



REVIEW

by foreign scientific consultant, Professor Andrzej Muszynski
for the dissertation "3D modeling of the Beskempir deposit for
estimation of mineral resources and engineering geological conditions",
submitted for the degree of Doctor of Philosophy (PhD) by
Shaiyakhmet Tanirbergen Kerimbekuly in the specialty
6D075500 – "Hydrogeology and Engineering geology"

The relevance of the research work of the dissertation is to reach a new level of ensuring safe mining operations in the underground conditions of the mine and rational development of solid mineral deposits on the territory of Kazakhstan.

The timeliness, accuracy and reliability of the estimation of engineering and geological conditions (hereafter EGC) of mineral deposits, as well as the prediction of geological processes and phenomena, are of great importance. Due to the complexity of these deposit conditions and the multifactorial processes resulting from their interaction with the mine workings, most of the problems related to the assessment and prediction of the stability of the rock mass are solved during the development of the deposit, i.e. during the construction and operation of the mine workings. It is therefore necessary to carry out targeted engineering and geological studies, not only during the exploration of deposits to approve their reserves and design a mining operation, but also directly in the mine workings during their sinking. If these studies are synchronised with the geological exploration in the phases of exploration and operation of the deposit, the usefulness and self-sufficiency of the study of the EGC of mineral deposits is achieved.

Recently, the following factors have been observed in various developed and newly developed mineral deposits: deposits with more complex engineering and geological conditions are being explored and transferred for operation; the depth of underground mining is increasing; the physical and mechanical condition of rocks is deteriorating; increasingly advanced and powerful equipment is being used, requiring reliable working conditions; there are growing demands for rational use and protection of mineral resources, improvement of working conditions and safety of workers in mines. The solution of the above tasks is directly related to the achievements of engineering geology of mineral deposits. In this regard, only a comprehensive study of the EGC components and the use of the capabilities of modern geo-information systems can provide a quantitative and qualitative estimation of

the EGC of the deposit, i.e. 3D modelling based on data from field studies of engineering and geological features of the massif in the mine workings allows reliable prediction of the complexity of field development, negative geological processes and phenomena (arising and developing under the influence of management mining operations), as well as determination of changes in the stability category of the massif. This will ensure increased safety, rational use of natural resources, efficient operation and environmental protection. At the present level, the assessment of EGC deposits using the principles of 3D modelling is a very relevant issue for the mining industry, and at the global level, the use of the author's research results in other mines can be an important contribution to reducing the number of accidents involving workers in the mining industry of Kazakhstan.

The research methodology is based on the author's long-term experience in underground mining, as well as advanced technological knowledge and approaches used in international practice, and is aimed at a comprehensive estimation of the EGC of the Beskempir gold deposit. The author personally participated in the field study of the rock mass, and the main factual material was obtained as a result of special engineering and geological studies in the underground mine workings. Mathematical methods of processing large amounts of data and 3D digital modelling based on modern computer technologies were used to analyse and summarise the research results.

The scientific novelty of the research lies in the developed scientific and practical method of solving engineering and geological problems in the field under operation, using the principles of 3D modelling for the first time in Kazakhstan. The initial data for the creation of the models were obtained as a result of specially conducted engineering and geological studies of the rock mass in the conditions of the underground method of exploitation of the deposit.

The results of the study have been reviewed at various international and national scientific conferences, confirming their importance to the scientific community. As a result of the research, 12 articles were published, two of which were included in the publications indexed in the Scopus databases. These works have become an important contribution to the development of knowledge of engineering geology of mineral deposits and for further use in the mining sector of Kazakhstan.

The results of the work have been implemented at the Beskempir gold deposit under development. The 3D models of the EGC deposit created by the author are used as a valuable source material for the competent design of the construction of new horizons and the extraction of natural resources in an



underground mine, taking into account all the expected complexities of engineering and geological phenomena and processes.

The applicant, a graduate of the Kazakh National Research and Technical University named after K.I. Satbayev (Satbayev University), has gained significant work experience in the company JSC "AK Altynalmas", one of whose projects is the operation of the Beskempir deposit. He participated in design and research work, which allowed him to become a competent specialist and researcher, capable of professional, scientific and educational activities. In the course of his research he was directly involved in the search and analysis of literary and design sources, as well as in the publication of the results of his research. He has carried out the work competently and consistently, coordinating it with academic advisors, demonstrating a deep understanding of the subject and excellent research skills.

The dissertation of Shaiyakhmet Tanirbergen Kerimbekuly on "3D modeling of the Beskempir deposit for estimation of mineral resources and engineering geological conditions" meets all the requirements and deserves to be awarded the degree of Doctor of Philosophy (PhD) in the field of "Hydrogeology and Engineering Geology".

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