

*Materials of Conferences*

**THE BRITTLE MATERIALS DESTRUCTION  
GEOTECHNOLOGICAL PECULIARITIES  
WITH THE PLASTIC MATERIALS  
AND SUBSTANCES APPLICATION  
IN THE SHOCK REGIME**

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Thus, the conducted researches complex on the natural stone destruction technology development with the plastic materials and the substances application in their shock impact displacement regime from the blast holes into the generated and the formed cracks has been permitted to be set the following scientific position: «The blast holes dimensions, the orientation, the location, and their quantity in the splitting plane are being defined by the cracks shock loading parameters, by the rocks mechanical – physically properties and characteristics, and the applied plastic materials and the substances rheological properties».

For all this, it has been determined, that the applied instrument impact energy, the generated and the formed crack dimensions, the distance between the filled and the empty blast holes, and also their quantity in the line of the splitting in the crack formation along the blast hole's axis are defined by the blast hole diameter and its length. So, the same indices are defined at the crack generation and its formation in the brittle materials and the substances perpendicular to the blast hole's axis to its diameter, in combination with the length, with the exception, that the empty blast holes are not applied.

So, it is necessary to be used the natural stone impact fracture technology with the plastic materials and the substances application, together with the well – known technologies, with regard to the specific and the particular monolith (e.g. the block). This is quite true for the rocks of any strength. For all this, the planes, in which the breaking is performed with the plastic materials and the substances application, are coincided with those, in which the quite other breaking blast hole's methods are applied.

So, the natural stone impact fracture technology use with the plastic materials and the substances application, due to the empty blast holes use, will be connected with the labor productivity increase, with the production activities labor intensity decrease, and with the solid wastes output, and also with the lower cost units and the blocks rescued, at the expense of the cheap materials and the equipment application with the low maintenance costs. So, the natural stone impact fracture technology use, with the plastic materials and the substances application,

will be resulted in the security general increase, and in the works conducting hazards reduction.

As a result of the theoretical and the experimental researches cycle completion on the validation the natural stone impact fracture technology application planes with the plastic materials and the substances use at their displacement along and across the blast holes axes, the following scientific position has been set: «The natural stone destruction with the with the plastic materials and the substances application at their displacement along the blast hole axis is practically applied in the vertical plane of the splitting with the crack size, having defined by the volume embedded the plastic material and the substance into it, across it – in the horizontal one with the crack size, which is additionally defined by the destruction pressure transmission distance, having depended on the batter block height».

So, the conducted works examples have been shown the natural stone impact fracture technology application possibility with the plastic materials and the substances use in the different fields and the various areas – as in the mining, as well in the construction and the building, when in the second case, the conditions and the requirements to the final result are less complex.

For all this, it has been proved, for example, the marbled limestone blocks breaking, that the natural stone impact fracture technology with the plastic materials and the substances application under conditions of the large natural fracturing or the artificial cracking is able to be provided the rocks breaking sawing methods alternative in the presence of the hard rocks inclusions in them.

So, the crack configuration formation laws and regularities determination challenges, the plastic material and the substance propagation in it, as well as the relationships with the impact energy with them have been solved in the works complex, having conducted by the author's report. For all this, the natural stone breaking technology has been developed with the plastic materials and the substances application in their shock impact displacement regime from the blast holes into the generated and the formed cracks, as well as its application planes at the blocks breaking have experimentally and theoretically been proved. So, the work and the report have been directed at the mineral resources deposits development efficiency improvement challenge solving, at the expense of the technology development, having based on the rocks massif destruction and the fracture geomechanical characteristics, the peculiarities, and the special features knowledge with the plastic materials and the substances application. For all this, the following basic scientific

and the practical results have already been received and obtained:

1. It has been found and established, that the distance between the crack boundary and the zone boundary of its filling by the plastic material and the substance is depended on its delivery, on the flow rate regime, and the rheological properties, as well as on the destructible rocks mechanical – physically properties.

2. It has been proved, that the brittle materials destruction the perspective diagrams and the promising circuits are quite needed to be considered their further displacement along and across blast holes axes in the dynamical or in the quasi – static regime. For all this, for the long cracks of the required sizes creation with the plastic materials and the substances application, because of the forces absence, having resulted in the crack surface curvature with the increase its sizes, instead of the single blast hole, is quite be able to be applied their combination of them just in the one line.

3. It has been established, as a result of the laboratory experiments conducting, that for the correct form cracks generation and their formation with the smooth surfaces, it is necessary the plastic materials and the substances fixed flow rates provision at its displacement from the blast hole into the generated and the formed crack in the small (e.g. up to 150 mm<sup>3</sup>/sec.) value.

4. It has been clarified at the laboratory experiments on the blocks from the organic glass, that the plastic material and the substance, having found in the crack, and having caught into it, as a result of the dynamical injection, it is accumulated the pressure. So, this pressure is able to be kept in it during several days and nights, and it is the samples and the specimens further spontaneous fracture and the destruction reason.

5. It has been established, that the crack preferential growth is observed in the direction of this load application, in the case of the external load application to the destructive pattern and the specimen (e.g. the rock pressure presence), and the distance between the crack boundary and its zone edge of the plastic filling material and the substance is constantly increased, regardless this load application direction or its availability.

6. This calculation is quite able to be carried out, as the quasi – static one, under condition of the low flow rates (e.g. up to 150 mm<sup>3</sup>/sec.) of the plastic material and the substance in their destruction, due to the brittle materials and the substances fracture dynamical calculations absence by the plastic materials and the substances with the sufficient degree of the accuracy. For all this, it is able to be destroyed any well – known rocks strength (e.g.  $\sigma_p = 80$  MPa) with the plastic materials and the substances use.

