AP14972951 "Optimization of mining parameters to control ore dilution during mining of low thickness deposits on the basis of a set of geotechnical solutions" – p.m. Mussin A.A.

Relevance:

Low-grade ore bodies usually have a complex structure with possible blowouts and overburden. When mining shallow ore deposits by the system of sub-stage caving with end discharge of ore, the probability of mineral content reduction increases. For example, the actual dilution of ore at Akbakai deposit of Altynalmas JSC reaches 70% and more.

The problem of ore dilution has been studied by many domestic and foreign authors. Despite the large volume of theoretical and experimental studies, to date there is no scientifically based approach to ore dilution management in the mining of low thickness ore deposits by the system of sub-storey caving with an end discharge of ore.

Reduction of ore dilution requires a comprehensive study of structural, strength properties and stress-strain state of the rock massif, drilling and blasting operations, leaving protective pillars, and supporting near-ore rocks with bracing.

To date, at all low thickness deposits, ore dilution is an unsolved problem. Consequences of dilution lead to increased costs of ore transportation and processing, respectively, the cost of the mineral increases. In connection with the abovementioned, the management of ore dilution in the mining of low thickness deposits with high-capacity development systems is an urgent problem requiring a set of research and practical work.

The project purpose:

The project purpose is to conduct a set of geotechnical studies to determine the rating of the host rocks to develop a methodology to optimize the parameters of mining operations to reduce ore dilution.

Expected and achieved results:

- statistical analysis of ore dilution in the course of performed research works, comparative and statistical analyses of applicability of performed experimental works, mathematical and numerical analyses for the development of small ore deposits;
- calculation of the parameters of the cable support for the support of the rocks containing the ore, and experimental tests aimed at the reduction of ore dilution during the mining of small ore deposits were carried out;
- analyzed the economic efficiency of the performed scientific and experimental-industrial works, and substantiated the applicability of this or that approach for the effective development of shallow ore deposits;
- a specialized Excel spreadsheet will be developed to calculate inter-chamber and inter-storey pillars and to determine the stable parameters of treatment chambers.
- Recommendations will be developed to manage ore dilution through an integrated approach to the development of low thickness deposits using a sub-storey caving system with an end discharge of ore.

Figure 1 - Determination of intact rock strength (IRS) in mine workings using the Schmidt hammer

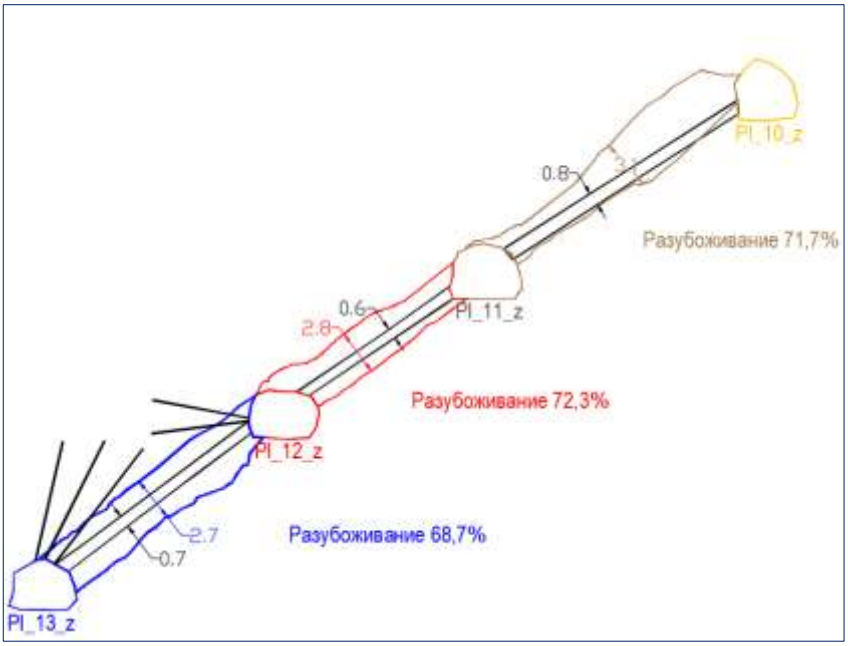

Figure 2- Experimental test results for the use of cable anchoring.

