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CHOOSING OF TURBO COMPRESSOR ROTOR SURFACE RESTORATION METHODS

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Formulation of the problem. At present, considerable experience has been accumulated in the restoration of turbocharger rotors. The technological process consists of restoration methods that ensure the required level of operational properties of restored parts. The restored part of the rotor is the shaft. Taking into account the possibility of restoring the shaft in several ways (the method of repair sizes, galvanic build-up – chrome plating, iron plating and the electro sparking method of building up [1, 2]), it is necessary to substantiate and choose a rational technological method of restoration.

The method of three criteria (technological, technical, techno-economic) is usually used to choose a rational technological method of restoring the surfaces of parts. But the multi-criteria choice based on the distance to the goal – the Pareto analysis method allows you to reach the effective frontier, which unites options dominating over others [3].

The main research materials. Three methods of shaft restoration were subject to analysis: electro sparking method of building up, iron plating, and chrome plating.

When restoring by the method of galvanic coatings, iron plating is most often used, chrome plating is less common. Applying a galvanic coating to the worn surface of the turbocharger rotor shaft is an effective way to restore the fit. The advantages of the method are the absence of thermal effects on the part, which causes undesirable changes in the structure and mechanical properties; obtaining with great accuracy the specified coating thickness; the possibility of simultaneously restoring a large number of parts.

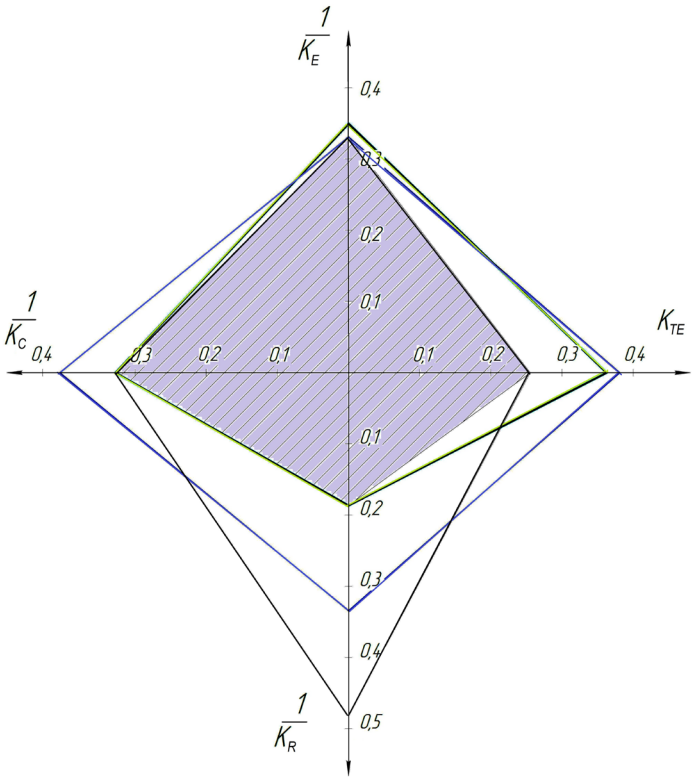
When using the electric spark method, the rotor shaft is restored with medium or high-carbon steels in mechanized mode on special installations. The method makes it possible to increase the micro hardness of the surfaces of the "rotor shaft – bearing sleeve" friction pair, reduce the intensity of wear, thereby creating conditions for increasing their average service life between repairs.

One of the methods of multi-criteria selection consists in the application of the integral criterion of the distance to the target. Its essence is in substantiating the ideal and evaluating the degree of approximation to it of each of the options. Criteria are defined for options for methods of

restoration of shaft surfaces, and they are placed on radially located scales. The scales are built in such a way that the improvement of the criterion goes to the center. By connecting the points on the scales for the j-th option, a polygon is obtained. A polygon of the idealized version is built on the best values of the criteria (Figure 1). The generalized criterion of the distance to the target μ is defined as the ratio of the area of the j-th option to the area of the idealized one [3]. In order to construct a multi-criteria evaluation based on the distance to the target, the actual value of the criterion must be converted into a standardized value.

When determining the distance to the target μ, the area of the polygon is determined as the sum of the areas of triangles with sides corresponding to the values of the criteria.

A comparison of μ values for different methods of restoration of turbocompressor rotors shows that the smallest distance to the goal (ideal) is characteristic of fertilizing (μ = 1,24), and the furthest method is electro sparking method of building up (μ = 1,67).



K_R – coefficient of resistance to tripping; K_E – endurance coefficient;
K_C – coupling coefficient; K_{TE} – technical and economic coefficient

– iron plating
– chrome plating
– electro sparking method of building up
– the perfect way

Fig. 1. Multi-criteria selection of the rotor shaft restoration method

Conclusions. Ironing can be considered an effective way to restore worn surfaces of the turbocharger rotor shaft. This method is characterized by high technical and economic indicators: consumables are cheap and not in short supply, high productivity of the process, the ability to adjust the properties of the coatings within wide limits, sufficiently high wear resistance of the coatings, lack of thermal impact on the part.

References

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