

# 10 types of casting process

The **classification of casting process** can be divided into the following 10 types, including **sand casting, investment casting, die casting, low pressure casting, centrifugal casting, gravity die casting, vacuum die casting, squeezing die casting, lost foam casting, continual casting.**

Next, we will introduce the definitions, characteristics, advantages and disadvantages of these 10 different casting processes.

I believe you will have a new understanding of casting technology after reading them all.



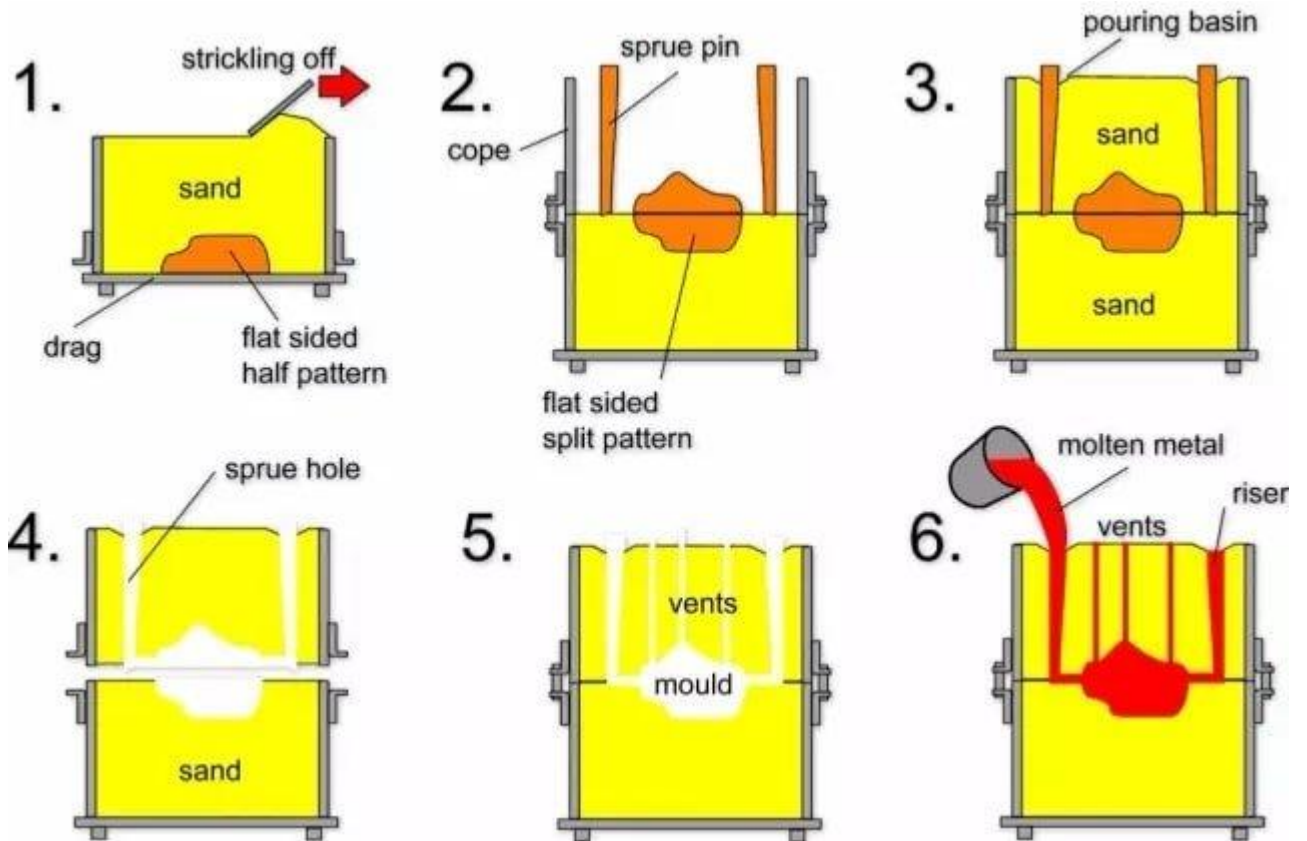
## (1) Sand casting



### **What is sand casting**

A casting method for producing castings in a sand mold. Steel, iron and most nonferrous alloy castings can be obtained by sand casting.

