

# WAYS TO IMPROVE THE RELIABILITY EARTHMOVING MACHINES

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**Abstract:** as you know, the study of increasing the efficiency of using earth-moving machines by improving and increasing the operational indicators of the reliability of machines, taking into account the factors affecting their operational indicators of reliability in extreme operating conditions, is a very urgent task.

The article presents the results of the study of the reliability indicators of a single-bucket military excavator of the EOY-4421 brand based on the KrAZ-255 vehicle in the process of use and effective operation, as well as quantitative characteristics of the indicators of the effective use of the excavator.

**Keywords:** reliability, operating time, excavator, process, cutting bodies, effect, durability, safety, stability.

## ПУТИ ПОВЫШЕНИЯ НАДЕЖНОСТИ ЗЕМЛЕРОЙНЫХ МАШИН

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**Аннотация:** как известно, исследование повышение эффективности использования землеройных машин путем улучшения и повышения эксплуатационных показателей надежности машин, с учетом факторов, влияющих на их эксплуатационные показатели надежности в экстремальных условиях эксплуатации, является весьма актуальной задачей.

В статье приводятся результаты исследования показателей надежности одноковшового войскового экскаватора марки ЭОВ-4421 на базе автомобиля КраЗ-255 в процессе использования и эффективной эксплуатации, а также количественные характеристики показателей эффективного использования экскаватора.

**Ключевые слова:** надёжность, наработка, экскаватор, процесс, режущие органы, эффект, долговечность, безопасность, устойчивость.

The study of increasing the efficiency of using road-building machines, including a single-bucket excavator by improving and increasing the operational indicators of the reliability of machines, taking into account the factors affecting their operational indicators of reliability in extreme operating conditions, is a very urgent task [1].

It is known that the efficiency of using road-building machines is overestimated by a large number of parameters and indicators characterizing the operational properties of machines and their influence on the reliability of equipment.

The operational indicators of reliability and durability of the main components and assemblies and, in general, machines that ensure the safe operation of machines, both in operating mode and in transport mode, operating at high temperatures, must be not lower than the established requirements imposed by firms, companies and manufacturers [2].

Thus, on the basis of the obtained research results, it is necessary to develop technological and technical-operational recommendations and proposals for a single-bucket excavator intended for operation in hot climates, as well as in sharply continental and high-mountainous areas.

Further, to solve the set research tasks, a method was developed to determine the operational reliability indicators of a single-bucket excavator of the EOY-4421 brand based on the KrAZ-255 vehicle as: mean time between failures, a parameter of the failure flow, as well as the gamma-percentage resources of parts and units of limiting reliability of a single-bucket excavator.

Planning for maintenance repairs, taking into account the working capital of units and assembly units, as well as the presence of posts for repairing a particular enterprise, in order to reduce irregular machine downtime during maintenance repairs of communication with machine failure.

Based on the results of the study, 80% and 90% gamma-percentage resources of parts and units of limiting reliability of a single-bucket excavator of the EOY-4421 brand based on KrAZ-255 have been determined and established.

The determined 80% and 90% gamma percentage of the resources of parts and assemblies is a regulated probability that characterizes the probability of maintaining the operability of machines.

As a result of the study of the operational indicators of the reliability of a single-bucket excavator, the specific values of the operating time of the machines are determined, in which it is based as the average resource of the duration of the operation of the part and machine units.

It has been established that a significantly minimal gamma-percentage resource of parts and assemblies, limiting the reliability of a single-bucket excavator of the EOY-4421 brand based on the KrAZ-255, is the mechanical rubber parts (cuffs, oil seals and rubber ring) of the hydraulic system of the machines, namely the cuff 80 x 115 of the boom hydraulic cylinder working equipment.

According to the results of the study, it was established that 80% and 90% cuff resources 80 x 115 limiting the reliability of the hydraulic cylinder unit of the boom of the EOY-4421 single-bucket excavator based on the KrAZ-255, respectively, is: 556 and 410 motor-hours, these resources are also resource operating time the boom cylinder as a whole.

As a result of the studies carried out, the values of 80% and 90% gamma-percentage resources of the detail of the limiting reliability of the undercarriage of the EOY-4421 single-bucket excavator based on the KrAZ-255, which is the crosspiece of connecting bridges and propeller shafts, have also been determined and established. One of the main reasons for the failure of the crosspiece is the acceleration of the wear process from transport relocation from one object to another, as well as from the inertial load during the working process.

The established values of gamma-percentage resources of the crosspiece of a single-bucket excavator of the EOY-4421 brand based on the KrAZ-255 connecting bridges and cardan shafts, respectively, are: 1930 and 1346 motor-hours.

In the course of the study, the values of 80% and 90% gamma-percentage resources of the part, limiting the reliability of the working equipment of the EOY-4421 excavator based on the KrAZ-255, were also determined and established.

Research has shown that the limiting reliability of the working equipment of the EOY-4421 excavator based on the KrAZ-255 is the pin connecting the booms with the stick, the resources of which, respectively, are 1540 and 1195 motor hours.

Thus, as a result of the studies carried out, the values of 80% and 90% gamma-percentage resources of parts and assemblies of limiting reliability of the EOY-4421 single-bucket excavator based on KrAZ-255 were obtained, which will allow standardizing spare parts and their costs, as well as planning costs these parts and assemblies in perspective. On the basis of the results obtained, proposals and recommendations are developed for improving the design of a single-bucket excavator, adapted for operation in hot climates.

For rubber seals, it is recommended to use heat-resistant rubber or multi-edged rubber sealing parts, namely: cuffs, oil seals and others in the hydraulic system of a single-bucket excavator of the EOY-4421 brand based on KrAZ-255.

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