating conditions of road construction machines. The probabilistic nature of external influences due to numerous and diverse dynamic factors are an essential feature of the functioning of road construction machines. Consequently, under the influence of a random external load, the characteristics of road-building machines deviate from the dependencies obtained under static loading. The optimal operating modes of power plants according to the energy criterion are currently formed by the influence of a certain number of design parameters on operational properties. The parameters of the rack and pinion regulator of the diesel engine have a particular influence. When operating road-building machines, it becomes necessary to assess real external influences on their dynamic characteristics [9,10,11,12,13,14]. The world practice of our time shows that when constructing mathematical models of dynamic systems of road-building machines, the parameters of the speed controller of the crankshaft of a diesel power plant are not properly studied, which significantly reduces the accuracy of calculations [15,16,17]. This means that the development of ways to improve the energy and dynamic performance of road-building machines must be carried out considering the parameters of

the diesel engine regulator and the probabilistic nature of external influences, which confirms the relevance of the problem under study. The main work of researchers related to improving the efficiency of road construction machines is aimed at stabilizing the rotational speed and torque of the crankshaft. The tasks solved within the framework of improving the efficiency of operation of RCM power plants are usually aimed at studying patterns that reflect the energy, dynamic and static characteristics of RCM subsystems. As a result of achievements in this direction, we can note the development and application of:

- methods for assessing the dynamic loading of the RCM, considering the influence of the existing subsystems of the RCM power plant;
- dependence of the dynamic and energy performance of the road machine on the characteristics of the engine and transmission;
- recommendations of manufacturers and design organizations to establish operating conditions that reduce dynamic loads on the RCM.

The diversity of the modern fleet of road construction equipment predetermines the use of devices with electric, mechanical, hydraulic and pneumatic drives in production processes and their combination. Due to the well-known advantages, the hydraulic drive is most widely used in road construction machines.

The scientific and technological achievements of our time, in particular the engineering industry, increasingly point to the need to use hybrid technologies capable of converting, accumulating energy and redistributing power in accordance with the energy intensity of the excavation process [1,2,3,4].

In a narrower sense, a hybrid is a single functioning node in which heterogeneous technologies are combined. The volumetric hydraulic drive and diesel-electric drive known for decades are also suitable for this definition, since they combine mechanical and hydraulic or electric methods of energy transmission, however, in practice, such designs are rarely called hybrid. It is generally accepted that the term "hybrid" is used to refer to innovative modern mixed (dissimilar) technologies for the use of energy in heavy special equipment.

A more specific definition is given by Caterpillar: "A hybrid is a machine equipped with equipment that can recover, store and release energy during operation".

Conclusion

However, according to this definition, some machines equipped with innovative mixed energy technologies should formally be excluded from the "hybrid" class, such as the Cat D7E crawler dozer, because its electromechanical transmission does not recover, store or release stored energy, and also several wheel loader models: Cat 966K XE, John Deere 644K Hybrid, John Deere 944K, in which the recovered energy is not accumulated, but is used for useful work, excluding heat losses.

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