### **Technological process:**



Sand casting process

**Technical characteristics:**

1. Suitable for making blanks with complex shapes, especially with complex inner cavity;
2. Wide adaptability and low cost;
3. For some materials with poor plasticity, such as cast iron, sand casting is the only forming process for manufacturing its parts or blanks.

**Applications:** Automotive engine block, cylinder head, crankshaft and other castings.

## (2) Investment casting

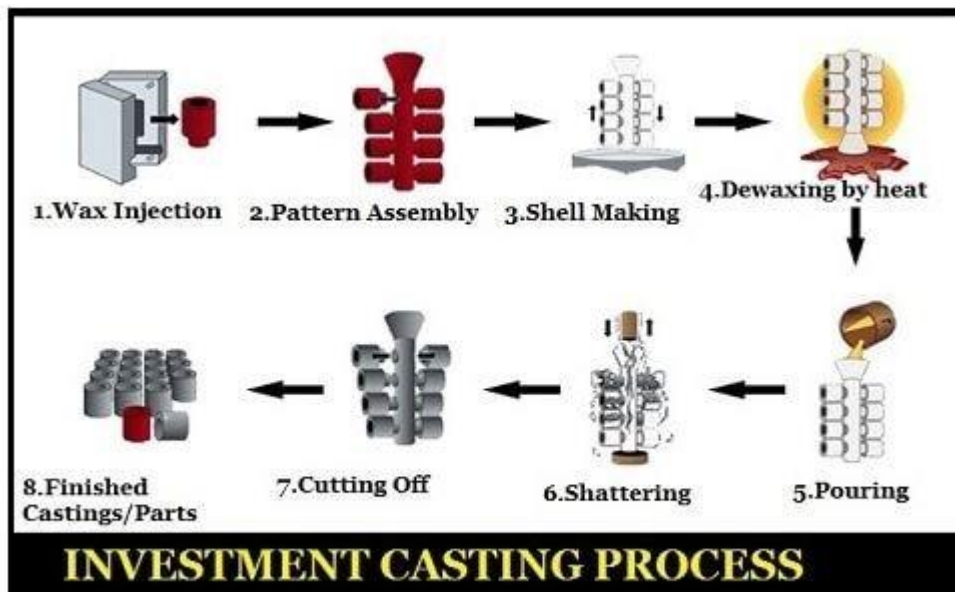


### **What is investment casting**

A kind of casting method that usually refers to making patterns in fusible materials, covering the surface of the pattern with several layers of refractory materials, and then melting the pattern out of

the mold shell to obtain a mold without a parting surface, which can be filled after baking at high temperature.

**Technological process:**



*investment casting process*

**Investment Casting Process**

**Advantages:**

1. High dimensional accuracy and geometric accuracy;
2. High [surface roughness](#);
3. It can cast complex castings, and cast alloys are not restricted.

**Disadvantages:** complicated procedures and high cost

## **Applications:**

It is suitable for the production of small parts with complex shapes, high precision requirements, or other processing that is difficult to perform, such as turbine engine blades.

