C4-O-003702

DRILLING OF TITANIUM ALLOY USING A CARBIDE TOOL WITH ANTIFRICTION COATINGS[1]

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Among the problems encountered in the processing of titanium alloys, in particular, during drilling, additional difficulties are associated with their low thermal conductivity. Since the heat released during the cutting process is distributed rather slowly over the workpiece, the expansion of the metal leads to pressure on the tool. Chips actively stick to it, the coefficient of friction increases, additional heat is released. The high temperature and its unfavorable distribution in the cutting tool significantly reduce the cutting time before the tool change.

To increase the durability of the tool, wear-resistant coatings are used everywhere and quite successfully. Moreover, modern coatings can be considered as wear-resistant complexes designed taking into account the working conditions of the tool. The three- to five-fold effect of increasing durability in the processing of carbon steels has already become normally. However, when processing titanium alloys, an increase of 50-70% can be considered a success.

From classical works in the field of the theory of cutting materials, it is known that the power of heat sources during shaping largely depends on the friction forces on the working surfaces of the tool. Consequently, their coating efficiency will largely depend on the ability to reduce the frictional interaction on the contact pads, of course, while maintaining heat resistance. Here, additional antifriction coatings can provide some help, which can be applied by a variety of methods.

Diamond-like carbon coatings (DLC) have pronounced advantages over nitride and oxide coatings in terms of providing a reduced coefficient of friction on the working surfaces of the tool. However, the use of DLC coatings for cutting tools in the conditions of processing difficult-to-process alloys is limited by their relatively low temperature resistance. However, modern DLC coatings remain undervalued, they have certain prospects in increasing the cutting ability of the tool when cutting titanium alloys.

Another interesting way to reduce friction is the technology of epilaming, which is based on the use of surfactants in fluorocarbon easily evaporating solvents. Such solutions (epilams), in particular the composition 6SFC-180-05, are applied to the surface and after evaporation form a thin film up to 100 nm thick. Modern compositions are quite capable of working in a zone of sufficiently high temperatures.

New experimental results on the evaluation of the cutting ability of carbide drills with coatings of group (CrTiAlSi)N and additionally applied antifriction coatings, as well as the establishment of the influence of such coatings on the condition of the workpiece surface can be a step towards expanding the areas of technological application of such coatings and their implementation based on new technical solutions.

1 This work was supported financially by the Ministry of Science and Higher Education of the Russian Federation (project No 0707-2020-0025)