

AP19579377 “Investigation and substantiation of the parameters of special drilling and blasting operations in order to minimize the negative impact on the stability of the sides to increase the efficiency of the quarries: – p.m. Hussan B.

Relevance:

Currently, at large mineral deposits developed by the open-pit method the transition to the development of deep horizons is underway. With increasing depths, ensuring the stability of the sides and ledges of quarries is one of the main tasks of mining production. The stability of the sides of the quarry is assessed both by the initial mining and geological conditions of the environment and the parameters of special drilling and blasting operations, and by the seismic impact of the explosion, which must be taken into account through the parameters of their influence. At the same time, an increase in the slope angle of the sides of the quarry leads to a decrease in the volume of cutback and increases the economic efficiency of field development. However the risk of collapse of slope structures in the quarry increases as a result of geodynamic movements associated with rock pressure and the influence of short-term impulse loads caused by blasting operations. The assessment of the stable state of a slope structure at a certain angle is based on measurements of the movement of the massif in one direction or another within sufficiently long periods of observation, while short-period deformations leading to local interblock movements are not taken into account when justifying stable angles. In this regard, unjustified scientific, insufficiently accurate drilling and blasting operations near slope structures can cause a violation of their stability and lead to catastrophic landslides.

The subject of the study is mineral deposits developed in the open-pit deep-lying in terms of the stability of the sides of the quarry.

The purpose of the project is to study the impact of drilling and blasting operations on the side of the quarry near the limit contour, to ensure minimal impact of drilling and blasting operations on the stability of the sides of the quarry, to increase safety during work under high ledges. The development of effective parameters for special drilling and blasting operations will ensure the bulk of well-fragmented, loosened chipped rock, as well as an undisturbed slope according to the project.

It is necessary to establish the relationship between the parameters of drilling and blasting operations, mining and geological conditions and the stability of the sides of the quarry, taking into account the influence of the seismic impact of the explosion.

Expected and achieved results:

Achieved results:

The effect of the explosion on the contour array was studied, the patterns of wave processes in the array were established, the interaction of charges on the near-contour explosion of the block was revealed, depending on the strength characteristics of the array.

On the drilling and blasting block of the Koktaszhal quarry, an optical survey of the boreholes with video and photo fixation was carried out using a video inspection endoscope for the presence of fractures and waterlogging of drilled wells. Using the Schmidt Hammer tool, data were obtained to determine the strength properties of a rock mass in the fracturing zones of a quarry. Using the GeoID mountain compass, data on the directions, angles and azimuths of the quarry cracks were obtained. The obtained data were imported into the Rocscience DIPS program, then the directions of crack systems were determined. Studies of core images for uniaxial compression have been carried out in the laboratory. The dependence between the rock strength and the bounce rate of the Schmidt Hammer tool has been revealed.

The method of calculating the effect of drilling and blasting operations (DBO) on the stability of the slope of the sides and ledges of the quarry is determined. The license of the Ansys Mechanical program has been purchased. The Ansys LS-DYNA training program was conducted, with the help of which it is planned to simulate the dynamics of blasting operations using data from previous studies to determine the physical and mechanical properties of rocks, fracturing of the massif. The technology of conducting DBO in the contiguous areas has also been determined.

Expected results:

It is planned to acquire a patent of the Republic of Kazakhstan.

The results of the research work carried out will be published in an article reviewed in a

foreign or domestic publication recommended by the CQAFSHE. It is planned to purchase a certificate of state registration of intellectual property rights.

The research results will be used in the preparation of 2 PhD theses, 2 master's theses and educational complexes on the discipline "Destruction of rocks by explosion" of the educational program 6B07202 "Mining", "Improvement of drilling and blasting" of the educational program 7M07202 "Mining".



Figure 1 – Preparation of cores to determine the strength of rocks for uniaxial compression



Figure 2 – Determination of deformation properties of rock samples

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Expected publications:

During the implementation of the Project, it is planned to publish research results in journals and collections of scientific papers of Kazakhstani and foreign scientific publications, including – 1 article or review in a peer-reviewed foreign or domestic publication recommended by CQAFSHE, 2 articles and (or) reviews in peer-reviewed scientific publications in the scientific field of the project, indexed in the Science Citation Index Expanded database of Web of Science and (or) having a percentile of at least 35 (thirty-five) CiteScore in the Scopus database, and also, the publication of 1 monograph and the receipt of 3 security documents (IPS), 1 patent based on research results.

Information for potential users:

The result of the research work is to improve the production technology of drilling and blasting operations in the contour area of the quarry and minimize the negative impact of drilling and blasting operations on the stability of the sides of the quarry. Potential consumers of research results are research centers, mining and design companies.

Scope:

Geology, extraction and processing of mineral and hydrocarbon raw materials, new materials, technology, safe products and structures

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