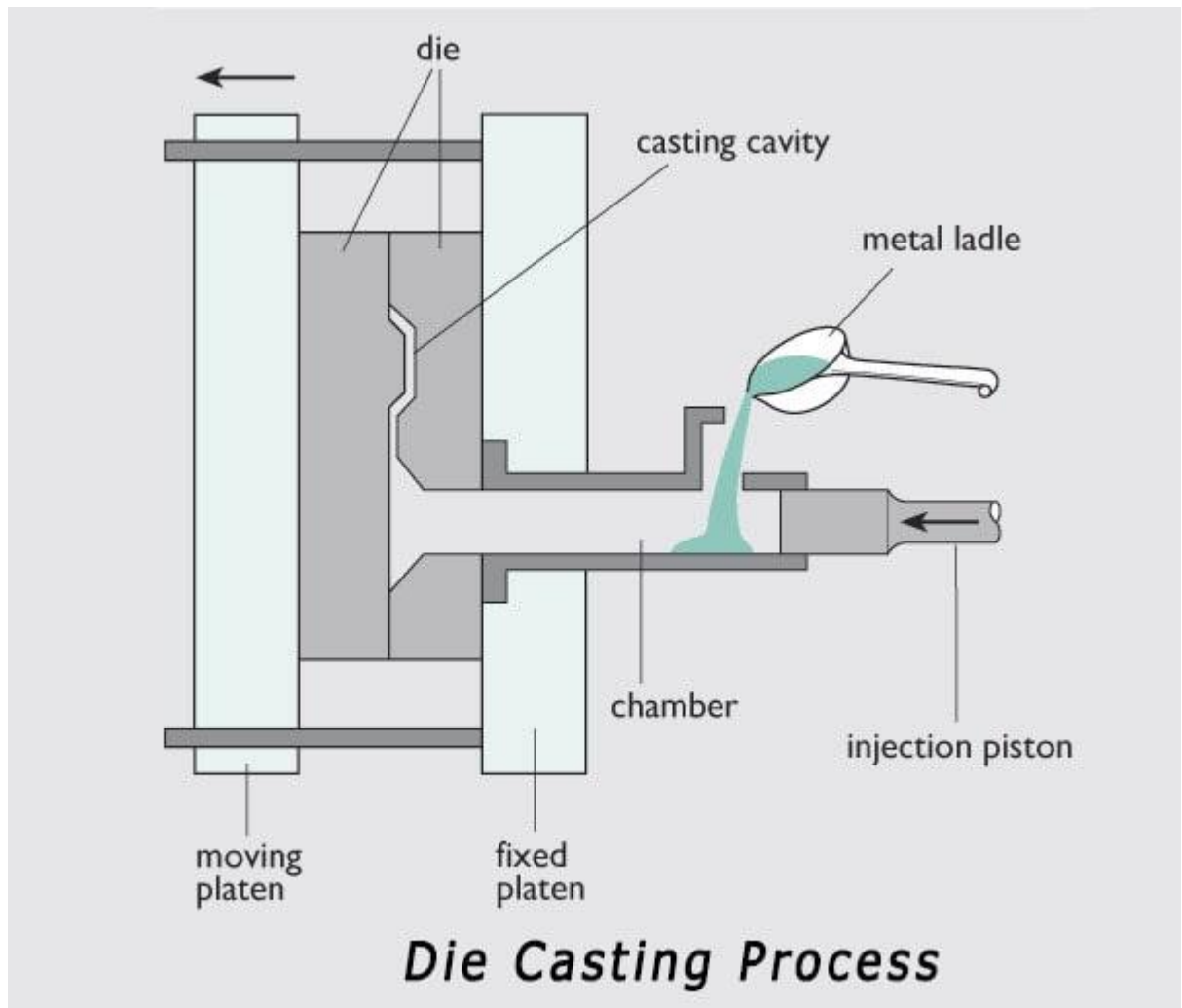
## **(3) Die casting**



### **What is die casting**

The high-pressure metal liquid is pressed into a precision metal mold cavity at high speed, and the metal liquid is cooled and solidified under pressure to form a casting.

## Technological process:



## Advantages:

1. The metal liquid is subjected to high pressure and the flow rate is fast during die casting.
2. Good product quality, stable size and good interchangeability.
3. High production efficiency and die casting molds can be used for many times.

4. It is suitable for mass production with good economic benefits.

**Disadvantages:**

1. The casting is prone to produce fine pores and shrinkage.
2. The die-casting parts have low plasticity and should not work under impact load and vibration.
3. When die casting of high melting point alloy, the life of the mold is low, which affects the expansion of die casting production.

**Applications:** Die castings were first applied in the automotive industry and the instrument industry, and then gradually expanded to various industries, such as agricultural machinery, machine tool industry, electronics industry, national defense industry, computers, medical equipment, clocks, cameras and daily hardware.



