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FEATURES OF DRILLING DETAILS MADE OF COMPOSITE POLYMER MATERIALS

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Abstract: The importance of polymer materials in the world economy is very great. In this article, the main conditions and features of drilling details made of these composite polymer materials are shown. It is also mentioned that during drilling, the walls of the hole are cracked, the edges of the hole are cracked, and because of this, the cuttings stick to the drill.

Key words: material, composite polymer materials, scrap, hole, drill

Аннотация: Значение полимерных материалов в мировом хозяйстве очень велико. В данной статье показаны основные состояния и особенности буровых деталей из этих композиционных полимерных материалов. Также упоминается, что при бурении стенки отверстия растрескиваются, края отверстия растрескиваются, и из-за этого шлам прилипает к сверлу.

Ключевые слова: материал, композиционные полимерные материалы, лом, отверстие, сверло.

Annotatsiya: Jahon iqtisodiyotida polimer materialllarning ahamiyati juda kattadir. Ushbu maqolad esa manashu kompozitsion polimer materiallardan tayyorlagan detallarni parmalashning asosiy holat va xususiyatlari ko’rsatilgan. Shuningdek, Parmalanganda teshik devorlarini titilib ketishi, teshik qirg‘oqlari yorilishi va shu sababdan qirindi parmaga yopishib qolishi keltirilgan.

Kalit so‘zlar: material, kompozitsion polimer materiallar, qirindi, teshik, parma

Introduction. Holes in a solid material made of polymer are usually drilled with a drill with two cutting edges. The drill creates friction between the hole wall and the outer surface. Due to the dense bond between the parma and the surface of the hole, it becomes more difficult for the cuttings to get out of the hole, as the hole gets deeper. Due to the small heat transfer, large coefficient of thermal expansion, low softening temperature and high values of plastic elastic recovery, the surfaces of the holes tend

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to be indented during the drilling process, which increases the friction between the walls of the hole and the drill bit. These phenomena affect the appearance of the hole, the force directed along the axis, the time of rotation and the resulting debris. The appearance of the hole is also affected by the shape of the drill bit.

LITERATURE ANALYSIS AND METHODOLOGY

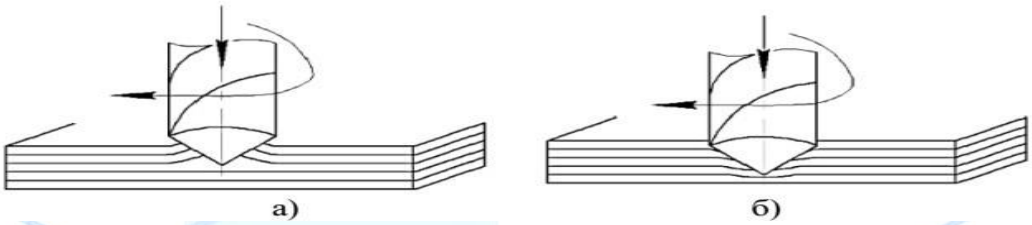

Figure 1. Separation of the hole surfaces into layers at the outlet (a) and inlet (b) of the parma

Figure 2 shows the external appearance of the walls of the hole drilled using a standard drill and double-sided drills.

The diameter of the drill is 8.1 mm, the upper angle is 100°, the back angle is 15°, n=2000 rev/min, s=0.05 mm/rev. The upper half of the image shows the edge of the hole when the drill enters the material, and the lower part shows the edge when it exits the material. .The cracks around the edges of the hole become larger with the increase of the angle, which automatically increases the front angle of the drill. The melting of the inner surface of the hole is especially intense when using the parma with a small angle of inclination of the screw groove.

