

ANNOTATION

dissertation work

«Study of external waste dumps influence on the coal mines sides stability»
submitted for the degree of Doctor of Philosophy (PhD)
in the specialty 6D070700 – «Mining»

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The relevance of the problem. The formation of working and stationary boards, the organization of dumping for the storage of overburden rocks and ensuring the stability of these geomechanical facilities for the entire period of operation of the deposit is one of the main issues in the open-pit mining of deposits in mines and coal mines. With a sufficient volume of the developed space of the section, the rocks are stored in internal dumps, which is more technologically and economically compared to the external dump.

However, at the first stages of open-pit mining, overburden rocks are stored in external rock dumps, and often continues after. With a transportless stripping and dumping system, external dumps are usually formed at relatively small distances from the sides of the cut. For various reasons, this distance was determined only by economic factors, without taking into account its effect on the stability of the side as mining operations developed at the section.

The stability of the sides of the sections (quarries), as well as the external dumps in this case, are directly related to the overall safety of mining operations. They influence the adoption of many technological decisions, on their basis, the maximum angles of inclination of the sides, the working depth of the section or quarry, etc.

are determined. As for safety, dangerous deformations of rocks occurring due to deformation of dumps, ledges and sides of sections, as well as territories adjacent to the section, can cause major accidents of mining and transport equipment and they can threaten the safety of work on the sections.

In this regard, the issues of managing the stability of the working sides of the section, quarry and external rock dumps considered in the dissertation on the basis of a set of studies aimed at achieving such a state of the rock mass, which ensures safe mining and efficient extraction of minerals, is an important scientific and technical problem.

The subject of the study is the processes determining the formation of geomechanical structures of a coal mine (working sides, external rock dumps), as well as factors affecting their stability.

The objects of the study are the designed and operated working sides of the coal mine and external rock dumps during the open-pit development of the Ekibastuz deposit.

The **purpose** of scientific research in the dissertation is to develop and substantiate methodological provisions for determining the stability of the working sides of a coal mine under the action of external rock dumps.

The **idea** of the dissertation work is to establish the relationships and patterns of interrelated technological parameters of the working sides of the quarry with the stability parameters of the external rock dump in order to ensure safe operation of the section.

Research objectives: in order to achieve this goal, the following tasks are set and solved in this dissertation work:

- study of the characteristics of the stability of the sides of the Ekibastuz and Vostochny sections;
- identification of the main factors affecting the stability of the sides;
- selection and justification of a method for solving the problem of stability of loaded sides of sections;
- numerical simulation of the stability of boards loaded with external rock piles;
- analysis of modeling results and development of recommendations to ensure the stability of geomechanical objects of sections.

Research methods. The work was performed with the analysis of open literature sources on the topic of the dissertation, using theoretical and experimental research methods, numerical modeling methods, using modern software packages for scientific research.

The main scientific provisions in the dissertation are as follows:

1. The stable condition of the external rock dump during the entire period of development of open-pit mining depends on a number of factors. One of the important mining and technical factors is the distance between the upper brow of the working side of the coal mine and the lower boundary (base) of the external blade, the minimum safe value of which, based on numerical modeling using FEM at the general angle of inclination of the side 24°, was 150 m. Approaching the blade to the side at this distance will lead to a decrease in the coefficient of stability margin of the side below the standard 1.2 and may cause deformation of the side.

2. Distributed loads from external rock piles located directly on the sides, due to the commensurability of their sizes with the size of the sides, have a more complex effect, excluding direct methods of the theory of marginal equilibrium and stamp theory, which do not allow us to study the influence of distributed loads from the action of external rock piles. A reliable assessment in cases of the action of distributed load sections in the form of external rock piles on the sides requires the use of numerical modeling of the VAT of the instrument array based on the finite element method.

3. The correct choice of the initial location of the external blade makes it possible to exclude the occurrence, as mining operations develop, of a situation of dangerous influence of the blade on the stability of the sides in the form of spreading of the working sides and excessive increase in the height of the blade. The maximum height of the blade with the minimum distance of the base of the blade from the upper edge of the side, at which the stable condition of both the side and the blade is maintained, is recommended no more than 100 m, while the general angle of inclination of the side in the final position is no more than 35°;

4. Calculations of the angles of inclination of the working side of the section, performed using well-known analytical methods and a special application program developed, ensuring its stability with a certain coefficient of stability, along the exploration lines of sections 7 and 8 of the Vostochny section, allow for these sections to recommend the angle of inclination of the working side in the final position to the coal seam in the range of 27-29 ° c the coefficient of stability margin is about 1.5-1.6, which is not lower than the standard 1.3.

