

AP13268891 “Development of effective technological schemes of stripping of low thickness deposits, providing reduction of ore dilution, taking into account the geomechanical condition of the rock massif” – p.m. Suimbaeva A.M.

Relevance:

The relevance of the problem of creating technological schemes to optimize the parameters of drilling and blasting operations (DBO), providing reduction of ore dilution, taking into account the geomechanical state of the rock massif when stripping low thickness ore bodies with highly fractured stable host rocks, has always been an important task in the mining industry. Optimization of DBO parameters on the basis of a set of geotechnical works may become the answer to the question of how to ensure cost reduction and increase the efficiency of tunneling and cleaning works while maintaining the high quality of the extracted mineral component.

The project purpose:

The purpose of the project is to carry out geotechnological research on zoning of the deposit areas by rock stability rating according to the geological strength index for the development of optimal drilling and blasting passports for mining of low thickness ore bodies depending on their thickness, providing a reduction in ore dilution.

Expected and achieved results:

In the course of the project implementation, research was carried out to identify the regularity of changes in the zone of destruction of the contours of the treatment block due to the seismic impact of the explosion force. Methodological guidelines were created for calculating the technological parameters of borehole stripping schemes for low thickness deposits, which ensure the reduction of ore dilution. DBO parameters are calculated in accordance with the classification of rocks by strength in order to ensure a minimum yield of oversize and minimum ore dilution by reducing the capture of waste rocks. The main parameters determining the efficiency of the explosion are the line of least resistance (W), the distance between neighboring wells in the row (a), the amount of explosives placed in one well (Q_{CKB}), the length of the stripping well (L_{CKB}), the number of stripping wells in the row (N_{CKB}), the specific consumption of explosives (q).

Work is underway to develop a feasibility study on the implementation of the results of scientific and technical activities (RSTA).

The results of the research have been published:

1) 1 article in a highly rated scientific journal indexed by international databases Web of Science, SCOPUS:

Imashev A.Zh., Suimbaeva A.M., Musin A.A. Predictive assessment of ore dilution in mining thin steeply dipping deposits by a system of sublevel drifts // Journal of Mining Institute. 2024. Vol. 266, p. 283-294 (Web of Science database - Q1, in Scopus percentile 84) <https://www.scopus.com/record/display.uri?eid=2-s2.0-85194259128&origin=resultlist>.

2) 1 article in the journal included in the CQASE database:

Imashev A.J., Suimbayeva A.M., Auelbekova A.J., Mataev A.K. "Estimation of ore dilution during mining of low thickness steeply falling deposits on the basis of numerical modeling" // Mining Journal of Kazakhstan, No. 4, 2024, p. 7-13.

3) 1 patent for utility model No. 8951 dated 29.03.2024 Suimbayeva A.M., Imashev A.J., Musin A.A., Musin R.A., Mataev A.K., Suleimenov N.M. "Method for determining the dilution of ore in the mining of low-grade steeply-dipping deposits" was obtained.

4) 1 certificate of state registration of intellectual property rights No. 46862 dated June 3, 2024 Suimbayeva A.M., Imashev A.J., Auelbekova A.J. "Prognostic assessment of ore dilution in the mining of low-grade steeply falling deposits by a system of sub-stage drifts" was obtained

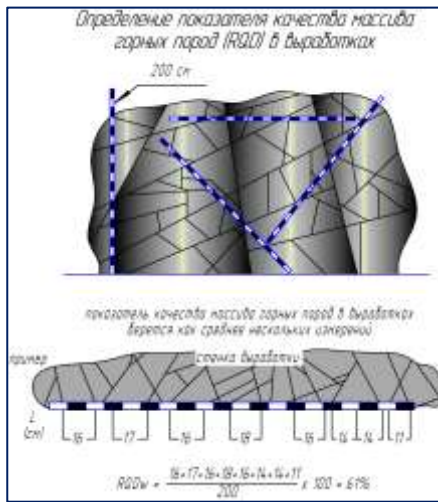


Figure 1 - Schematic of RQD measurements in the mine workings

Figure 2 - Measurement of cores for RQD determination at Zholymbet field

From June 18 to 23, 2024 visited “Research Institute of Mining Geomechanics and Mine Surveying - All-Union Research Institute of Mining Geomechanics and Mine Surveying” and St. Petersburg Mining University (Russian Federation, St. Petersburg) to study experience and receive advice on the development of passports for drilling and blasting operations for stripping of low-power ore bodies, providing reduction of ore dilution.