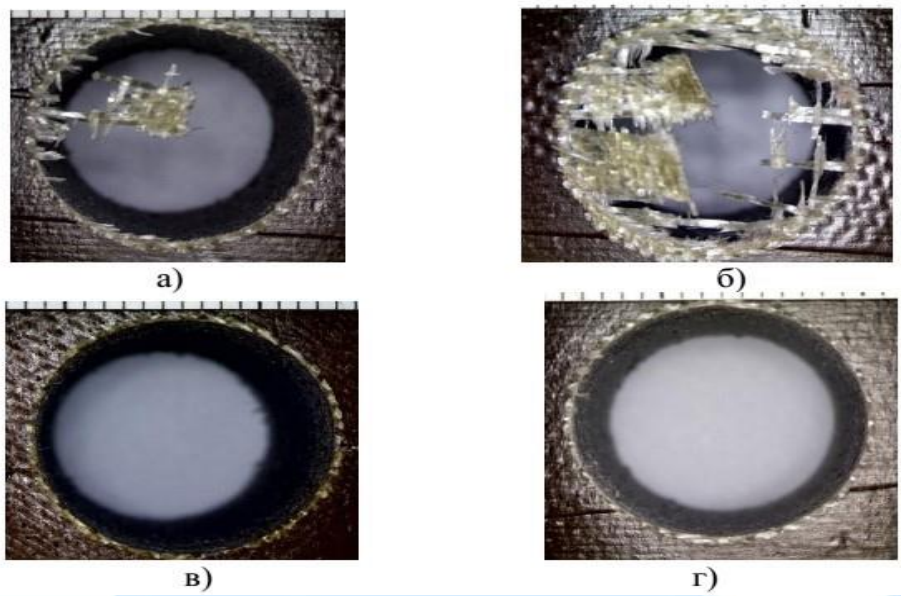

Figure 2. The appearance of the carriages at the exit of Para: a,b-standard drill; v, g-double-sided drill

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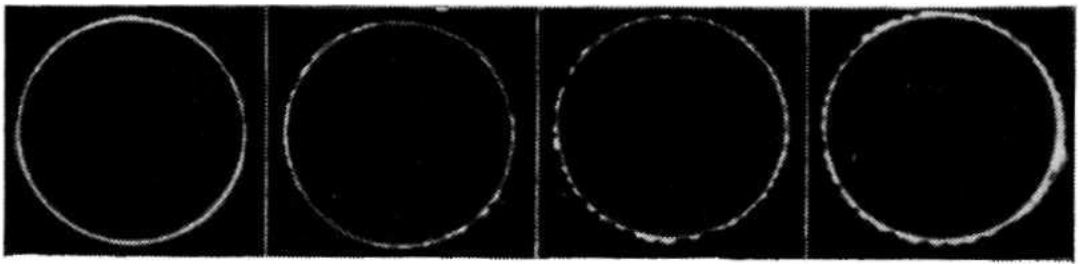
The process of formation of cracks around the edges of the hole is also influenced by the 2φ angle of the drill bit. The size of the cracks varies depending on the feed and the top angle of the drill. With the increase of the upper angle, the cracks become larger, and the thickness of the chips increases. (Fig. 3).The number of cracks during processing with a PKM drill is reduced to a minimum by means of a special design. The construction drill shown in Fig. 4 b has a two-step top angle. With the help of the second cutting edge of this type of drill, the thickness of the shavings cut is reduced, and due to this, cracks do not form around the edges of the hole.



Upper corner of Parma

Figure 3. The influence of the top angle of the drill on the appearance of cracks along the edges of drilled holes in polymethyl methacrylate

Figure 4v shows the type of wheel that reduces the cutting edges of the drill, as well as the front angle; with such a drill, it is possible to obtain holes with a good quality, crack-free appearance.

PCM drilling is widely used during processing of parts made of pressed or layered materials. However, it is not easy to avoid the deterioration that may occur in the processed material, such as melting, sticking to the walls of the drilled hole, and the appearance of cracks around the edges of the hole.

