QUALIMETRIC EFFECTIVENESS EVALUATION OF LARGE-SIZE CRANKSHAFT NECK SUPERFINISHING

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It is known that grinding is mostly used in finishing processing. However the grinding process is accompanied by high temperature in the cutting area. This temperature causes the structural changes of superficial layer, reduces its endurance. Besides grinding polishing is also widespread as finishing processing. This type of finishing processing is universal enough and does not require difficult equipment. But polishing does not provide the quality indicators of the geometrical shape of the machined surface. It is also characterized by a substantial complexity.

Superfinishing is a final treatment with the use of grinding stones. In particular it is applied for the removal of the noted lacks of grinding and polishing processes. But the practical usage of large-size detail superfinishing involves certain difficulties. These difficulties increase if the surfaces are hidden, for example necks of crankshafts.

In some practical cases we succeeded to overcome the characteristic phenomenon of traditional superfinishing, namely the instability of working conditions of grinding stones. The schemes of superfinishing, in which the removal of the material is carried out keeping the cutting properties of grinding stone, are divided into the following kinds: percussive-cyclic; cyclic; of double oscillation; cyclic with oscillation.

There is no comparative analysis of superfinishing processing schemes. This doesn't assume the selection of the primary processing scheme. Therefore the problem of the selection of the superfinishing scheme aimed at putting the large-size crankshaft neck processing into practice is essential.

On this stage of research we've expressed a hypothesis that one of the superfinishing schemes can possibly take an advantage in comparison to other ones, which are examined in this work. This advantage must be confirmed by the numeral value of some criterion.

It is suggested to take into account the indicators that can help us to perform the evaluation of superfinishing schemes. They are: the correcting capability of superfinishing, the coefficient of the intensity of shape rejection correction, the linear wear of grinding stones, the basic time of processing.

We've applied the idea of the mathematical method for the complex evaluation of superfinishing schemes. This method is used for the economic analysis of the production activity of enterprises and their subdivisions. This is the method of reverse determinate factor analysis. Thus any list of indicators which are used for complex evaluation is possible. The significance of every indicator and the differences in conditions for each of them are also taken into account.

This method involves the use of linear algebra. It is intended for the comparison of all indicators and the measure of their deviations from the best results for each indicator. The indicators characterize the agreed object of analysis – etalon. The best result for each indicator is not optimum. It does not characterize the efficiency of compared superfinishing schemes.

Let's consider the mathematical analogue of the method. Each superfinishing scheme corresponds to a point in n-dimensional space, where n – the number of indicators that the comparison is occurred on. Coordinates of the point are the superfinishing estimate indicators. They are expressed in the shares of the same indicators of the etalon scheme. Thus the superfinishing scheme subordination will be determined as a distance from the etalon scheme points to the points that correspond to each superfinishing scheme.

The linear models of superfinishing indicator have been got by the simulation modelling of superfinishing. The models of superfinishing indicators provided the receipt of statistical material. This material is necessary for putting the estimate determination method of superfinishing scheme effectiveness into practice.

The analysis of the superfinishing scheme estimations we've got allows us to make a conclusion: if using the accepted evaluation method, the grinding stone wear U_s affects the choice of superfinishing scheme more than the coefficient of the intensity of shape rejection correction K_i does.

From this, it can be inferred that our hypothesis should be rejected. It means that no superfinishing scheme takes the advantage in comparison to others. In such a situation the roughness characteristic of machined surface will have the determined meaning. Using this characteristic we should prefer the cyclic superfinishing scheme or the cyclic scheme with oscillation.

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