

Abstract

**Of the dissertation for the degree of Doctor of Philosophy (PhD) in specialty
6D070700 – Mining**

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**Selection and justification of the technology of fastening preparatory
workings in unstable massifs of the Khromtau deposit**

Relevance of the study. The dissertation work is devoted to the issue of securing preparatory mining workings using combination fastening technology.

Underground mining at the Khromtau deposits is one of the processes that require the greatest amount of labor and capital expenditures. The growth in the volume and construction of mine and underground structures requires an increase in the technical level of their implementation, the quality of work, labor productivity, ultimately saving financial resources and reducing construction time. The main feature of the deposits under consideration is that as the development moves into deep layers, it is exposed to a complex unstable array. In this case, the fixing work carried out during the sinking of mine workings must be carried out in accordance with environmental changes. From this point of view, the search for an optimal solution to the set goals requires justification of the stability of the workings by geomechanical in-depth studies of the type and parameters of the support.

The issues considered in the dissertation work are aimed at improving the effectiveness of measures arising in connection with the stability of workings during mining in the deep layers of the Khromtau mines.

The technology of fastening preparatory workings has been widely used all over the world. In operational practice at the Khromtau deposits, a number of significant shortcomings have been identified, such as displacement of the rock contour, collapse of the roof and sides of the workings, leading to deformation of the preparatory workings.

When choosing a support for mining workings, mining-geological and mining-technical factors are highlighted. In accordance with this, it is relevant to calculate the fastening parameters taking into account factors affecting the stability of mine workings in various technological aspects, and in accordance with specific mining conditions.

The complexity of the construction of an array in the mines of the Donskoy GOK also lies in the fact that sometimes during the mining process one can observe collapses (especially in deep layers) that do not comply with the laws of mechanics. In these conditions, the actual problem of mining production is the geomechanical justification of the parameters and the choice of optimal and effective types of supports that ensure the stability of workings.

The purpose of the work is to substantiate the technology of fastening schemes of preparatory workings in conditions of unstable massifs in the zone of impact of treatment faces.

Research objectives:

1. analysis of domestic and foreign experience in choosing the optimal parameters of the support in accordance with the zone of influence of cleaning operations during the sinking of mine workings;
2. investigation of the KDC of the array in the cleaning area and determination of patterns of changes in voltage indicators;
3. to develop reasonable recommendations for optimal parameters of the support of mine workings in the treatment zone, taking into account the categories of rock stability in the conditions of the mine "10 years of Independence of Kazakhstan".

The idea of the work is to substantiate the optimal parameters of the combination support, taking into account the stability of rocks when sinking workings in the zone of influence of cleaning operations.

Object of research: an array of rocks of the underground mine of the Donskoy GOK-a branch of JSC TNK Kazchrome, the mine "10 years of Independence of Kazakhstan".

The following methods were used in carrying out research and scientific and technical work:

- analysis and generalization of the Literary Fund, patent materials and technical developments on the topic of dissertation research;
- setting up mine experiments to study the manifestations of rock pressure, deformation and destruction of rocks using modern methods of scientific research;
- determination of zones of inelastic deformations by numerical modeling of peripheral elements using high-precision software that takes into account the structural and strength characteristics of rocks according to the stress-strain state of the array.

The main provisions submitted for protection:

- the disturbance of the support of workings of great depth was determined by the asymmetric magnitude of stresses acting on its cross-section in the vertical direction with a maximum;
- based on numerical modeling of the rock mass, it was found that the magnitude of the load arising in the array varies significantly depending on the impact of the cleaning space;
- based on computer modeling by the method of extreme elements, it was found that the coefficient of stability in the zone of plastic deformation depends on the bearing capacity of the relief Scientific novelty:
investigation of the stability of workings located in the direction perpendicular

to the clearing space, in accordance with their influence and the formation of optimal parameters; to determine the deformation parameters arising in connection with complex collapses of lateral rocks, geomechanically substantiate the necessary types and parameters of fastening.

Practical significance of the work:

The practical significance of the work was considered to be the basis for choosing the optimal types of support, taking into account the stress-strain state of the massif and the structural and strength properties of rocks, in maintaining the stability of the mine workings laid in the zone of influence of cleaning operations.

The validity and reliability of scientific statements, conclusions and recommendations is confirmed by the results of computer modeling of the rock mass, comparative, statistical and analytical analyses.

Implementation of the results of work in industry. Recommendations on the application of the technology of fixing workings while maintaining preparatory workings have been developed.

According to the dissertation work, certificates were received in the educational process of the NAO "Karaganda Technical University named after Abylkas Saginov" in the bachelor's and master's degree disciplines of the specialty "Mining".

Personal contribution of the author: in the scientific substantiation of the construction of the effectiveness of the construction of enclosing systems for fastening in areas with unstable rocks during mining operations.

Approbation of the work. The results of scientific research obtained in the dissertation were introduced into the educational process in the disciplines of specialties 6b07202 bachelor's degree and 7m07203 master's degree in mining and ICT in Voskhod Oriel LLP.

The main provisions of the work are outlined and approved at the Scientific and Technical Council of the Abylkas Saginov Karaganda Technical University, the Department of Mineral Deposits Development.

Publications. The main provisions of the work are reflected in 11 printed works, including 6 articles published in a journal included in the Scopus database, 3 articles published in journals included in the list of publications submitted by the Committee for Quality Assurance in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, 2 theses at an international conference and 1 certificate of entry of information into the state register of rights to objects protected by copyright.

The structure of the dissertation work. The dissertation consists of an introduction, four chapters and a conclusion, 110 pages of printed text and a list of used sources from 44 titles.

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