The validity and reliability of scientific statements, conclusions and recommendations are confirmed:

- the correct and purposeful formulation of research tasks, the reliability of the field data used and the mining and geological conditions of the deposit;
- application of proven theoretical and practical methods of numerical modeling and data processing;
- approbation of research results at conferences, discussions at meetings and seminars, and speeches in the open press.

The scientific novelty of the work consists in the following:

- for the first time, the influence of the impact of external rock dumps on the stability of the instrument array during open-pit mining has been established;
- for the first time, the parameters of the relative position of the external rock dump and the working side have been established to ensure their stability in the conditions of the Ekibastuzsky section.
- the necessity of using numerical modeling of the stress-strain state of the array by the finite element method to assess the mutual influence and stability of geomechanical structures is proved.

The practical significance of the results obtained in the dissertation lies in the fact that the use of the proposed scientific methods for studying the interaction of geomechanical structures allows for the design and further development of open-pit mining operations to make informed decisions on the optimal organization of stripping operations that ensure safety for the entire period of operation of coal mines.

The connection of the dissertation with the research plans. The main provisions of the dissertation work were obtained during scientific research in 2021-2022. when performing research at the Scientific Research Center "GeoMark" on the topic "Determining the safe parameters of temporary external dumping and the impact on the working boards "Vostochny-1" and "Vostochny-2"

Implementation of the results of the work. In the research center "GeoMark", the following results of scientific research on the dissertation were used in the research "Determination of safe parameters of temporary external dumping and influence on the working boards "Vostochny-1" and "Vostochny-2":

- methodology of research on the geomechanical effects of external rock dumps on the stability of working or stationary sides of a coal mine;
- in the process of research and studying the effect of temporary dumping on the western side of the Vostochny section, taking into account the filling of overburden of the allocated lands for temporary transshipment warehouses No. 1 and No. 2, the recommendations proposed in the work were used;

- based on these recommendations, the required calculations for the stability of the working side were performed: with the height of temporary warehouse No. 1 at 100 m and its distance from the upper edge of the side at 90m, the coefficient of its stability margin will be at least 1.3, and the approach of temporary warehouse No. 1 to the working side at a distance of less than 90 m at a general angle of inclination of the side 24° may lead to to reduce the coefficient of stability margin of the side below the standard 1.2 and cause deformation of the side.

Testing work. The main work and results of the research carried out were completed and received a positive report for scientific and technical seminars at the Department of "development of field studies" (2019-2024) and "Rudnichnaya aerology and labor" (2019-2024) Karaganda Technical University named after abylkasa saginova (Karaganda, 2019-2024 GG. the technical Council (G. Ekibastuz 2019-2023 GG.international scientific and practical conference "integration of Science, Education and production – implementation of the national plan" (Karaganda, 2019, dvazh), "actual problems of Ecology and safety of human life in the XXI century" (G. Taraz: 2021).

Publications on the work: the main content of the dissertation is reflected in 4 printed articles, 4 reports of international conferences.

1.Narodkhan D., Isabek T. K.,Huangan N.,Zandybay A. formation of the zone of inefficient development of the Chalk River under the action of expanded reserves// scientific journal "Sustainable Development of mountain territories". Vladikavkaz, 2021.-T.13.-№4(50).- Pp. 558-563

2. Narodkhan D., Iskabek T. K., Khodzhaev R. R., Huangan N. detailed modeling of the sustainability of the board of directors under the action of the authorized capital // Sustainable Development of Mountain Territories, 2020, 12(3), pp. 428–435, DOI: 10.21177/1998-4502-2020-12-3-428-435.

3. Isabek T. K., Narodkhan D., Huangann. Tazhibayev D. K. on the introduction of foreign criminal offenses for the stability of bortov ugolnye razrezov // Gorny magazine Kazakhstan, 2020 No. 11(187), pp. 32-36.

4.Isabek T. K., Narodhan D., Huangan N., Tajibaev D. K. Studying the Coal Pit side Stability Loaded by an External Dump upon Strength Criterion // Journal "Trudi Universiteta", Karaganda: izd-Vo NAO Karagandinsky Technical University named after Abylkasa Saginova, 2022, No. 2, pp. 103-107.

The scope and structure of the work. The dissertation work consists of an introduction, 4 sections and conclusions and 74 pages of printed text, contains 39 figures, 14 tables, 42 lists of used sources, 8 appendices.