Keywords: mineral deposit, mining system of development, stability of dumps and open-pit side, stand-by condition of technological facilities, production costs, competitiveness, working area of the open-pit.

References

1. Дриженко А. Ю. Кар'єрні технологічні гірничотранспортні системи : монографія / А. Ю. Дриженко. – Д. : Державний ВНЗ «НГУ», 2011. – 542 с.

2. Прокопенко В.І. Соціальна відповідальність гірничо-збагачувальних комбінатів України за використання природних ресурсів / В.І.Прокопенко, О.Г. Вагонова // Соціальна відповідальність влади, бізнесу, громадян: монографія: у 2-х т./ за ред.. Г.Г. Півняка; М-во освіти і науки України; Нац. гірн. ун-т.- Дніпропетровськ: НГУ, 2014.-Т.1.- С. 195-202.

3. Прокопенко В.И. Технологическое обеспечение засыпки остаточного выработанного пространства карьера при доработке горизонтального месторождения // В.И. Прокопенко, Т.Н. Мормуль // Екологія і природокористування: Зб. наук. праць. – Дніпропетровськ: ІППЕ НАН України, 2014.- Вип. 18.- С. 122-130.

4. Определение научных рекомендаций для реконструкции системы разработки марганцевой руды на карьерах ОГОКа при максимальном сокращении трудових и материальных затрат на вскрышные работы: Отчет о НИР / НГУ; руководитель Прокопенко В.И. – Днепропетровск, 1998. - 54 с.

5. Прокопенко В.І. Облаштування земної поверхні після відкритої розробки горизонтального родовища //В.І. Прокопенко, А.Ю Череп / Металлургическая и горнорудная промышленность.- 2015.- №4.- С.101-105.

6. Собко Б.Е. Совершенствование технологии открытой разработки россыпных титан-циркониевых руд /Б.Е. Собко. – Днепропетровск: РИК НГУ.-2008. – 167 с.

7. Коробкова Е.А. Из опыта консервации угольных разрезов / Проблемы освоения минеральной базы Восточной Сибири. — Иркутск: Изд-во ИрГТУ, 2007.-Вып. 7. С.51-55.

8. Тальгамер Б.Л. Классификация и обоснование схем консервации карьеров / Б.Л. Тальгамер, Е.А. Коробова // Вестник ИрГТУ. – 2012. - №3 (62). – С. 56-60.

INCREASING THE EFFICIENCY OF ROCK DESTRUCTION BY BOREHOLE CHARGES

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Purpose. Study of the processes that determine the low utilization rate of the energy of the explosion of a borehole charge, and consider ways to increase it.

Methodology. Investigation of thermodynamic, gas-dynamic and wave processes occurring in the rock and in the cavity of the explosion of the borehole charge.

Findings. For the qualitative crushing and softening of the rock, it is necessary that the compressive, tensile and shear stresses, their rate of change and gradients are within the limits determined by the strength of the rock. In addition, the time of their existence should be sufficient to destroy the rock.

Modern explosives create in the rock a field whose parameters differ significantly from optimal. A very high rate of change of stresses (10^{15} Pa/s) and a gradient of stresses (10^{11} Pa/m) lead to formation of crushing and grinding zones at the well.

At a distance of several meters from the well, in the middle zone the weakening of the rock is minimal. The size of the particles, into which the rock breaks down in the zone of crushing and grinding, and hence the amount of heat released, is inversely proportional to the chemical reactions zone width in the explosives, which in modern non-granular explosives is measured in millimeters.

In the case where the speed of the detonation wave is less than the velocity of the stress waves in the medium, the emulsion explosives do not detonate in the normal mode (the under-compressed mode). During the explosion, a strong compression wave overtakes the detonation wave, compressing the explosive and reducing the number of "hot-check-points

To reduce the zone of crushing, it is necessary to use charges with a shell of porous or bulk material. If there is an air gap between the walls of the well and the explosive, then with a borehole diameter of 250 mm and a gap of 20 mm, the pressure gradient decreases by approximately 4 times, and the maximum pressure of the explosion products decreases by 9%. As a shell, it is possible to apply a porous substance, which when heated, enters an exothermic reaction, for example, a thermite mixture.

As a result of the researches carried out by the authors, it was shown that the field of stresses in the middle explosion zone has a rate of change and a stress gradient that is insufficient for the weakening of the rock. In this case, the cracks grow mainly in the radial direction.

To destroy and weakening the rock under tensile or shear stresses, it is necessary to create a field satisfying the optimal conditions. Such a field is created by combined charges and charges with inert gaps. The average mass velocity of the rock in the gap is at least half that of the rock in the explosive. The energy of the stress wave radiated by the gap is several times less than the energy emitted by the same part of the products of explosion.

With an increase in the radius of the gap from rock particles compressed to a pressure of 5 GPa from r = 125 mm to r = 129 mm, the pressure in the gap would decrease to 0.1 GPa. The wave of compression in the products of explosion provides energy inflow into the gap, but the intensity of the outflow of energy is much greater, which leads to the appearance of tensile and shear stresses in the rock near the gap. For a good final processing of the sole of the ledge, air gaps near

the bottom line of the sole of the ledge are effective. The authors showed that for the first 0.5 to 0.7 ms the average pressure in the gap is at least an order of magnitude less than the pressure in the borehole at a distance of approximately 1.5 m from the gap. For the indicated time, the rarefaction wave in the products of explosion passes approximately 1.5 m. Thus, parts of the blasthole charge act independently of other parts located at a distance of about 1.5 m.

Investigation of the wave processes occurring in the tamping of the charge allows us to conclude that, when selecting material of tamping and the blasting method, a small charge (about 10 kg) placed in the tamping allows a significant reduction in the output of the boulders from the top of the ledge.

The researches were carried out within the framework of state budget researches at the Dnipro University of Technology.

Keywords: explosion, zones of destruction, structure of borehole charges

References

1. Kurinnyi V.P. , Garkusha I.P., Nikiforova V.A. Processes of initial stage of expansions of explosive cavity in blasthole charge. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, 6, 49-54.

2. Ефремов Э.И., Никифорова В.А., Ищенко К.С. Исследование влияния ширины и свойств заполняющих их материалов на результаты действия взрыва в трещиноватых средах. Разработка рудных месторождений. – Кривой Рог.– 2008.– Вып. 92.– с. 25-28.

3. Efremov EI, Nikiforova VA, Barannik V.V. The mechanism of the explosion in watered rocks. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, 2, 19-22.

SUBSTANTIATION INTO PRACTICAL APPLICATION OF THE BIOMASS GASIFICATION TECHNOLOGY

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Purpose. Consumption of energy resources in the nearest time will provoke their rapid rise, accompanied by their gradual exhaustion. This situation requires a search of internal reserves based on renewable energy. Energy crisis prompts European countries for searching an alternative source of renewable energy. Important part of those efforts is conducting of integration research and development of road maps for sustainable energy use for whole continents. That is why the primary purpose of current research is to try find solution in diversification of energy resources.