The third option is characterized by the use of surface mining of the rock massif, extraction and loading of rocks by a mining combine in a vehicle and the use of other auxiliary equipment to ensure the smooth operation of the mining combine.

Comparing the above options based on the results of various research works, it can be concluded that the use of the technology of surface mining of the rock massif by surface miners increases the profitability of rocks mining by 2 ÷ 3.5 times compared with the technology of drilling and blasting operations. Moreover, increasing the efficiency of the development of rocks depends on the thickness of the layer of milling rock massif and strength of rocks.

So, as a more effective technology for the preparation of half-rocky rocks and rocky rocks, the excavation should include surface mining of the rock massif by mining combines compared to the preparation of rocks by a mass explosion. So, as surface mining allows you to effectively switch to non-blasting technology of open-pit development.

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S.V. KALCHUK, PhD (Engineering), Associate Professor,
Zhytomyr State Technological University, Ukraine
S.O. ZHUKOV, Sc.D, Professor, Kryvyi Rih National University

FEATURES OF THE NON-EXPLOSIVE EXTRACTION OF A DIMENSION STONE DURING OPENCAST MINING

In dimension stone extraction technology the basic criteria of the process efficiency is its productive capacity and survival capacity of the extracted blocks. In some scientists' investigations [1,2] splitting is viewed exclusively as the task of critical stress calculation at which the splitting occurs. Here the borehole model containing holes is considered and to the walls of which splitting force is applied to. Further, the tension intensity between adjacent blast- holes is calculated. The splitting criterion is the stress field between the boreholes, the minimum value of which should be equal to the ultimate solid's tensile strength.

With the increase of the distance between the boreholes' walls the stress decrease after the quadratic law of the function $f(x)=k/x^2$. Thus, to provide enough of splinting stress in the middle of the distance boreholes it is necessary to make considerable stresses on the boreholes' walls to outperform the resisting power limits. It leads to the considerable stress elevation and to the radical fractures formation in all directions from the borehole. Besides, the model of elastic solid under the internal pressure is valid only till the tension joints appear resulting in the integrity violation of the environment. The further disruption occurs along the crack that initially appeared with the gradual radial cracks destruction process development. The radial cracks direction differs from the direction of the splitting plane. In this matter new borehole splitting approaches and models involvement is required. Making borehole stress field calculations from the walls of which radial cracks start is a very complicated task. The solution to this issue is to estimate the possibility of crack formation not just by the stress but, mainly by the stress intensity coefficient and definition of common splitting stages.

Drilling of the borehole line alongside the necessary break line full or 90% of the blocks' height is the initial splitting operation by means of non-blasting method. Herewith, the boreholes diameter varies from 36-42 mm and the borehole center distance is 200-220 mm. In first case destruction process starts in the very stone in tension ring deformation from the borehole center distance where radical cracks appear developing equally in all directions. Discoveries of the cracks increase at the labradorite quarries showed that the initial crack develop in all directions to the certain length.

The crack, direction of which is different to that of the splitting, gradually stops. All direction radical cracks, as a rule, they spread all over about 16-28 mm. The further crack continues increasing primary in the direction coinciding with the splitting plane. Before now the splitting around the crack model was aimed at defining tension intensity coefficient for the n quantity of radical cracks solved by means of conformal presentation [3]. According to this with the increase of crack length, tension intensity coefficient does increase as well. For this model the tension intensity coefficient is defined by the boundary collocation method [4]:

On this very stage the decrease of necessary stress for destruction process is significant, because the whole efforts will be made to grow two diametrically-opposite main cracks. With the lengthening of cracks the tension intensity coefficient grows leading to the decrease of necessary splitting effort on a certain boundary. As soon as it is achieved, the final splitting occurs incrementally.

The increase of cracks number at the initial stage of their development will happen in all directions to the defined value. And the further main cracks development in the the stone direction will be caused by coincidence with the anisotropic plane (of less strength). All the cracks directions of which will differ from the initially appointed will slow down and later will completely stop. While transferring to the non-blasting methods of splitting the stone it is necessary to take into consideration the amount of destruction load because for the splitting process to start a considerably less than it was accepted before stresses are required. Besides, the maximum stresses will correspond to the initial splitting stage and according to the cracks lengthening speed it is necessary to decrease them with the aim of reducing the amount of impact on the nature. And a sudden growth of the stress concentration coefficient as soon as it reaches 2/3 of its maximum length, it does witness a considerable decrese of the necessary splitting effort.

The increase of cracks amount at the initial stage is possible only through considerable short-term loads. The viewed models do not allow to define the definite stress value, and the splitting model estimation at the certain stages can be possible due to additional investigations of stone samples fragile splitting.

Conclusions

The defined model of the gradual stone splitting by means of radical cracks lengthening and development that is based on the stress concentration, as a criterion of cracks lengthening in the sub-dynamic range of applied loads;

At the non-blasting natural stone splitting maximum destruction stresses should correspond to the initial destruction stage, and the stress function should be destructive depending on the cracks' sizes;

The highest stress limit should correspond to the smallest stress concentration value in the crack directions different from the directional ones.