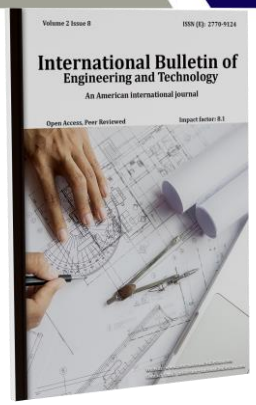

CALCULATION AND MODELING OF WORKING PRODUCTIVITY OF EXCAVATORS IN MINING ENTERPRISES

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Abstract: Prospects for the development of the mining industry in the Republic of Uzbekistan are closely related to the current situation and development the use of mining machines and equipment that meet the technical and quality requirements of mining enterprises is gaining importance. Mining enterprises are economic assessment-oriented - depending on the volume of mineral extraction, activity efficiency a prospective mining machine series model, including the use of modern mine excavators, should be built and calculated. The downtime and unplanned downtime of mining excavators is directly related to the working conditions of the mining machine, which is a negative affects the machine in general and its technical condition, which leads to a decrease in the efficiency of use and may also result in expensive mining equipment and economic losses for the mining enterprise. Rationale of external factors affecting the working time and technical condition of excavators used in the mining industry is given. For a more detailed assessment of the impact of externalities on operational efficiency mining machines, influencing factors are divided into two groups: 1) Directly related to human participation, 2) Factors of a natural and man-made nature, where human participation is minimized. It was found that natural and man-made factors have the greatest influence. Taking into account natural and man-made factors, an algorithm is proposed for a comprehensive assessment of the technical condition and forecasting of working time in nominal and real working conditions. It is offered on the basis of the developed program for planning and evaluating the working life of excavators used in the mining industry. In the mines modifying maintenance and repair chart schedules to reduce the number of unplanned it creates opportunities for mining excavator downtime and keeping it in good condition.

Keywords: Open pit mining, open pit excavator, performance indicators of excavators, performance indicators, working conditions, working hours.

Introduction

Currently, one of the promising areas of development of the mining industry in the Republic of Uzbekistan is the mines is to increase the share of open mining. Currently, the main job in large mining enterprises equipment for quarrying is the use of large-scale excavators. With the development of mechanics engineering, there is a steady trend to increase trunk unit capacity selection of mining and mining equipment, including excavators, based on the condition of the mine is one of the main tasks. As the capacity of dump trucks increases, Excavators with a bucket volume of 30 to 55 m3 and a payload of up to 65 tons are increasingly being used. The goal of any system is to get maximum profit with minimum mining cost excavators, the goal will be to maximize uptime with minimal costs in rock excavation. Along with the reduction of the working time of the excavator and its residual

resource, the annual increase in operating costs leads to inefficient use of resources of mining enterprises. And so, to achieve this goal, the operating conditions of the machine must be evaluated and minimized and is to eliminate the problems of unplanned failure of models. Mining engineer O'telbayev Azizbek shows in his research that unplanned outages related to malfunctions affect the productivity of the excavator and the economic indicators of the mine. A complex system with a mining excavator can reach up to 30% of the working time fund. The technical condition and service life of these machines directly depends on the working conditions and the influence of external factors. Most of the failures caused by man-made, technical and ergatic factors, first of all, it is necessary to implement processes related to determining the response of exposure. external influences, drive and control systems, the drive itself and the design of the excavator and its high rigidity operating equipment, which causes the mining machine to respond in interaction with the surface rock, and during the continuous monitoring of the bucket movement during the operation of the excavator and related controls causes errors. All the various factors that affect the intensity of the deterioration processes during the operation of the excavator used in mining enterprises for many reasons can be divided into two large groups: male. due to human intervention, natural phenomena without direct human influence and man-made factor or it is minimized. The first group of factors includes the control of the excavator by the driver, the nature and level of mining operations, their organization in the introduction of mining technology, as well as the nature and level of maintenance during maintenance and repair of the excavator. Natural and man-made influence factors includes: geological and climatic conditions, quality of surface and rock preparation mass, the selected maintenance and repair strategy and the natural aging factor of the equipment. Provided that the operation of the machine continues under nominal (passport) operating conditions, the last factor is present here as a kind of ideal process of natural aging of the excavator during its service life. The factors of these groups do not have the same effect on the intensity and degradation processes, as a result of which deterioration processes can increase the actual aging, which the process reduces this intensity if the nominal operating parameters are exceeded or when the operation takes place under more favorable conditions than the nominal. It should be noted of all the above factors, only one factor is aimed at leveling the degradation processes - this factor work is carried out on models that determine the nature, quality and integrity of the implementation of measures for maintenance and repair of equipment. Undoubtedly, as a result of the different intensity of manifestation of some factors caused by open pit mining processes natural and man-made conditions or conditions that determine the degree of manifestation of ergic factors, the same samples of mining machines and, in particular, excavators will be different. In mining enterprises should be recognized as residual life after degrees of degradation and equal time or service life. This as a result of the analysis of statistical data on the operation of the quarry excavator with of large unit capacity, the distribution of downtime under the influence of various factors was determined. The total downtime of the excavator during the considered work period is approx. 5000 hours, of which 30% is aimed at maintaining the working condition related to the implementation of planned maintenance and repair activities, 20% of the reasons organization of mining operations and management of excavator drivers is considered as a masculine factor. Failures caused by natural and man-made factors accounted for 30% of all failure rates. Quarry excavators, like other mining machines, are designed for specific working conditions, will be nominal for them, while arranging as follows: stone

