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Modelling and Evaluation of Aggregate and Ornamental Rock Quality

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Extended Abstract

Minimizing environmental impact is an important concern in all types of mining, but research generally focuses on metal mining [1]. Recently environmental and social aspects are included in the evaluation of some deposits [2]. In non-metallic mining, building materials are widely needed. Special interest is given to calcareous materials, due to their intrinsic characteristics, which are appropriate for construction and have a strong presence in the industry [3]. Calcareous deposits are massive, often superficial, have extensive dimensions, and are frequent, so resource evaluation should be carried out simply and practically. For this, a process must be in place to determine quality production and predict environmental effects.

One of the most widely used classification systems in geomechanics is the well-known RMR [4], which uses parameters such as rock strength, weathering, joint conditions, etc. This system is used to evaluate rock masses and its application field is diverse, so it could be used to evaluate the product quality of a rock mass [5]. This study analyzes a calcareous rock mass from drill holes and field points using observational and geomechanical classification parameters. Geomechanical variables were used previously defined in a block model (BM). The BM was implemented in Vulcan by Maptek, where the available data was interpolated. The BM contains sub-blocks with operational dimensions of 10x10x0.6 meters. Ten interesting variables were considered, and their importance level was established for production purposes, either as aggregate or as an ornamental rock. This weighting may vary depending on the user's interest because if a certain material is intended as an aggregate, strength characteristics will prevail, while in ornamental rocks, layer size is the main characteristic.

The methodology is based on selection and quarryability criteria, and a parametric evaluation from drill holes. The aim is to define a practical methodology to evaluate a rock mass through a Quality Index (QI). The QI can take values from 0-100 % and would initially predict the suitability of the rock to be used as aggregate, ornamental rock, or waste. This study is a proposal for the evaluation of rock masses simply and insightfully since it aims to add variables that can predict operational performance such as fuel consumption per ton mined, and environmental impacts such as CO2 emissions, and dust or waste generation [6]. These variables could be adapted in the sense that environmental effects have a relevant influence on the production process and can be valued from a holistic perspective in the early stages of a project.

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