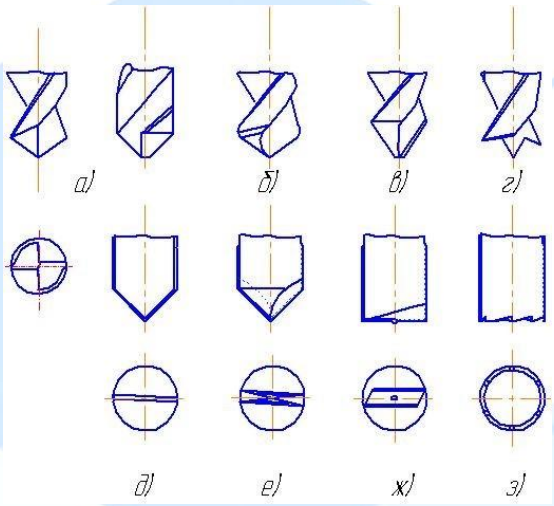


Figure 4. The main types of drills in PKM drilling

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a - spiral drill; b and v - special spiral drills; g - a modified structure of a spiral drill with three edges; d - blade drill; e - drill with a special blade; j – center-bladed drill; z is a hollow drill.

Figure 4 shows the cuttings obtained from a simple spiral drill, a drill with a double wheel on the upper corner, and a drill with a wheel on the cutting edges. Parma diameter d=8.1 mm, ω=270, a=150, n=2000 rev/min, s=0.05 mm/rev. When working with the last two types of drills, a continuous chip with a smooth surface is obtained, cracks do not form around the edges of the hole. In the process of drilling, the elastic deformation of the material and its elastic recovery after drilling significantly affect the bending of the back surface of the drill and the generation of temperature due to friction. Due to the elastic deformation and elastic recovery of the material being processed, as the back angle decreases, the force directed along the axis increases. In recent years, the share of polymer composite materials (PCM) with high physico-mechanical and operational properties has been growing rapidly in the industry. It is possible to get a lot of details from them, and even replace some steel materials.

Compared to metals, it is associated with a decrease in the cost of production of spare parts, a decrease in the share of products and an increase in the disposal of materials. Polymer composite materials based on carbon or carbon plastic are widely used in engineering. These materials are characterized by high strength, elasticity and low density. To date, the problem of removing cuttings from the cutting environment has been identified in order to increase the efficiency of the processing process in the industry. A lot of cutting tools are used due to the bending of the cutting tool during machining.

Introduction of new methods of processing of holes, selection of appropriate cutting tools and cutting methods, helps to achieve the desired quality of the surface, reduce their cost and increase the accuracy of holes.

RESULTS

Based on the theoretical and experimental studies, technical methods were developed for drilling holes in PCM details that ensure the quality, accuracy and efficiency of the drilling process.

A recommended method for drilling polymer composite materials is to rotate the drill and periodically stop the axial movement of the drill, meaning that the drill moves at least one turn. The proposed method stabilizes the dynamic properties of the machining process, improves the quality of machined holes by crushing the cuttings, removes cuttings along the drill spiral, and improves the removal of cuttings, especially in automatic machining. The method is carried out in the following order. During machining of a drill installed on a machine tool, the suction movement of the spindle is stopped at least one turn of the drill according to a certain program. As a result, the

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scum that is released is crushed. Comparing the proposed drilling method with conventional drilling, the quality of the machined holes and the durability of the drill were evaluated well. In addition, during normal processing, defects appear in the places where the drill exits the detail hole. Such defects do not appear when drilling in the recommended way. Thus, it is possible to achieve high-quality holes when processed by the tempered drilling method. According to the results of theoretical and experimental studies, the problem of improving the productivity of PCM processing, surface quality and accuracy of holes was solved by choosing the right processing method. Diametric dimensions and deviation from roundness were carried out using a coordinate measuring device.

CONCLUSION

1. If you want to increase the performance with minimal effect on the deviation of the profile of the longitudinal section, increasing the thrust should be considered first.

2. The surface of the longitudinal part of the PCM hole almost does not change, but during drilling, a change in the diameter of the hole is observed in the near parts of the drill exit.

3. In the study of roundness deviations, no statistically significant regularities resulting from cutting speed and thrust factors were found.

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