category by difficulty excavation work, the average size of the part, the permissible slope of the working platform, climate working conditions and other reasons should be taken into account.

Assessment of the impact of natural and man-made factors in mining enterprises and modeling of excavators' activity time value calculation.

Since the mining excavator operates in different climatic, mining and mine-geological conditions that differ from the nominal values recommended by the manufacturer, it is necessary to assess the external effects of natural and man-made factors on the car significantly affects the efficiency of mining machines. To estimate the weight of each a factor with a natural and man-made nature, an algorithm has been developed, which allows for a comprehensive assessment and accurate consideration of the level of influence of external conditions. In mining enterprises the effect of the influence of each factor, thus it is possible to determine the degree of reduction of working time due to the influence of a certain factor when it deviates from the face. This value, if other factors remain unchanged, the overall performance indicator will not change. In practice, as the total working time of mining machines increases, the speed of the equipment failure increases, which requires an increase in time to deal with the consequences of these failures and as a result, there is a decrease in the production of excavators. To reduce the number of unscheduled stops it is suggested to increase the downtime of the excavator and its reliability, to carry out corrections. In the enterprise based on the developed algorithm, maintenance and repair diagram tables, taking it is necessary to take into account the working conditions of the machine in which it works. Based on the developed algorithm, information model and computer program for planning and created an estimate of the working time of the mine excavator under specific operating conditions, with recommendations for subsequent adjustments to the planned maintenance schedule. The goal is to increase the productivity of the working condition of excavators. Forecast of annual operating hours of excavators in nominal and considered operating conditions can be determined by the formula.

$$Q = 3600 t_c^{-1} ETK_e K_{\text{MOT and R}} K_{\text{oversize}} K_{\text{PA}} K_{\text{SI}} (1 - 5 \cdot 10^{-4} Y^2 + 6 \cdot 10^{-4} Y),$$

where tc is cycle time, s; E – bucket volume, m3; T – time fund, h; Ke - excavation coefficient taking into account fossil-geological working conditions, category of rocks according to the difficulty of excavation; K_{MOT} and R – MOT and R coefficient strategy; Coversize is a large size coefficient, taking into account the quality of surface and stone mass preparation; K_{PA} - platform angle coefficient; K_{SI} is the calculated coefficient the influence of the weather factor is determined according to the weather influence index for certain working conditions. Y is the number of years of operation of the mining excavator.

Conclusion

Based on the simulation results using the model proposed in this paper to estimate and estimate excavator uptime, maintenance and maintenance rules should be and performance indicators customized and maintenance and repair tables of the EKG-5A excavator adaptation of repair of excavators in the name and allows maintenance schedules to be reproduced to actual operating conditions and determines the working time of a complex technical system. The structure of the repair cycle adjusted for naturalness and excavator aging and factors natural and man-made effects it is recommended to use it depending on the working conditions. Procedures during the evaluation of the effects of external influences conditions

and natural phenomena processes operation of mining machines using consideration of relevant factors to account for the decline in activity the time of the mining excavator in real conditions compared to the nominal and reduces the aging factor. The latter accepts to account for the decline in activity the time of the quarry excavator in nominal terms operating conditions, taking into account the natural aging of the machine and is defined as the ratio of and estimated working time of the excavator in the considered year of operation to the estimated working time at the ratio is calculated for the first year of operation. This is to clarify the technical maintenance periods during the operation of the machine it is necessary to follow the information obtained in the process of computer modeling and regulation.

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