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Blasting Optimization Model

Rock breaking by drilling and blasting is the first phase of the production cycle in most of the mining operations. Optimization of this operation is very important as the fragmentation obtained thereby affects the cost of the entire gamut of interrelated mining activities, such as drilling, blasting, loading, hauling, crushing and to some extent grinding. Optimization of rock breaking by drilling and blasting is sometimes understood to mean minimum cost in the implementation of these two individual operations. However, a minimum cost for breaking rock may not be in the best interest of the overall mining system. A little more money spent in the rock-breaking operation can be recovered later from the system and the aim of the coordinator of the mining work should be to achieve a minimum combined cost of drilling, blasting, loading, hauling, crushing and grinding. Only a “balance sheet” of total cost of the full gamut of mining operations vis-à-vis production achieved can establish whether the very first phase- rock breaking- was “optimum” financially; leaving aside factors of human safety.

An optimum blast is associated with the most efficient utilization of blasting energy in the rock-breaking process, reducing blasting cost through less explosive consumption and less wastage of explosive energy in blasting, less throw of materials, and reduction of blast vibration resulting in greater degrees of safety and stability to the nearby structures.

The study of the various parameters of blasting suggests that the powder factor should be constant as per the requirement. The number of holes desired as per the explosive, the drill hole diameter as available and the cost of explosive are kept as input. The spacing, bench height, burden, charge per hole as depending on the previous parameters can be calculated. From the different input and calculated parameters the total cost of the method is calculated and the least expensive method is selected as the optimized model.

The blast optimization model has been developed with simple methodologies which can be adopted by the mining industry to compare the explosive costs and achieve better blasting results. The model developed is a user friendly one, since by keeping the powder factor and number of choices of explosives available as constant and by varying the parameters like drill hole diameter, number of holes and cost of explosives one can compare the explosive performance and accordingly take a decision to select the proper type of explosives for blasting.