

CASTING AND COMPUTER

Feng Gang, Akimov O., Masalitina O.

National Technical University «Kharkiv Polytechnic Institute», Kharkiv

Casting is a time-honored process designed to create objects of various shapes by melting metal. There are various traditional casting methods, such as investment casting, metal mold casting, and low-pressure casting. These techniques have always played an important role in human history, helping mankind to make a variety of household and industrial products. However, the traditional casting technology also has some shortcomings, such as long production cycle, low efficiency, product quality is not stable. In order to solve these problems, people continue to explore the innovation and improvement of casting technology.

An interesting and practical improvement method is to introduce CNC technology and 3D printing technology. Through computer-aided design and manufacturing, sand molds can be made quickly and accurately, greatly reducing the production cycle. Three-dimensional printing technology, on the other hand, allows for the rapid production of complex parts and improves the precision and quality of castings. In addition, new coating technology, vacuum casting and low-pressure casting technology are also widely used in metal mold casting to improve the compactness and surface quality of castings.

In addition to the introduction of new technologies, the optimization of casting material ratio and melting process is also the key to improve casting quality. By testing and screening the metal materials put into production, the initial content of inclusions can be effectively reduced. In the melting process, the use of refining agent and deoxidizer can improve the liquid properties of the metal and reduce oxidized inclusions. At the same time, reasonable adjustment of melting temperature and holding time is also an important measure to ensure the quality of castings.

The design of the mold is also a key factor affecting the casting quality. Reasonable mold design can not only reduce the introduction of inclusions, but also solve the casting defects such as cold segregation and shrinkage. Through scientific pouring system design, it can ensure that the metal liquid in the filling process to minimize the contact with the air, thus reducing the generation of oxides and other inclusions. The heat treatment and cooling process after casting is equally important. Proper heat treatment can optimize the microstructure of the casting and enhance the mechanical properties. By controlling the cooling rate and method, the agglomeration of inclusions due to thermal stress can be effectively avoided. Together, these measures improve the quality and performance of castings and enhance the competitiveness of products in the market.

The innovation and application of casting technology not only improves production efficiency and product quality, but also provides strong support for the development of modern industry. From the introduction of new technologies to the optimization of the melting process, to improve the mold design and heat treatment process, each step of the improvement reflects the in-depth understanding of human casting technology and continuous exploration.