Figure 3 - Catherine II Saint Petersburg Mining University (19.06.2024)



Figure 4 - Familiarization with the laboratory facilities of Catherine II St. Petersburg Mining University (20.06.2024).



Figure 5 - Discussion of further cooperation with the Head of the Department of Mineral Deposit Development at Catherine II St. Petersburg Mining University

Figure 6 – “Research Institute of Mining Geomechanics and Mine Surveying - All-Union Research Institute of Mining Geomechanics and Mine Surveying” (22.06.2024)

Research team:

Project Manager - Suimbayeva Aigerim Maratovna - PhD, Senior Researcher of KazMRDI Institute at Abylkas Saginov Karaganda Technical University, Acting Associate Professor of the Department of “Mine Aerology and Occupational Safety”.

Hirsch Index – 4;

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Hirsch Index – 6;

Researcher ID – ABC-2138-2021;

ORCID - 0000-0002-9799-8115;

Scopus Author ID – 57204153972.

List of publications:

1. Zhunusbekova G., Suimbayeva A.M., Imashev A., Kazakov A. Analyzing strength criteria for assessing mine working stability / Proceedings of the University, 2022. No.3(88). P.159-165.
2. Suimbayeva A.M., Zhunusbekova G.J., Imashev A.J. Analysis of strength criteria for assessing mine working stability / Certificate of inclusion of information in the state register of rights to copyrighted objects No.29648 from “21” October 2022.
3. Salkynov A., Rymkulova A., Suimbayeva A., Zeitinova S. Research into deformation processes in the rock mass surrounding the stoping face when mining sloping ore deposits / Mining of Mineral Deposits, 2023, 17(2), P. 82-90 <https://doi.org/10.33271/mining17.01.082>
4. Imashev A., Suimbayeva A., Makhmudov D., Auelbekova A. Review analysis of modern methods for determining ore dilution // Proceedings of the University, 2023. – No.3(92). – P.166-171.
5. Suimbayeva A.M., Imashev A.J., Mussin A.A. Improving the quality of blasting indicators by studying the natural stress field and the impact of the blast force on the rock mass / Certificate of inclusion of information in the state register of rights to copyrighted objects No.35437 dated “4” May 2023.
6. Imashev A., Suimbayeva A., Mussin A. Predictive assessment of ore dilution in mining thin steeply dipping deposits by a system of sublevel drifts // Journal of Mining Institute. 2024. Vol. 266, p. 283-294. <https://www.scopus.com/record/display.uri?eid=2-s2.0-85194259128&origin=resultlist>
7. Imashev A., Suimbayeva A., Auelbekova A., Mataev A. Estimation of ore dilution during mining of low thickness steeply falling deposits on the basis of numerical modelling // Mining Journal of Kazakhstan, No. 4, 2024, p. 7-13.
8. Suimbayeva A.M., Imashev A.J., Musin A.A., Mussin R.A., Mataev A.K., Suleimenov N.M. “Method for determining the dilution of ore in the mining of shallow deposits” // Patent for utility model No. 8951 dated 29.03.2024.
9. Suimbayeva A.M., Imashev A.J., Auelbekova A.J. “Predictive evaluation of ore dilution in the mining of low thickness steeply falling deposits by a system of sub-stage drifts” // Certificate of State Registration of Intellectual Property Rights No. 46862 from “3” June 2024.

Information for potential users:

Drill and blast passports will work to minimise the seismic impact on the rock mass, which in turn will reduce ore dilution to the design standard. Reducing ore dilution will reduce the volume of excess rock mass transported, stabilise the geomechanical condition of the rock mass and improve rock safety.

Scope:

Mining companies developing deposits of low-grade ore deposits.

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