STEPS OF OPTIMIZATION OF MINING AND LOADING PROCESSES OF EXCAVATORS IN OPEN-PIT MINING ENTERPRISES

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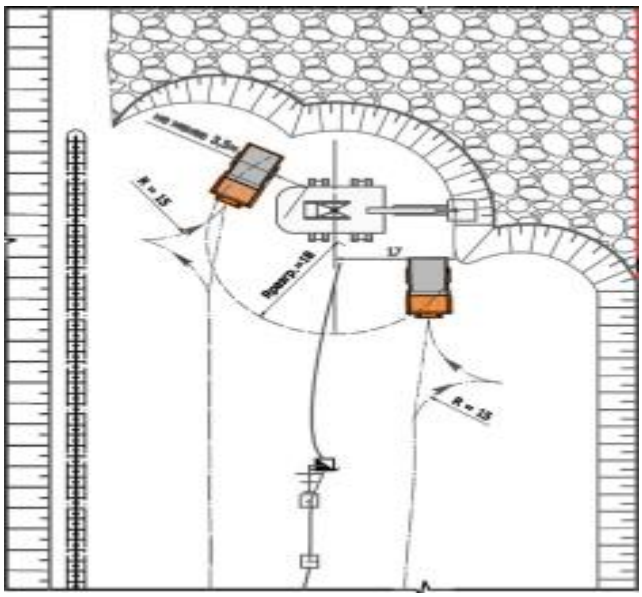
Abstract: To date, the Republic of Uzbekistan requires the transition to the use of new equipment in mining enterprises, and by revising the previously established relationships that form new mining technologies in the mine. The methodological basis of optimization to ensure high efficiency is mining and loading exploitation of technological equipment of excavators will consist of attaching to a complex that performs all technological processes of overloading. Open source mining and loading processes the imperfection of existing methods of optimization is related to their use as mining processes according to the rule of empirical formulas for obsolete equipment installed for calculation performance, so replacing or partially adjusting these dependencies, includes methods and tools for determining process parameters. Therefore, it is important to set the mining and loading parameters of excavators in the mining processes of each. Covering rocks and mining technological processes for the development of hard rocks and semi-rock formation, they together provide optimal results. We performed calculations on the entire excavator-dumper complex. The article examines the use of optimized methods of excavation and loading processes of excavators. Open source mining and loading processes optimization of the excavator and dump truck complex as a criterion for average weight of fragments of blasted rock mass determine the optimal parameters of each of the relevant technologies processes are performed. Also, their consumption costs and total costs of technology are calculated.

Keywords: Open-pit mining, loading, blasting, crushed rock, drilling, geological conditions, geotechnical requirements, mine-technical indicators, mining efficiency of excavators.

Introduction

To date, in order to ensure the efficient operation of large-scale excavators in the open-pit mining enterprises of the Republic of Uzbekistan, it is necessary to monitor the quality of the mass of the crushed part of the rock blasted in the mine. From mining and loading processes will need to be prepared along the rock crushing section, which can be done by using it together. Data and actual results are supplemented by direct timing observations will be attached to the excavation process. Mining and loading processes in mines the main goal of optimization is to choose the best of the possible solutions in mines and will consist of ensuring the continuity of processes based on the criteria adopted in certain conditions. The best option for controlling mining and loading processes in mines is the option that is in the

mine in the planned period, the necessary conditions of the process are met and the value of the function reaches the extremum, that is, the highest productivity or current efficiency indicators for a given cost equal to the minimum costs. Optimization is primarily about process selection minimizes unit costs and parameters, but provides the necessary requirements for them. In this regard, optimization of mining and loading processes of excavators is to determine the minimum of the complex parameters of the open pit. In mining enterprises specific costs of overburden mining for the entire technology and parameters each of the processes for the technical means used in physical and accounting mechanical properties of the rocks being developed to ensure optimum performance should be carried out sequentially based on the conditions. The main content of this article is that by constructing a graphical connection of mining and loading processes, we will be able to select suitable excavators for the mine. In the mine the change in the price of the cleaning unit for each process of the applied technology is drilling and processes such as blasting, excavation, transport and disposal by average lump weight of exploded overburden, which can be the minimum zone of total costs when collecting these costs. On the other hand, a medium-weight excavator is in the mining and loading processes the size of the continued rock piece determines the parameters of each process and technical means used taking into account their physical and mechanical properties rocks that ensure optimum performance of the excavator conditions are created for the entire complex of excavators. In the Tebin Bulak iron ore open mine located in the territory of the Republic of Karakalpakstan, overburden works are carried out with almost full utilization. In the mine drilling and blasting is underway. As preliminary geological information for drilling and blasting the design uses information from geological exploration wells, which are often even beyond it the explosion block will depend on the placement scheme. The geologic structure represented by these data is assumed to be uniform. Mining the entire block and this is far from the actual geological conditions of the development of overburden, because the rock mass being developed has a complex structure, its location is solid and weak rock layers are constantly changing and it is almost impossible to predict the location. Mainly in the mine consists of deep solid layers. Drilling and blasting project based on such information often leads to uneven grinding of the rock mass, a large number of large pieces of rock. These processes in some cases it will be necessary to reblast part of the block. During the initial period of operation of this excavator in Tebin Bulak open-pit mine in December In 2022, it was established to determine the average daily productivity of the excavator. Diary monitoring and stopwatch monitoring using shift work time is permitted and to determine a number of technical and organizational changes, including cargo replenishment Place the truck (Picture 1) and provide continuous work on the face of the wheel dozer access and parking plan for dump trucks to allow for daily freight production volume is estimated up to 50 thousand m3. It was found that the drilling and blasting works were performed in good quality to the excavation site of the rocks, the step height is not less than 15 m and the corner angle The rotation of the excavator when loaded up to 60 ° reduces its cycle time by 35-40 seconds.