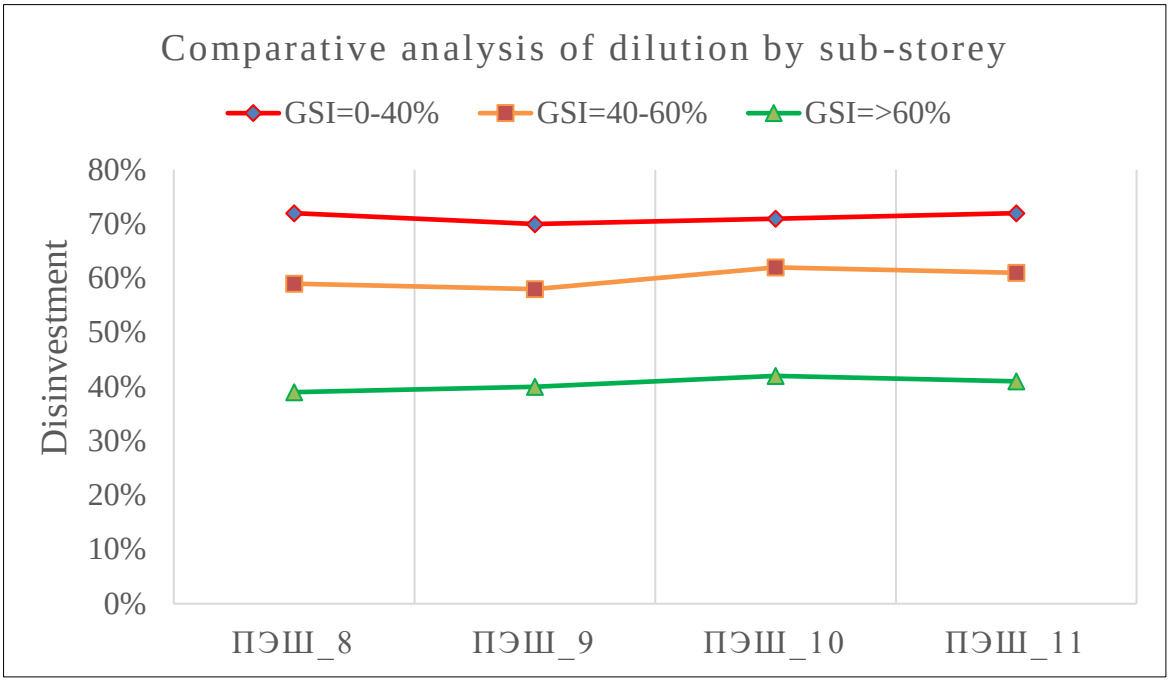

Figure 3 - Graph of change in ore dilution depending on the massif stability rating

List of publications:

1. A.A. Mussin, *A.K. Matayev, E.A. Abeuov, Analysis of methods of ore dilution management during mining of low thickness deposits, Scientific-technical and production "Mining Journal of Kazakhstan". - Almaty: Publishing House of LLP "Scientific-Production Enterprise "Interrin", 2022. - No.9 - P.14-19.

2. Mussin A., Imashev A., Matayev A., Shaike N., Kuttybayev A. "Reduction of ore dilution when mining low-thickness ore bodies by means of artificial maintenance of the mined-out area"// Mining of Mineral Deposits, 2023, 17(1), pp. 35–42.

3. Mussin A.A., Abdieva L.M. Management of ore dilution by justification of optimal parameters of cleaning chambers and pillars, Republican Journal "Proceedings of the University". - Karaganda, 2023. - No.3. - P. 206-212.

4. Patent for utility model No. 8526 Mussin Aibek Abdukalykovich, Imashev Askar Zhanbolatovich, Suimbayeva Aigerim Maratovna, Matayev Azamat Kalyzhanuly "Method of reduction of ore dilution during development of thin and low thickness ore bodies".

5. A.A. Mussin, G.Zh. Zhunusbekova, Sh.B. Zeitinova, T.K. Shaiyakhmet "Reduction of ore dilution in the mining of low thickness ore bodies by artificial maintenance of the excavated space" // Scientific-technical and industrial "Mining Journal of Kazakhstan". - Almaty: Publishing House LLP "Scientific and Production Enterprise "Interrin", 2024, No.3, P.9-15.

6. Mussin A., Kydrashov A., Asanova Zh., Abdrakhman E., Ivadilinova D. // Ore dilution control when mining low-thickness ore bodies using a system of sublevel drifts // Mining of Mineral Deposits, 2024, 18(2), pp. 18–27.

Research team:

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Position in the project - Research Manager. Employment in the project - 100%.

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Information for potential users:

Scientific and applied work is a substantiated and implemented in practice method that allows to determine the rational parameters of mining operations on the basis of a set of geotechnical solutions aimed at minimizing the dilution of ore in the mining of low thickness deposits by the system of under-storey caving with end discharge of ore.

Scope:

The results of research can be used in mining industry, in particular, in the uphill development of low thickness ore bodies by the system of under-storey caving.

The results of the research will be used in the preparation of 1 dissertations, educational and methodical complexes for the discipline “Systems of deposit development on Underground Mining” of educational program 6B07202 “Mining”, “Modeling of mining systems” of educational program 7M07202 “Mining”.

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