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ADVANTAGES AND DISADVANTAGES OF WIRE SAW INSTALLATION AT BLOCK STONE QUARRY

By volume of ornamental stone reserves Ukraine occupies a leading place in the world. There are about three hundred deposits of ornamental stone on the territory of the country, the half of which is being developed. The annual production of blocks is 150-160 thousand m³. The main source of ornamental stone is Ukrainian shield. Within its area there are about 140 deposits of granite, gabbro, labradorite with high technical and decorative properties. Generally, ornamental stone deposits can be found in all regions of Ukraine, but the most valuable types occur in Polissia - in Rivne, Zhytomyr regions, and in Zaporizhia, Zakarpattia and Khmelnytsky regions.

There are many different ways to extract minerals from massif. The most widely used methods are: by energy of explosion, by diamond wire saw, by non-explosive destructive device (NED) and by breaking off with hydrowedge.

Diamond-cut wire is the most common non-explosive method of separating rock monoliths of hard ornamental stone from the massif. This method has many advantages compared to other methods of quarrying. The advantages are: monolithic massif and blocks are not destroyed; the quality of product units (side facets are equal and opposite sides of the block are parallel) significantly improves; an opportunity to consider geotechnological features of massif and geometric parameters of working face; the depth and the height of sawing is hardly limited by the parameters of working body, on the contrary to sawing with rotatory saw reinforced with diamond segments; low impact on the environment.

Along with the advantages, this method has several disadvantages which include: high precision drilling; requires qualified personnel; constant supply of water; inability to use at high fracturing, softer inclusions and other irregularities; high cost of wire (the cost of the diamond wire on average is 80-90 dollars per meter); a large volume of drilling operations; large operating losses; working tool rejection from a given direction of drilling; rapid wear of wire due to the dynamic load at work.

For all the above, we can say that the most effective way to get high-quality monoliths is the method of sawing with diamond-cutting wire, since in the condition of correct operation, it almost does not pollute the environment if to compare with blasting. Apparently, this method requires less energy consumption as the latest generation of machines has inverter motors that change cutting speed by changing frequency. Thus, all energy consumed is directly transferred to diamond wire (drive wheel is mounted directly on the motor shaft). At the same time, the first modern wire saws for granite had mechanical change of rotation frequency which led to a rapid wear of equipment and high lost of energy (about 30% of energy spent for mechanical change of rotation frequency). The positive point of this mining method is a small cut width, which in turn can reduce exhaustion of a deposit.