

عنوان مقاله:

Optimizing mining economics : Predicting blasting costs in limestone mines using the RES-based method

محل انتشار:

مجله بین المللی معدن و مهندسی زمین, دوره 58, شماره 2 (سال: 1403)

تعداد صفحات اصل مقاله: 10

نویسندگان:

.Hadi Fattahi - Faculty of Earth Sciences Engineering, Arak University of Technology, Arak, Iran

.Hossein Ghaedi - Faculty of Earth Sciences Engineering, Arak University of Technology, Arak, Iran

خلاصه مقاله:

The mining process involves several sequential stages, including drilling, blasting, loading, transportation, and mineral processing. Among these stages, blasting costs (BC) exhibit greater sensitivity compared to others. Inadequate blasting practices can lead to additional drilling, increased explosive consumption, and environmental consequences such as ground vibrations. The variability in blasting patterns and ore rock hardness results in variations in BC. Consequently, there's a need for a method that can establish a relationship between design, geotechnical parameters, and blasting costs while accounting for uncertainties in input parameters. In this study, the rock engineering system method (RES) was employed to construct a complex and non-linear model for predicting blasting costs, considering uncertainties in geotechnical parameters. Data from six limestone mines in Iran were utilized, incorporating ۱۴۶ data points. The input parameters used for creating this relationship included hole diameter, burden, Emulsion, hole number, hole length, spacing, stemming, sub-drilling, rock hardness, ANFO, number of electric detonators, uniaxial compressive strength, and specific gravity. The model was built using ۸۰% of the data (۱۱۷ data points) to establish the RES-based method, with the remaining ۲۰% (۲۹ data points) dedicated to evaluating and validating the model. To assess its performance, the RES-based method was compared to other statistical regression techniques, utilizing statistical indicators such as root mean square error (RMSE), mean square error (MSE), and coefficient of determination (R^2). The results demonstrated that the RES-based method significantly outperformed other statistical approaches, with impressive accuracy, as indicated by $MSE=۰.۰۰۶۰۸$, $RMSE=۰.۰۷۸$, and $R^2=۰.۹۵۱۸$ in predicting explosion costs. Therefore, the model developed through this method can be effectively applied in mining and rock mechanics projects, providing a high level of accuracy

کلمات کلیدی:

Blasting costs, RES-based method, Mining economy, Limestone mines, Predicting blasting costs

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