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METHODS FOR INCREASING HOLE DEPTH AT A CONSTANT MINING SECTION

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Abstract . *In the world, most of the work in coal and ore deposits is carried out by drilling and blasting. In the practice of mining, practically the only method of crushing rocks is the method of blasthole and borehole charges, which should be given special attention to increase the efficiency of blasting operations.*

Key words : *cut, carrying out, blasting , hole, workings, well, explosion, hole utilization rate.*

Introduction. The development of an optimal cutting scheme when carrying out blasting operations is considered a determining factor that increases the quality and efficiency of the explosion. When underground mining, it is especially important to pay attention to blasting. The design of sets of boreholes is associated with the solution of many issues of explosion control in workings of limited cross-section. One of these issues is drilling and blasting deep holes with a fairly high hole utilization rate.

An increase in the depth of boreholes is necessary due to the use of more productive technical means for carrying out workings and, as a consequence, a sharp increase in the speed of workings in hard rock and tunneling cycles. The multi-cyclic organization of work under such conditions leads to a relative increase in time lost on auxiliary and preparatory and final operations. Therefore, drilling deep holes and reducing the number of cycles leads to an increase in the productivity of the miner. However, in workings of a given cross-section, the increase in hole depth is limited by natural and technical factors. With an increase in the depth of the holes, the operating conditions for all the holes in the set and especially the cutting holes become significantly more complicated, and the possibility of obtaining an even contour of the excavation decreases. Accordingly, the design methods of drilling and blasting operations must change. They must take into account the change in the specific consumption of explosives with the depth of the holes, changes in parameters due to contour blasting and the use of cut holes. These issues can be resolved by improving methods for increasing the depth of holes, rationally changing the parameters of a set of holes and a charge, and using contour blasting methods.

Today, scientific and practical research is being carried out in the world ; for the foreseeable future, the explosive method of rock destruction has no alternative, especially in cases where we are talking about increasing the safety of the contour massif by optimizing the parameters of contour blasting when excavating deep horizons of underground mines.

Material and Methods. In this regard, an increase in the depth of development, all other things being equal, leads to an increase in the specific consumption of explosives and a decrease in the design parameters of the explosion: the hole utilization rate, the volume and quality of preservation of the boundary mass, depending on the physical properties of the rocks that cross the face; there are different ways To carry out excavations in hard and soft rocks , as well as for hard rocks, a drilling and blasting complex of works is used, in which there is a need to select the type of explosive, the mass and design of

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the charge, the depth, number and arrangement of holes.

To remove rock to a given depth, a set is drilled in the face of a horizontal working, usually consisting of cutting, auxiliary and delineating holes. The location and number of holes in a set depends on the mining and geological characteristics of the rocks and the cross-section of the working, as well as on the nature of the adopted mechanization, the type of explosive, the depth and diameter of the holes, and the design of the charge.

Under given mining and geological conditions of the excavation and its constant cross-section, the main influence on the design of the set is exerted by the depth of the holes. Extraction of rock to a significantly greater depth of drill holes in a set than that used in the face is possible by increasing the specific consumption of explosives or creating additional exposure planes, i.e. drilling an additional number of holes or holes of large diameter, as well as the use of cutting holes and slots.

Depending on the depth, the set of holes will change. If you know the principles inherent in the design of a particular cut, methods, techniques and corresponding recommendations, the use of which ensures rock removal to an increased hole depth, then you can change the design, abandoning the outdated standard that is unsuitable for the given conditions. Such a change is usually necessary when using more productive drilling machines and other technical means, in which the use of holes of smaller depth is irrational. A set of drill holes is usually selected experimentally. Therefore, it is necessary to note the basic principles of the methodology and comparative criteria that should be used when choosing it. It is known that under given mining and geological conditions, excavation cross-section and other equal conditions, sets of blastholes are compared with each other according to such indicators as the specific consumption of explosives and borehole gauges and drilling holes. However, with increasing hole depth, the specific consumption of explosives and borehole gauges usually increases, and the time consumption of the tunneling cycle per 1 m of excavation for such operations as preparatory and final operations, loading, blasting, and ventilation decreases [1].

