

Optimization of Existing Mining Activities Expansion in case of Increased Mining and Geological Complexity using Integrated Analysis at KGHM Polska Miedz

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Key words: Deformation measurement; Engineering survey; Mine surveying; Integrated analysis of deformations; finite element method

SUMMARY

The growing demand for raw materials pressures the mining industry to either find new mineral deposits and develop new mines, or to optimize and economize the extraction process at the existing mines. The expansion of existing or new developed mining activities very often are characterized by increased mining geological complexity and more harsh working conditions that require an optimal use of natural resources by maximizing recovery. Innovation of the mining method must be based on a good understanding of the rock mass behavior to obtain balance between design, efficient functioning of the mine system, safety, economy, and environmental protection.

The innovative mining methods must be based on good knowledge of characteristics and behavior of rock mass that can be achieved by using an integrated analysis of deformations. The analysis is based on integration of results of most modern sensing technologies for geo-data acquisition and information extraction, with the results of the deterministic method using the finite element method (FEM). Use of FEM is essential for studying the processes occurring in rock mass and in engineering structures at the construction and post-construction stages including determination of mining subsidence.

Results of geodetic and geotechnical methods play leading role in verification of the FEM model. In case of determination of mining subsidence and the stress re-distribution between underground mining activity and a surface using FEM, the rock mass model is considered as a large-scale problem. Development of methodology for FEM modeling of large-scale rock mass deformation has been a very challenging task, because the in-situ rock mass is discontinuous, anisotropic, inhomogeneous and may have characteristic of a non-linear material. The analysis of large-scale rock mass deformations requires scaling of laboratory geo-mechanical parameters. In most cases

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scaling coefficients are obtained based on rock mass classification systems and stress redistribution information.

KGHM Polska Miedz company is optimizing and economizing the extraction process during expansion of its existing mines. The developing mining activities at KGHM are characterized by increased mining geological complexity and more harsh working conditions, and they require maximized recovery of the resources. In the presentation 2 cases of maximization of resources recovery using the integrated analysis of deformations methodology are presented. First case is impact of mining close or within shaft safety pillars. Second case is determination of the deformations of the West Dam of Żelazny Most the largest copper mining tailing dam in Europe caused by mining activity and increase of height of the tailing dam.

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