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REASONING THE PARAMETERS FOR OVERHEAD WORKINGS ON BLOCK QUARRIES BY DIAMOND-ROPE CUTTING

The high strength and hardness of rocks such as granite cause low productivity and high cost of work on the extraction of granite blocks, therefore it is necessary to choose right methods for its extraction. The practice evidences that the use of the drilling and explosive method leads to a number of problems including the appearance in the massif the different types of cracks that reduce its strength. That is why it is relevant to determine the main parameters for conducting the technology of capital trenches using diamond-rope cutting and to determine the optimal angle of drilling for dipping the rope.

It is reasonable to dig a split trench parallel to longitudinal cracks, and to dig a cut one along transversal cracks. The breaking off a monolith or a block should be done in the way its longer side could be parallel to the longitudinal cracks. Analyzing the literature, we have found out that split and cut trenches have to be digged between the vertical cracks of the same principal system.

The use of the cable rig will help extract marketable blocks several times more in the quarries. It is proposed to open the trenches with the cable rig without using drilling and explosive operations. It is proposed to dig the trenches using a cable saw according to the scheme (fig. 1).
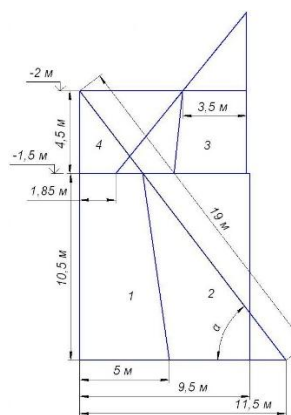
Fig. 1.

First, they perform the cutting of the lateral surfaces (fig. 1), then drill holes at an angle to the surface, pour a non-explosive destroying mixture in them and using pneumatic pillows or hydro-jacks, this wedge is removed. Next, the separation of the vertical part of this block is carried out with the help of the installation of continuous drilling, the separation of the remaining parts of the massif with the diamond-rope rig is performed and the removal of the rock is carried out. The process is repeated until the required length is reached. This method of digging trenches helps reduce the number of man-caused cracks and re-crushing, the quality of raw materials significantly increases

as well as the subsequent separation of the blocks from the massif, and the possible use of the rock located on the site of the trench.

It is reasonable to install trenches in the areas with a lower quality of a stone, which is characterized by a denser network of vertical cracks. When choosing the width of the trench, one should take into account the overall width of the loader. The width should be 3 m. greater than the width of the loader.

In order to reduce the losses and economic costs that arise when digging the trench, the most optimal width is chosen. This width will allow safe work and reduce the losses of facing stone. The calculations are shown in fig. 2. and fig. 3.
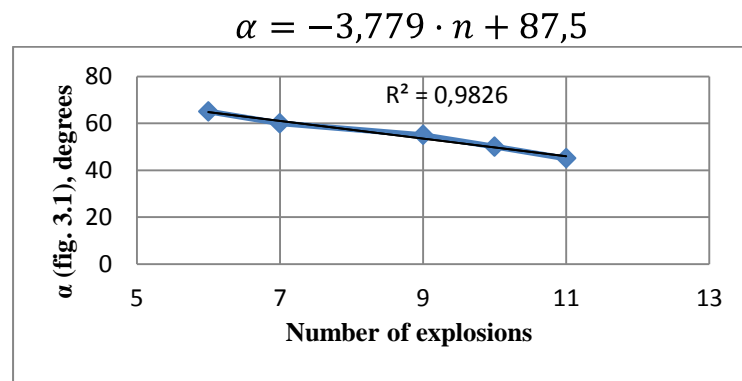
$$\alpha = -3{,}779 \cdot n + 87{,}5$$

Fig. 2. Number of explosions depending on the angle of dipping the rope for reaching the designed depth of 6 m.

The most economical result will be achieved with the least number of explosions and the lower starting trench width. Therefore, we accept the optimal angle of 65 °.

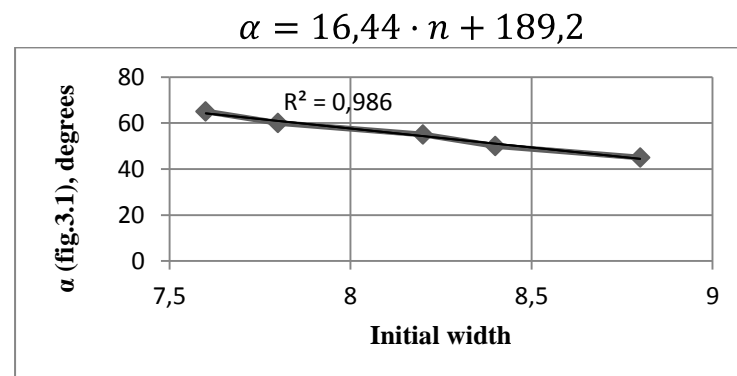$$\alpha = 16{,}44 \cdot n + 189{,}2$$

Fig. 3. Dependence of the initial width on the angle of rope dipping to achieve the designed width of 6 m.

The graph shows that the increase in the dipping angle results in the decrease in the initial width of the trench. The optimal angle will be 65 °, but one should take into account the condition.

The most economical effect will be achieved with the least number of explosions and the lower starting trench width. In addition, due to the diamond-rope method of digging the trenches, the integrity of the massif is preserved, therefore, the method can be used for digging the trenches on block quarries of Zhytomyr Region as well as other areas.