Picture 1. Scheme of optimization of mining and loading processes in the mine

Our research showed that the parameter describing the entire aggregate of fractions in determining the granulometric composition and technology of blasted rocks drilling and blasting parameters are therefore the costs of this process is equal to the value of the weighted average size of the blasted top layer pieces. Intensification of mining operations in quarries is usually used it is recommended to use large-scale excavation equipment, in particular, well-proven excavators. In this regard, it is appropriate to estimate possible operation mining performance of the excavator used in the quarry, taking into account its quality also depends on the dimensions of the explosive crushing of the rock mass. Such calculation of operating power differs and more consistent with operational than traditional method results. Used in mines should be used based on the parameters of the technical conditions of the equipment. Granulometric composition for the excavation process the rocks being developed are also crucial. The productivity of the excavator depends on the following fragments of blasted rocks, more precisely, the value of the coefficient of excavation and the time taken to retrieve the bucket with sufficient bench height and productivity determines the cost of the process. One way to control the build-up is through a short-term blasting process. Such detonation is defined as the alternating detonation of charges or groups of explosives. In the mine such small decelerations in residual stress and the resulting additional response time can be used on exposed surfaces caused by the explosion of a previous charge (or group of charges). Short-term blasting is used for the following purposes:

*To reduce the seismic impact of a mine explosion.

*To improve the level of crushing and reduce production of rock mass mined or blasted in the massif if too large.

*increase and decrease of yield of rock mass per unit length of mined well (field border) consumption of explosives.

*it consists in reducing the width of the mined area, changing the direction or shape of the axis cover of the blasted rock mass.

Additional drilling and blasting efficiency in the mine can be achieved using parallel and proximity charges. This is explained by the proximity of the blasting method and proximity of charges at distances approximately 1/2 the distance between charges in detonation processes in pairs, the cylindrical fronts of the voltage wave of the first and second charges begin and

interact, forming a flat front. To increase the energy of well charges, esp high-quality grinding and processing in the plantar part of the upper benches, one method parallel close blasting with well charges may be introduced. The essence of the method is as follows. Explosive bench drilling is carried out by several vertical or inclined groups and are considered as parallel wells six charges diametrically apart from each other. There are parallel and proximity charges in a line (two adjacent) or view. In this case three sets and more wells are placed. A beam or a pair of parallel-closed charges is directed parallel to the line will consist of a bench. Thus, an equivalent explosive charge of large diameter is formed, which increases the efficiency of blasting operations. This is done by switching to the explosion method. This is possible with a limited selection of the diameters of the charges. To perform parallel well charging with existing drilling rigs in mines a charge with the required diameter and explosive energy is simulated. The following formula is used to calculate the average size of crushed rock in rock crushing. Changes in the average weight of crushed rock fragments by specific volume of explosives in the mine allows to determine in certain con-geological conditions of the quarry. This may give rise to geotechnical requirements.

$$D_{av} = \frac{K \times D_{bl}^{0.61} \times f^{0.2} \times \Delta^{0.25}}{Q^{0.75} \times q}$$

Here, K can be a dimensional coefficient that depends on the strength of rocks It is calculated by the expression K = 3 + 0.7f and has a dimension of kJ/kg; Dbl – average block size in the stone massif, m; f - hardness coefficient of rocks according to Protodjakonov; D - charge density, kg / m3; Q – heat of explosion (energy), kJ/kg; q is unique consumption of explosives, kg / m3. In the process of dumping, the quality of the blasted rock mass is indirectly affected, depending on the operation of excavators and dump trucks, because these processes determine the amount of rock that fits in the landfill. Economic costs of the process determined depending on the productivity of the excavator-dumper complex; adopted by the damping technology and technical means used in the enterprise.

Conclusion

In the considered conditions, the productivity of excavators depends more organization of digging and loading and the quality of crushed rock mass changing the loading time of the dump truck is affected. Fragments of an explosion rocks primarily affect the time of collecting the bucket, the degree of clogging of the dump truck and as a result determines its fuel consumption. At the same time, the level dump truck loading is not directly related to rock fragmentation, but determined at boot time. Mining engineer O'telbayev Azizbek carried out many studies during the activity of mining enterprises. Azizbek has many articles published in international journals about the activities of mining enterprises.

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