

Sustainable development for underground mining of strategic industrial minerals: the geological and geotechnical modeling as a key factor. The case of the “Marmorino” mineral deposit (Sacile - NE Italy).

Piercarlo GABRIELE, Antonio DAMIANO, Dario VARRONE, Vincenzo PIOVANO, Michela CRAVERO, *GDP-GEOMIN s.r.l., Torino, Italy*

Eugenio CASTELLI, *Dip. Ingegneria e Architettura, Università degli Studi di Trieste*

Bruno ANSELMINI, *Mineraria Sacilese S.p.A.*

Abstract

The growing industrial minerals demand, in the perspective of a sustainable development of mining activities, implies a strong orientation to underground operations in the near future.

In complex geological areas, where the ore body for strategic minerals (namely limestones, dolomites, talc, feldspar, schists etc.) is represented by rock masses deformed by folding and affected by joints and faults sets, the definition of a reliable 3D ore body model is strongly influenced by geological and geomechanical factors. From these factors is dependent the choice of the underground mining method and, consequently the evaluation of the reserves and resources.

A geological model is an interpretation of actual conditions based on data that are limited and subject to the skills of geologists. A rigorous approach applied to data observation and analysis allows to minimize the subjectivity of interpretation and simplifies information sharing between experts.

The geomechanical model, on the other hand, provides to the mine designer the qualitative and quantitative data characterizing the rock mass structure in order to evaluate its mechanical properties at the scale of the volumes interested by the underground mine plan.

The use of accredited standards for the description of the intact rock, discontinuities and rock mass properties is of greatest importance because the data must be objective and shareable. Nevertheless, if a solid database together with a sophisticated data processing are not coupled to the field experience of skilled mine geologists and engineers, they would not lead to the comprehension of a rockmass framework. So rigorous observation and engineering judgement are strongly complementary in the definition of the orebody model.

This methodological approach, based on a reliable geological and geotechnical model, allows a confident mineral deposit evaluation and a reliable mine design, or, in other terms, costs reduction, safety increase and mining project sustainability.

The described method finds its maximum application in complex geological and structural contexts, where simplified geological/geotechnical reconstructions based on a geostatistical approach are not applicable. This is the case of the Valmadonna-Pedemonte “Marmorino” quarry, where a very complex geological context and a difficult geomechanical framework are the two major elements conditioning the future underground extraction of a strategic mineral deposit.