Methods to reduce the negative influence of blasting works in the conditions of open pit mining intesifying

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Analysis of changes in open geotechnology over the past 20 years has revealed a significant increase in the total volume of recoverable rock mass, which clearly determines the need for the development of technologies that reduce the negative impact of open pit mining on the environment. As a result of re-equipment of the excavation-loading and mining transport fleet, the unit capacity of the equipment used has increased significantly. In turn, the increase in power of excavation and mining transport equipment has determined the need to increase the intensity of drilling and blasting operations to ensure an adequate reserve of the exploded rock mass. Also in the course of the study a trend was established to reduce the distance from mining sites to populated areas.

The analysis actualizes the task of developing and introducing innovative methods and means of blasting operations that ensure the possibility of effective preparation in the required volume of rock mass for excavation by drilling and blasting, taking into account the use of equipment of high unit capacity without exceeding the permissible negative impact values. The goal was also to achieve the required quality of blasting of the rock mass while ensuring a reduction in the consumption of explosives.

In order to accomplish the task in the period from 2013 to 2018, extensive industrial tests were carried out under the conditions of the branches of Kuzbassrazrezugol enterprise in the Kemerovo Region, united by a common goal, as well as a unified methodological and programmatic approach.

Over the entire study period, more than 700 experimental explosions were carried out. The influence of methods and designs of tamping blasting holes and separating of explosives inside blasting hole, as well as methods and means of reducing the intensity of dust formation were studied.

As a result, the parameters of drilling and blasting operations were optimized; the design of borehole valves and universal locking devices were installed, the application of which provides:

1. reduction of specific consumption of explosives by 9.5-12.3%;

2. the ability to multiply increase the volume of rock, simultaneously prepared for excavation by drilling and blasting method;

3. reduction of seismic effects on protected objects;

4. reduction of labor costs for tamping.

It has been experimentally proven that charge separation in blasting holes using borehole gates reduces the negative impact of an explosion on the environment and allows to reduce the specific consumption of explosives by up to 15.8%, while the effect increases with increasing height of the escaping escarpment.

The obtained positive results ensured the creation of a scientific and methodological basis for the industrial implementation of the developed organizational and technical solutions. From 2013 to 2018, thanks to the use of universal locking devices, well valves and bottom compensators Kuzbassrazrezugol enterprise managed to achieve an actual reduction in the mass of explosives used relative to the baseline by 62.8 thousand tons, that in value terms amounted to more than 1 billion rubles.