

Q9: As the quality demand of die-casting parts is increasing, is the meaning of using release agents becoming more important?

A9: Mold release agents are especially important in die casting technology. They will affect the quality of the casting, the life of the mold and the length of the casting cycle. The release agent must match the corresponding casting material and meet higher requirements in terms of economic efficiency and environmental compatibility.

- **Release agent application**

Release agents are essential for trouble-free production processes in die casting factories. The most widely used release agents for die casting are water-based chemicals. They form an isolation film between the mold and the casting material during the casting process and cool the mold. After the casting process, the surface temperature will greatly increase. In the long term, such temperature (for example, up to 500°C in the case of aluminum) can cause severe mold wear. Therefore, the mold release agent can also protect the mold. The release agent, in many cases a wax and water emulsion, is sprayed onto the molding surface of the mold by a spraying device that moves into the open mold between two casting cycles. When the water evaporates and cools the mold, paraffin wax remains on the surface of the mold and creates an isolation film. It prevents the melt from sticking to the mold and helps to remove the finished casting from the mold.

- **Complex properties**

In addition to the mold release agent and coolant, the mold release agent must also have other properties, such as good wetting ability, chemical stability at high mold temperatures, environmental compatibility, and not clogging the channels and nozzles of the spray system with the ability to gap. Between the moving parts of the mold. The water-dilutable mold release agent contains additives that can make the organic raw materials form a stable mixture in the water phase and protect the die casting machine and the mold from corrosion. The bactericide can protect the release agent concentrate from microbial attack and decomposition associated with it. The release agent should also meet the demand for resource efficiency, so only a small amount is required per casting cycle, and the cost of recycling or disposal is very low. When using micro-injection technology, the amount of wastewater that must be treated can be further saved. Using this technology, it is possible to spray the mold with no more than the amount of liquid absolutely necessary for effective release and cooling.

- **Aqueous and anhydrous release agent**

About die casting, there is a difference between the use of water-based and anhydrous mold release agents. According to their basic raw materials, they can be divided into three categories. The first category includes mineral oils, semi-synthetic oils and fully synthetic oils and oils (ester oils) obtained from renewable raw materials. The oil has the properties of good spreading on the mold, and the ester oil also has a good effect on the CO<sub>2</sub> balance. However, the use of such oils is limited by the mold temperature.

The second category includes synthetic waxes produced from crude oil. Their particular advantage lies in promoting good flow of molten metal and good adhesion on the mold. This is important to avoid metal adhesion. A further advantage is that it has higher heat resistance than oil and has good demolding ability at higher mold temperatures. However, wax-based release agents tend to form deposits.

The third category is relatively new and is based on R-polysiloxane-based release agents. They can adhere well to the mold surface, promote the flow of molten metal and form a high-quality casting surface, and ensure easy removal of die castings even at high mold temperatures. Unlike the wax residue on the surface of the casting, the release agent residue caused by the decomposition products of R-polysiloxane is relatively easy to remove.

- **Micro amount spraying**

When the evaporating water of the release agent cools the forming surface of the mold relatively quickly, cracks will form here, which will negatively affect the quality of the casting and the life of the mold. If the amount of water is reduced and the amount of water is selectively increased, the cooling effect will be reduced, thereby reducing the risk of crack formation, so that the thermal load can be reduced, and the mold life can be extended. In addition, the lower consumption of the release agent helps reduce manufacturing costs. In addition, liquid residues are avoided, which also leads to an improvement in the quality of castings.

The further development of die-casting alloys, the increasing requirements for the design and surface quality of die-casting parts, and the optimization of production processes will inevitably have an impact on the release agent. Due to the increasing requirements for the surface quality of die-casting parts, Micro amount spraying technology has become more and more important.

**▲ This article is compiled by Chen Jiancheng from the Department of Mechanical Engineering, National Taiwan Ocean University, and is excerpted from: Significance of Release Agents for Die Casting Technology and is quoted from SPOTLIGHTMETAL.**