

Q4 : How to extend the life of die-casting molds? (3) Analysis from the perspective of mold manufacturing.

A4 : The 15th and 16th issue of this journal respectively introduces the four main ways to improve the life of die-casting molds, which focus on mold materials and mold design; however, mold manufacturing technology and its accuracy characterization are also important factors affecting mold life. In mold manufacturing, it is absolutely necessary to pay close attention to the various aspect that affect the life of the mold. If research and continuous improvement can be made, the level of mold manufacturing will be improved, and the life of the mold will be improved. This issue is to propose three related perspectives.

- [Improve mold manufacturing process and increase precision accuracy](#)

In the process of mold manufacturing, stress is prone to occur, and the internal stress of the die-casting mold is an important factor affecting the mold; therefore, the industry must be able to reduce the generation of stress when preparing the production line, production guideline, and programs during processing. And eliminate the stress in time to improve the life of the mold.

In the same way, choosing appropriate processing methods to improve the precision of mold manufacturing can also extend the life of the mold. Take processing the ejector pin hole as an example. At present, most die-casting mold manufacturers generally use Wire Electrical Discharge Machining. After this process, the hole brightness is not enough, and the dimensional accuracy is also insufficient.

On the other hand, it is easy to cause aluminum to enter, so that the ejector pin hole is squeezed out.

Many die-casting molds are damaged due to the ejector pin hole. In severe cases, the mold may be scrapped, and the life of the die-casting mold will be terminated early, which will affect the production and cause economic losses. However, some companies use advanced Low-speed Wire EDM to process the ejector pin hole to ensure dimensional accuracy, effectively improve the finish of the inner hole, and reduce the chance of ejector pin jamming, which not only improves the reliability of the mold, but also extends the mold life.

In addition, improving mold manufacturing standards, doing quality management, and reducing mold repair welding are also important guarantees for improving mold life. Due to the property of the repair welding material, problems such as high

temperature and internal stress will occur during repair welding, which will have a great impact on the life of the mold. For die-casting molds, cavity repair welding is extremely undesirable. Even if it happens, thermit welding should be avoided as much as possible, and stress relief and tempering should be carried out after welding to improve the life of the mold.

- **Hard layer that reduces electric impulse on the mold surface**

Electrical discharge machining is the most commonly used method of mold cavity processing; however, the surface of the processed mold cavity will form a bright white layer and a metamorphic layer, making the surface of the mold in a state of tensile stress. If the mold cannot be polished off the surface in the tensile stress state during the subsequent polishing process, the early cracking or cracking is highly likely after the mold is put into production.

The research results from Japan show that the tensile stress of the mold surface after electrical discharge machining can reach 700-1100MPa. At the same time, if the current of electrical discharge machining is large, many micro-cracks are more likely to form on the mold surface. Therefore, when using electric pulse processing operations, you must pay great attention to the control of processing parameters, and you cannot blindly increase the discharge current to improve efficiency. The discharge current should be reduced as low possible, and the thickness of the metamorphic layer should be reduced to avoid early problems after the mold is put into production. Early Cracks or cracks occur and affect the life of the mold.

In addition, some advanced mold manufacturing companies have begun to use high-speed milling processing methods, using super-hard milling cutters, and processing mold cavities with precision requirements on the heat-treated mold materials through CNC programs. The high-speed milling mold cavity not only has high dimensional accuracy, but its surface finish can also be achieved in one step and can be used directly without grinding or polishing; and the surface of the mold is in a state of compressive stress, and its compressive stress range can reach 300- 500 MPa, can effectively prevent the formation of early cracks, thereby prolonging the service life of the die-casting mold.

- **Reasonable fitting gap between the molds and molds to ensure that the aluminum is not jammed**

The die-casting process is in a high temperature, high-speed, and high-pressure state. Once the die-casting mold is not properly attached, it is highly likely to cause problems such as aluminum channeling and block jamming of the slide, resulting in damage to the mold and

affecting the service life of the mold; therefore, compared with the fitting of plastic injection molds, die-casting molds are more difficult, demanding, and more important.

The property of castings is different, especially for large molds. The temperature of the mold during die-casting production and when it is not produced at room temperature change greatly. Therefore, when attaching, it is necessary to fully study the property of the mold and the changes in the temperature field. Targeted placement adjustments make the mold fitting gap reasonable. In this way, it can be ensured that there is no aluminum channeling, slide jamming, etc. during die-casting production, and the reliability of the mold is improved, and the life of the mold is prolonged.

"Mold material" shows that the selection of materials and heat treatment methods affect the appearance of mold quality. "Mold design" focuses on avoiding defects from the design side, while "mold manufacturing" pays attention to stress. Only by grasping the general direction and paying attention to every small detail, can the quality control effect of die-casting mold be achieved, and mold life can be extended, and its economic benefits can be exerted. In the next issue, this journal will discuss and extract in depth from the perspective of "mold use and maintenance", so please keep following.

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