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THE SPECIFICATION OF DIAMOND ROPE TORSIONAL RIGIDITY COEFFICIENT TO REFINE THE PHYSICO-MATHEMATICAL MODEL OF NATURAL STONE SAWING PROCESS

The paper deals with the research in the field of block facing stone extraction and, especially, the work of flexible cutting element – diamond rope – is examined. The executed research is urgent because this type of instrument is widely used only in the last decade.

The research aim is to update the calculation algorithm of the computer model of natural stone cutting process with the help of diamond rope. The research objectives are to determine the torsional rigidity coefficient. For this purpose, the methodology that maximum meets the State Standard 3565-80 "Metals. The torsional test method".

The phenomenon of lateral input of the rope remains unexplored till now. The study of this phenomenon is caused by the necessity to determine the diamond rope torsional rigidity.

In his papers G. D. Pershin examined the free torsion of unlined steel rope [1]. However he didn't work out the process of the diamond-rope cutting with polymerized ropes. We have already tested the free torsion of the polymerized diamond rope and found out that the polymerization increases the torsional rigidity coefficient approximately by 103 percent. That's why it is necessary to carry out the specifying tests and calculations for the polymerized diamond ropes.

Creating the opportunities for more precise selection of rational cutting parameters it is necessary to construct the most accurate model of diamond hob operation in the saw cut that can be do in the Adams program [2],[3]. This program allows getting the numerical values of all nascent forces depending on the set-up initial parameters.

The torsion degree of the flexible instrument in saw cut is determined by the proper rigidity. A great number of experiments should be performed to define the given parameter of diamond rope more accurately. The diamond rope with the diameter of hob 11.5 mm will be tested. The rubbered rope consists of six strands. Parameters will be collected both at torsion and detorsion. The data processing will be represented graphically determining the coefficient of linear approximation.

The law of *Hooke* in the case of torsion can be written down as:

$$\varphi = \frac{M \cdot l}{J_0 \cdot G} \qquad (1)$$

where M is a power moment that causes the torsional deformation;
l is the length of sample;
J_0 is a geometrical polar moment of inertia;
G is the module of fault.

Using the concept of relative torsion angel we will present (1) in the form of:

$$\theta = \frac{1}{H} \cdot M \tag{2}$$

where H is a coefficient of torsional rigidity, H·m^2; $H = J_0 \cdot G$.

The specified parameters of this coefficient will allow modelling the diamond hob operation in the saw cutting process with high accuracy. By-turn, it will make possible to carry out empiric tests for the determination of optimal parameters of diamond rope cutting. In future, it is possible to create the rational parameters database of the block facing stone extraction with the least losses.

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