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An investigation into the Effect of Rockmass Properties on Mean Fragmentation Size and Ground Vibration

Type

Research paper

Keywords (in English)

: Mean fragment size (MFS), Peak particle velocity (PPV), Joint angle, Joint spacing, Protodyakonov strength index test, rock mass

Abstract (in English)

Desired rock fragmentation is the need of the hour, which influences the entire mining cycle. Thus, most engineering segments pay attention to rock fragmentation and neglect by-products like ground vibration and fly rock. Structural and mechanical properties of rock mass like joint spacing, joint angle, and compressive strength of rock pose a puzzling impact on both fragmentation and ground vibration. About 80% of explosive energy that get wasted in producing ill effects, can be positively optimized with a new set of blast design parameters upon identifying the behavior of rock mass properties. In this connection, this research aims to investigate the influence of joint spacing, joint angle, and compressive strength of rock on fragmentation and induced ground vibration. To accomplish this task, research work was carried at an opencast coal mine. The research unfolded that compressive strength has significant positive relation on both mean fragmentation size (MFS) and peak particle velocity (PPV), while joint spacing has shown a positive and negative impact on MFS and PPV respectively. The joint angle holds negative relation in both cases.

Fig 5: Blast design in O-PITBLAST

All blast design parameters are synchronized by the software as per the actual structural and mechanical properties of the rock mass. The interface has the intelligence to check information like a flaw in connections, overcharge, burden distribution, hole inclination, stemming, deck misplacement, and structural problems within the vicinity of the blast. After correcting the discrepancies, the software allows the user for further analysis. The picture shown in figure 6 was iterated several times to avoid errors and arrive at a successful blast design.

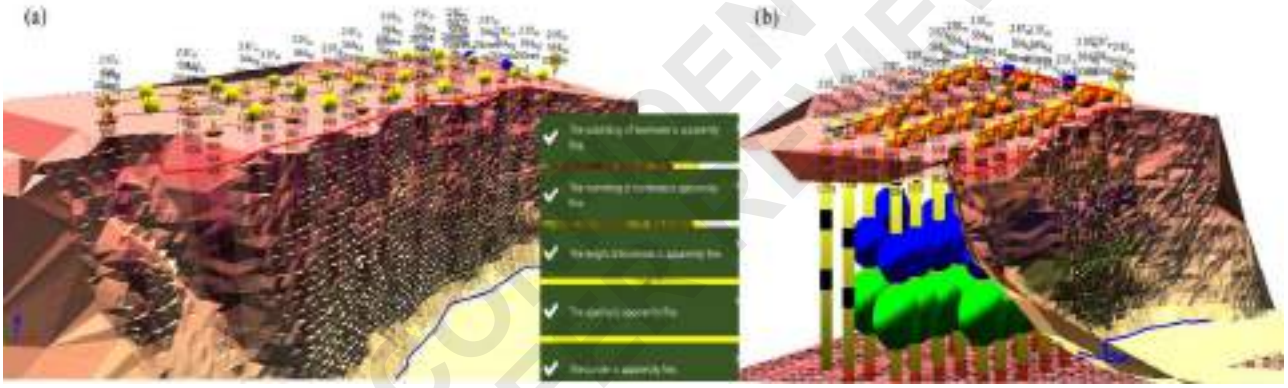

Fig 6: Final design and software check for problems

3.1. Rock Compressive strength test:

Protodyakonov strength index test gives compressive strength of rock material in a hassle-free manner. The apparatus shown in Fig 7 used to find the compressive strength of rock. Six sets of sandstone samples were collected between blasthole site and observation area at random, weighing 100g at size range 21≥22mm each of samples were taken in a Protodyakonov strength index test