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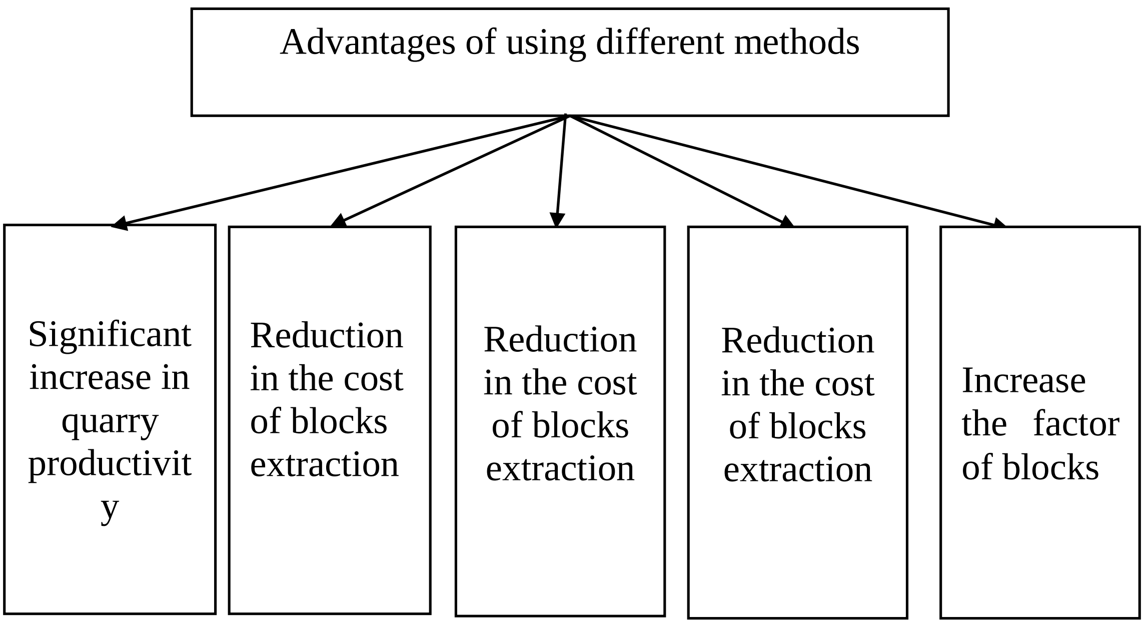
METHODOLOGY FOR SEPARATION OF QUARRY FIELDS INTO TECHNOLOGICAL ZONES AND THEIR GEOMETRIC ANALYSIS

The variety of methods and technologies to prepare stone for removal and the possibility of using these methods with a wide variation of the rocks properties significantly complicate their choice for the conditions of a specific deposit and even for certain parts of the field. This problem is especially topical in the case of extraction of gabroid rocks for which there are significant variations in properties. The use of only one technological complex in different areas of quarry field leads to the decrease of productivity, worsening of technical and economic indicators of the quarry, which manifests itself in reducing the coefficient of blocks output and deteriorating their quality. Therefore, the division of the quarry field into technological zones with stable properties (intensity of jointing, blockiness, strength characteristics, decorativeness and ore content) allows determining the parameters of elements of the development (the direction of removing the layers of minerals, the structure of equipment complexes) for each zone. It can ensure the removal of natural stone blocks with minimal losses and minimal cost.

As for major rock deposits, there are significant variations of the properties in space, then there is a need to use several methods of extraction, depending on the physical and technical properties of the individual site, and therefore, to use several technological complexes.



In accordance with the described methods and taking into account specific features of blocks extraction, it is necessary to divide the extraction array into certain areas. In this case, the initial information must be presented in models of rocks indicators which characterize the difficulty and expediency of extracting blocks by a given technological complex and in the form of equations (1), graphs or various diagrams:

$$\begin{cases} \sigma_m = f_1(x, y, z) \\ K_m = f_2(x, y, z) \\ a_a = f_3(x, y, z) \\ B_{cp} = f_4(x, y, z) \\ K_p = f_5(x, y, z) \\ D = f_6(x, y, z) \end{cases} \tag{1}$$

$\sigma_m = f_1(x, y, z)$ – strength characteristics;

$K_m = f_2(x, y, z)$ – coefficient of jointing;

$a_a = f_3(x, y, z)$ – coefficient of anisotropy;

$B_{cp} = f_4(x, y, z)$ – coefficient of block output;

$K_p = f_5(x, y, z)$ – the content of ore components, various inclusions and effects;

$D = f_6(x, y, z)$ – decorativeness is expressed in points and supplemented by a variety of electronic applications,

where x, y, z – spatial coordinates of the field.

All data must be integrated on the basis of standard GIS.

Then it is necessary to consider the data of the site as certain systems with their respective properties (stable on each given site).

Blockiness of each section of the array is determined during the exploration of the field and the coefficient of product blocks output is determined for each method:

$$B_{бi} = B_{mi} \cdot k_{зi} \cdot k_a, \tag{2}$$

$$k_a = -0{,}0003x^2 + 0{,}0241x - 0{,}0513, \tag{3}$$

where $B_{бi}$ – blockiness in the method of extraction;

B_{mi} – the blockiness of the same site;

$k_{зi}$ – the coefficient taking into account technological losses when using the i- technological complex.

k_a – a coefficient that takes into account the dependence of specific losses of raw materials on the coincidence (x) of anisotropy directions and the front of extractive works.

Consequently, due to these methods, it is possible to ensure the removal of blocks of natural stone with minimal losses and minimal cost, as well as possible increase in the productivity of the quarry.