THE INFLUENCE ANALYSIS OF COATING ON TOOL WEAR WHEN DRILLING CARBON FIBER REINFORCED POLYMERS

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The holes quality in the carbon fiber reinforced plastics (CFRP) deteriorates rapidly with tool wear, ultimately affecting operate performance of this type material. Tool wear resistance and the level of surface quality directly determine the machining performance. These parameters depend of the cutting tool material and its initial geometry, technological processing parameters and other factors. The nature of tool wear and its intensity over time also largely depend on the presence or absence of a hardening and protective coating. The degree of coating influence on tool wear is currently insufficiently studied, and a large number of studies are being carried out in this direction, which makes the task of studying the coating effect on reducing tool wear relevant and of great practical value.

Experimental studies known from the literature [1] using various types of drills, uncoated and coated with DLC, BAM and (AlCrSi / Ti) N showed that both DLC and BAM coatings did not prevent significant rounding of the cutting edge compared to the tool without cover. Coated carbide drills (AlCrSi / Ti) N showed better wear resistance than others. In addition, studies of the uncoated behavior and coated tools CVD-diamond and PCD-drills tested on drilling CFRP showed that the drill with PCD Seco CX-1 at the highest processing quality has the highest tool life, both among uncoated drills and with CVD diamond coating.

The results of the numerous studies analysis [2] have shown that the high hardness of the coating does not always provide high abrasion resistance. Important factors are the contact hardness of the coating comparable to the base tool material, strong adhesion between the coating and the substrate, and the unique morphology of the coating.

Strong adhesion to the tool base material guarantees its high safety, despite the hardness and abrasive properties of CFRP, which affect the flaking of the coating during operation. Therefore, it was concluded that increasing the bond strength between the coating and the tool material is the main direction of research for the future technology of coating the tool.

References:

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