7. Due to the fact, that the pressure distribution in the plastic material and the substance is taken its place by the decreasing dependence, the process

starting and the continuation possibility of the cross crack further development, having generated and formed at the level of the blast hole bottom, will be connected with the instrument use need, with bigger impact energy, in comparison with the longitudinal crack and the fissure, consistently, having generated and formed along the blast hole entire length, having started from its mouth.

8. The preference should be given to the instruments, having had at the same impact energy, the lower frequency, due to the fact, that the pressure, having generated and accumulated in the plastic material and the substance, and, having underachieved to be redistributed (e.g. to be decreased), is resisted physically the re-entering pressure transfer, and, thus, it is prevented the fragile material and the brittle substance further destruction.

9. It has been established, that the blast hole's diameter and its length is determined by the applied instrument impact energy, the crack generated and the formed size, the distance between the filled and the empty blast holes, as well as their number in the splitting line at the crack generation and the further formation along the blast hole axis. So, the same parameters and the indices are determined at the crack formation in the brittle material and the substance across the blast hole's axis to its diameter in the combination with the length, except to the fact, that the empty blast holes are not practically applied.

10. The natural stone impact fracture technology use with the plastic materials and the substances application, due to the empty blast holes use, will be connected with the labor productivity increase, with the production activities labor intensity decrease, and with the solid wastes output, and also with the lower cost units and the blocks rescued, at the expense of the cheap materials and the equipment application with the low maintenance costs. So, the natural stone impact fracture technology use, with the plastic materials and the substances application, will be resulted in the security general increase, and in the works conducting hazards reduction.

11. In comparison with the same bore wedge drilling method, the brittle materials and the substances directed fracture method advantages with the plastic materials and the substances application are concluded in the following ability: the blast holes length and the number reduction in the proposed splits planes; the solid wastes output reduction of the main production, at the expense of the splitting surfaces curvature reduction in the dorsal planes; the blast holes mouth parts shape maintaining; the commercially produced percussion instrument of another major destination application with its insignificant adaptation. In comparison with the similar method of the powdery destruction NEDM (e.g. the non – explosive destructive means), its advantages are concluded in the fact, that: it does not require the sealing of the horizontal blast holes mouths; it practically permits the plastic materials and the substances are able to be got into the cracks,

and to be transferred the efforts on their walls; it allows the plastic substances and the materials to be introduced in any volume; it can regulate the application temperature regime, being used in combination with the different and the various additives; it provides the best technical and the sanitary conditions of the works performance.

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#### USING OPTIMIZATION METHODS SOME NONLINEAR MODEL

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The World of the mathematical models of the phenomena's of the a live world inexhaustible, either as world of the living beings itself. However as in biologics as united theory emerges the theories to molecular biology and evolutions, revealing unity to generalities of the biological phenomena's, so and in biomathematics gradually drawn the general approaches, which will reveal essence main mechanism biological processes, acta a sing powerful ally to experimental biology.

To persisting moment mathematical methods got into most area miscellaneous theoretical and applied ecology: analysis of the relations type in community, study of the processes to migration, territorial behavior, analysis flow material and energy in ecosystems, problems to difficulties and stability community, estimations of the influence different anthropogenous factor on natural systems, problems optimum exploration populations.

At modeling ecological and other natural systems we face with the following circumstance: than for big period necessary to predict importance a parameter conditions surrounding ambiances under fixed accuracy of their description and upper frequency of the smoothing, that greater number interacting processes to us necessary to take into consideration at study of the operations.

The principle optimality pertains to biological process, which is formulated as follows: biological structure or process must be optimum to the extent that that alive organisms, staying it is enough long-lasting time in determined condition, as a result of actions of the natural selection must gain the signs optimum for these conditions.

The processes, occurring in nervous system animal under that or other its action, possible research with different standpoint. Possible consider functioning the concrete structures of the brain, distribution agitated and dullard neuron in them. Possible, however, expect that all this only facility for

realization of the certain procedures, providing as a result that or other behavior animal.

The processes in nervous system can have different physical, biochemical or the other nature. Each of they are realized certain physical controlling system.

Three types distinguish at study behavior:

- 1) instincts;
- 2) reflexes;
- 3) elementary rational activity.

Here the most typical characteristic to elementary rational activity animal is their ability to catch protozoa laws surrounding ambiances and handle these law at building of the algorithm of the behavior in new situation.

Greatly herewith that behaviour, founded on elementary rational activity, is seen already under the first meeting the organism with extraordinary situation, created in ambience its dwelling.

The problem speakers to number to populations occupies the special place in mathematical modeling of the biology.

Any ecosystem consists of population of one type, chosen in space that or other insulating barrier, which interact between itself, as well as surrounding their ambience. Most idle time description to populations – a description speakers to its number or biomasses forming its organism.

When we move to level экосистемы, that we produce the simplifying operation: we describe the speaker a community through speaker of the number or biomasses forming its populations. In spite of the fact that these values discrete, we their consider unceasing and describe their speaker unceasing value available continuously at time and in space. Certainly, such description there is abstraction, and we risk to lose some real existing characteristic of the system.

The Analytical models do qualitative information on behavior, about nature of the operation biological community and ecological systems. But these models in a complicated way to require that they gave the quantitative forecast of the behavior real ecosystem.

Correlation is shown In work between physical controlling system and their mathematical model, so named controlling system – one controlling system can be described whole class different physical controlling systems [1].

Herewith, important importance for ecology and practical problems to usages and governing the population has a study speakers age composition to populations [1].

The quantitative nature struggle for existence reveals itself in given ambience in the manner of change the number individual, forming population miscellaneous. Under one condition of these change consist of fluctuation around average importances, under the other condition it is reduced to disappearance or progressing increase some type. Of course, exists periodic changing condition of the ambience,