



## OPTIMIZATION OF OPERATIONAL RELIABILITY OF HARD-ALLOY DRILLS

**DSc., Prof. T.U. Umarov, assistant U.T. Mardonov, assistant Sh.O. Ozodova**  
**Tashkent state technical university named Islam Karimov**

**Annotation.** In this thesis, optimization of operational reliability of hard-alloy drills is considered. Experimental studies showed the cost of technological operation of drilling, drills of new construction equipped standard with hard-alloy plates, would allow approaching the best values of operational reliability.

**Keywords:** operational reliability, non-failure operation, a drill about MNP, firmness, number of inversions, technological operation, optimum values.

Operational reliability of hard-alloy drills of different constructions is defined by the number of failures at their operation, the cost of the tool which is subject to replacement and actions for elimination of idle time of technological operation.

Naturally, the reliability of tools is higher, the less there will be expenses in the course of its operation. At the same time, the cost of its production can increase considerably. The high cost of production and operation of the tool can lead to the fact that costs of technological operation will be above cost value of product. Therefore the level of reliability of the used tool should be defined by optimization of overall cost and quality of a product.

Within the last years, a number of progressive constructions of the drills equipped with hard-alloy plates were developed at Technology of Machine construction department of Tashkent state technical university.

Results of researches and industrial tests of the machine-building enterprises of Uzbekistan which are carried out on a row shows sufficient reliability of drills of such constructions.

For the analysis of optimum reliability drills with mechanical fastening of hard-alloy plates were taken. Testing were subjected a batch of the drills of standard construction equipped with special plates and a batch of the drills of new construction equipped with standard hard-alloy plates.

Calculation of standard of reliability for all tools was carried out by a technique of the simplified calculations at the following assumptions:

1. All elements entering a technological system are equally reliable.
2. The tool is operated under constant conditions of cutting during all term of its service.

Industrial tests showed that failure at hard-alloy drills often happens because of sudden breakdowns and a more clean of the cutting edges. Therefore for assessment and determination of importance of difference between two mean values of firmness the nonparametric valuation method of an accidental error (which is not depending on the distribution law) by double-sided criterion of Wilcoxon is applicable at

$h_1 \rightarrow \infty$  and

$$h_2 \rightarrow \infty$$

Under these conditions dispersion will be defined from expression;

$$S^2(n) = 1/12 h_1 h_2 (n_1 + n_2 + 1)$$

where  $n_1, n_2$  - the number of tests of each type of a drill.

The critical area is applied to 5% of significance value and is defined by inequalities:

$$u \leq u_1 - u - 2S$$

$$u \geq u_2 - u + 2S$$

$$\bar{u} = \frac{n_1 n_2}{2}$$

If the value of number of inversions counted on the basis of experimental data does not get to the critical area, distinction of the compared options is essential. For finding of number of inversions data on firmness of the studied batches of drills have their increase and define:

$$u = \sum r_i - 1/2 n_i (n_1 + 1)$$

where  $r_i$  - sequence number of the first selection.

And stainless steel 12X18HI0T shows the experimental data which are carried out when processing by hard-alloy drills with a diameter of 25 mm of details from titanium alloys that inversions of both types of the studied tools are approximately equal (142.1 and 174.2) and are outside critical area for 5% of significance value (18438 ... 375.62). Therefore, the distinction of the compared values of average values of firmness of two studied batches of drills is not essential and according to a drill of new construction the having standard hard-alloy plates possess rather high extent of optimization, and at the same time much lower cost.



Thus, the cost of technological operation of drilling by drills of new construction by the equipped standard hard-alloy plates, allows to approach best values of operational reliability.

### **Literature**

1. Holmogortsev Y.P. "Optimization of processing opening". M. Machine construction, 1984
2. Hard-alloy drills of one-sided action. M of the All-Russian Research Institute tool, 1981
3. Bashkov V.M. Tests of the cutting tool for firmness. M. Machine construction, 1985