Therefore, the choice of a set of optimal hole depths should be made taking into account many factors, including their economic assessment. For greater objectivity of the data, sets of different hole depths must be compared at the optimal CIS. For a given (constant) depth, the rationality of the chosen scheme must also be justified by practice or experience. It is necessary to compare as many schemes as are known in practice and sets of drill holes acceptable for these conditions. After that, the most rational of them is selected, providing the lowest specific consumption of explosives and borehole meters and the optimal CIR.

Results. If you increase the depth of the holes from the initial depth of the normal wedge cut, leaving the type of explosive and the design of the hole charge unchanged, then to preserve the CIS. Constantly, it is necessary to increase the specific consumption of explosives or drill, or otherwise produce additional exposed planes (Fig. 1).

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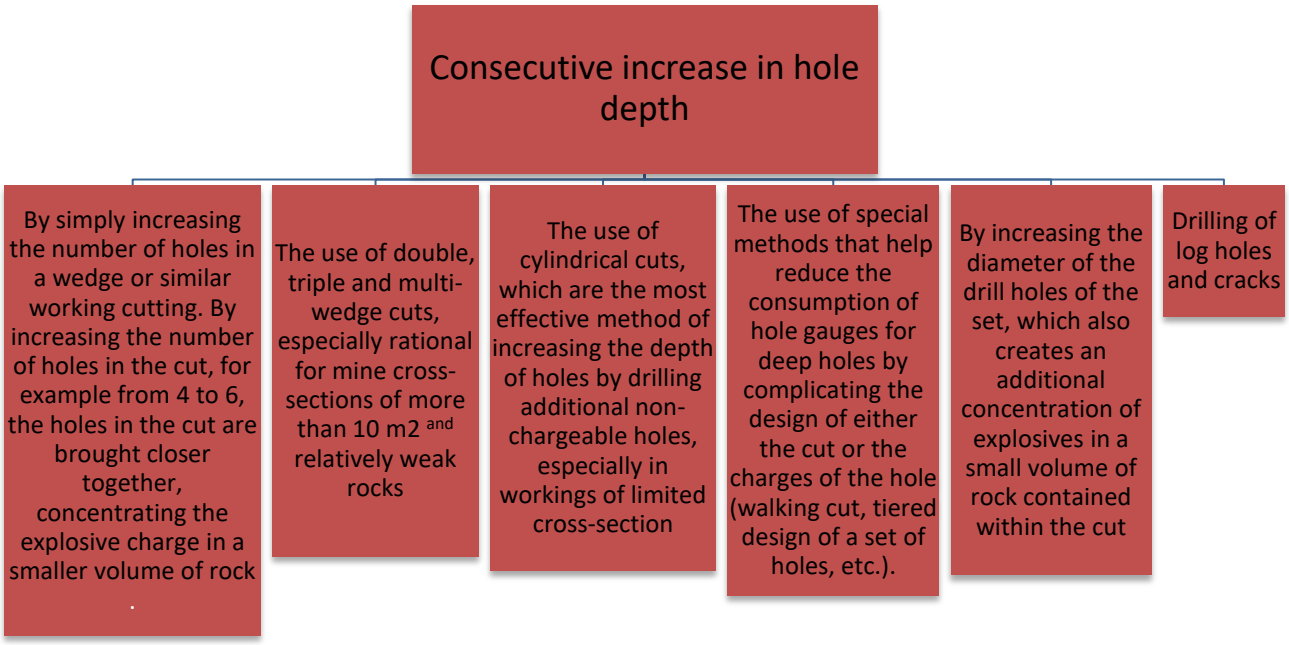

Fig.1. Ways to achieve an increase in the depth of holes with constant CIS

This set is taken for comparison with a set of increased hole depth selected in the same way. The initial depth of the holes is taken as the depth at which the specific consumption of explosives and the number of holes for a given cross-section of the excavation is minimal. When increasing the depth of the holes, their number and specific consumption of explosives should be left the same in order, on the one hand, to check the correctness of the choice of the number of holes at a shallower depth and, on the other hand, to prove the insufficiency of the number of holes and the need to increase the specific consumption of explosives as their depth increases. Thus, methods for increasing the depth of boreholes with a constant cross-section of the mine were selected and systematized [2].

Conclusion. Increasing the depth of holes using each of the listed methods depends on the physical and mechanical properties of the rock and the cross-section of the excavation. On average, the use of such methods makes it possible to consistently increase the depth of boreholes by 3 times or more compared to the original one .

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