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THE USE OF WEAR-RESISTANT COATINGS FOR CUTTING TOOLS WITH THE AIM OF OPTIMIZE CUTTING PROCESSES

*А.И. Кащёнок, студентка группы 10505117 ФММП БНТУ,
научный руководитель – д-р техн. наук, профессор Н.М. Чигринова*

Резюме – В данной статье обсуждаются факторы, влияющие на процесс резания. Для оптимизации процесса резания предлагается использовать режущий инструмент с износостойким покрытием. В статье приведены основные классификации износостойких покрытий, а также приведены данные об эффективности их работы.

Resume – This article discusses factors that influence the cutting process. To optimize the cutting process it is proposed to use a cutting tool with a wear-resistant coating. The article gives the basic classification of wear-resistant coatings, as well as data on the effectiveness of their work.

Introduction. The development of a modern tool is based on the principle of increasing durability by additionally processing its surface layer. One of the most effective ways to improve the quality of the cutting tool is to apply a wear-resistant coating.

Main part. In the process of cutting there are a number of negative factors [1]. High temperature in the cutting zone leads to a loss of strength of standard hard alloys. For this reason, tool life and cutting speed are reduced. This has a negative effect on productivity. High hardness and strength of hard-to-work materials, the probability of failure of the cutting tool due to its destruction increases. Low thermal conductivity and high strength of hard-to-work materials lead to an increase in the power of the main heat flux and redistribution, mainly due to an increase in the intensity of the heat flux towards the tools. This factor increases the likelihood of losing the shape of the cutting part of the tool. The high chemical activity of some materials leads to the activation of physical and mechanical processes at the tool contact pads, which causes fatigue wear of the tools. The tendency of some materials to mechanical hardening during plastic

deformation during cutting, which leads to an increase in the intensity of abrasive wear.

The quality of the cutting process also depends on the following factors: quality of the cutting tool, cutting conditions, condition of the machine. The solution to the problem, the action of negative factors may be the use of wear-resistant coatings. Wear-resistant coatings are used to reduce the impact of negative factors on the tool, as well as improve the quality of the processing. Next, the most common classification of wear-resistant coatings will be described. Wear-resistant coatings can be classified by a set of properties and functions that determine their purpose by coating composition and its construction. Wear-resistant coatings in structure are single-layer and multi-layer. Single-layer coatings are characterized by a constant composition. Multilayer coatings have a variable composition. A feature of multilayer coatings is a smooth transition of the physicomachanical and thermophysical properties of the coatings from the instrumental base to the upper boundary layer of the coating. Coverage should consist of the following layers: top – a layer providing wear resistance to the tool; lower – providing maximum adhesion with tool surface; intermediate layers – having variable properties and providing an adhesive bond between the upper and lower layers, as well as having barrier functions [2].

Wear-resistant coatings by composition are divided into the following groups. Multicomponent – created on the basis of mixtures of two or more compounds of refractory metal. Single-element – a coating based on one refractory metal. Multi-element – created on the basis of a combination of two or more refractory metals. Composite – are a mixture of two or more refractory metals. Are one-component wear-resistant coatings: TiN, ZrN, CrN, Cr₂N, Hf₃N₄, Cr₃C₂, TiC, ZrC.

To the coating of complex composition can be attributed: TiCN, TiAlN, TiZrN, ZrM₀N and other.

Analysis of the most used coatings of complex composition allows us to distinguish the following advantages of multicomponent coatings in comparison with single-component [3]:

1. The performance of the cutting tool with wear-resistant coatings of complex composition is determined by the parameters of the coating structure, directionally controlling which you can significantly change the properties of the coating.

2. The resistance of a cutting tool with coatings of complex composition, depending on the coating composition and cutting conditions, is 1.5–4 times higher than the resistance of a cutting tool with single-component coatings.

3. The composition of the wear-resistant coating has a significant impact on the processes taking place on the contact pads of the tool.

4. Coatings of complex composition due to high crack resistance, strength properties a high level of compressive residual stresses inhibit the processes of formation and development of cracks.

Economic reasons for the use of wear-resistant coatings. The use of metal cutting tools with pre-applied wear-resistant coatings provides a number of important advantages [4]. Increase in productivity of cutting by 200–200 %. Increase in tool life up to 1.5–10 times when machining structural steels, up to 4 times when cutting corrosion-resistant and heat-resistant steels, by 1.5–2.5 times when machining titanium and nickel alloys. Reduction in the consumption of a complex tool due to a decrease in the number of its regrindings.

Conclusion. In modern engineering, when using cutting as a processing method, a number of negative phenomena arise. In order that these phenomena do not affect the quality of products, it is necessary to apply, including a good cutting tool. Such a tool may be a tool with a wear-resistant coating. Wear resistant coatings are used to improve tool properties. A variety of modern wear-resistant coatings allows you to choose the perfect option depending on the working conditions of the tool, the tool material, the required work result, as well as other factors.

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BASIC PRINCIPLES OF SUCCESSFUL BUSINESS IN MODERN WORLD

*Н.П. Крапивин, студент группы 10503117 ФММП БНТУ,
Е.И. Рыжко, студентка группы 10508118 ФММП БНТУ,
научный руководитель – преподаватель Е.Н. Лазарева*

Resume – Around the world, aspiring entrepreneurs make mistakes at the very beginning of their journey. They do not take into account the principles and rules by which the business operates. Therefore, it is very important to understand how business works in the modern world.

Резюме – По всему миру начинающие предприниматели совершают ошибки в самом начале своего пути. Они не принимают во внимание прин-