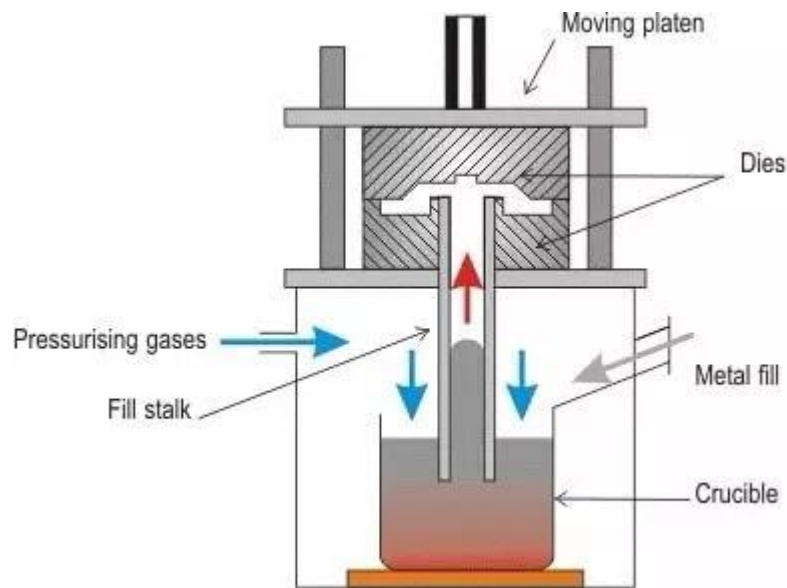
## (4) Low pressure casting



### **What is low pressure casting**

Refers to the method of making liquid metal fill a mold under a low pressure (0.02 – 0.06MPa) and crystallize under pressure to form a casting.

### **Technological process:**



### Technical characteristics:

1. The pressure and speed during pouring can be adjusted, so it can be applied to various casting molds (such as metal molds and sand molds), casting various alloys and castings of various sizes.
2. Bottom-injection filling is adopted, the filling of metal liquid is stable, and there is no splash phenomenon, which can avoid the involvement of gas and the erosion of the molding wall and core, which improves the qualification rate of castings.
3. The casting crystallizes under pressure. The casting has a dense structure, a clear outline, a smooth surface, and high mechanical properties. It is particularly beneficial for the casting of large thin-walled parts.

4. Eliminate the need to fill up the riser and increase the metal utilization rate to 90-98%.
5. Low labor intensity, good labor conditions, simple equipment, easy to realize mechanization and automation.

**Application:** Mainly used in traditional products (cylinder head, hub, cylinder frame, etc.).

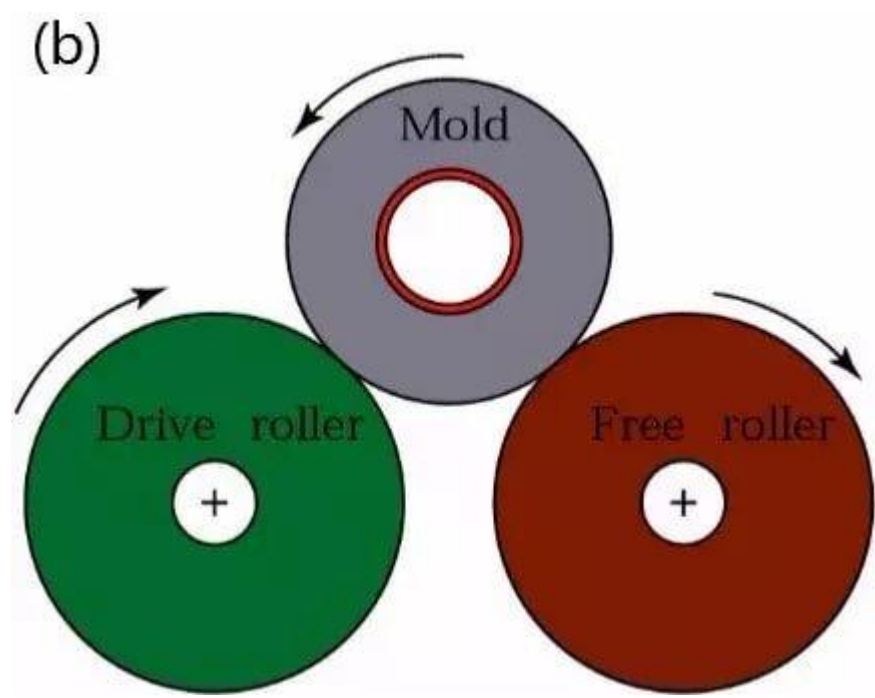
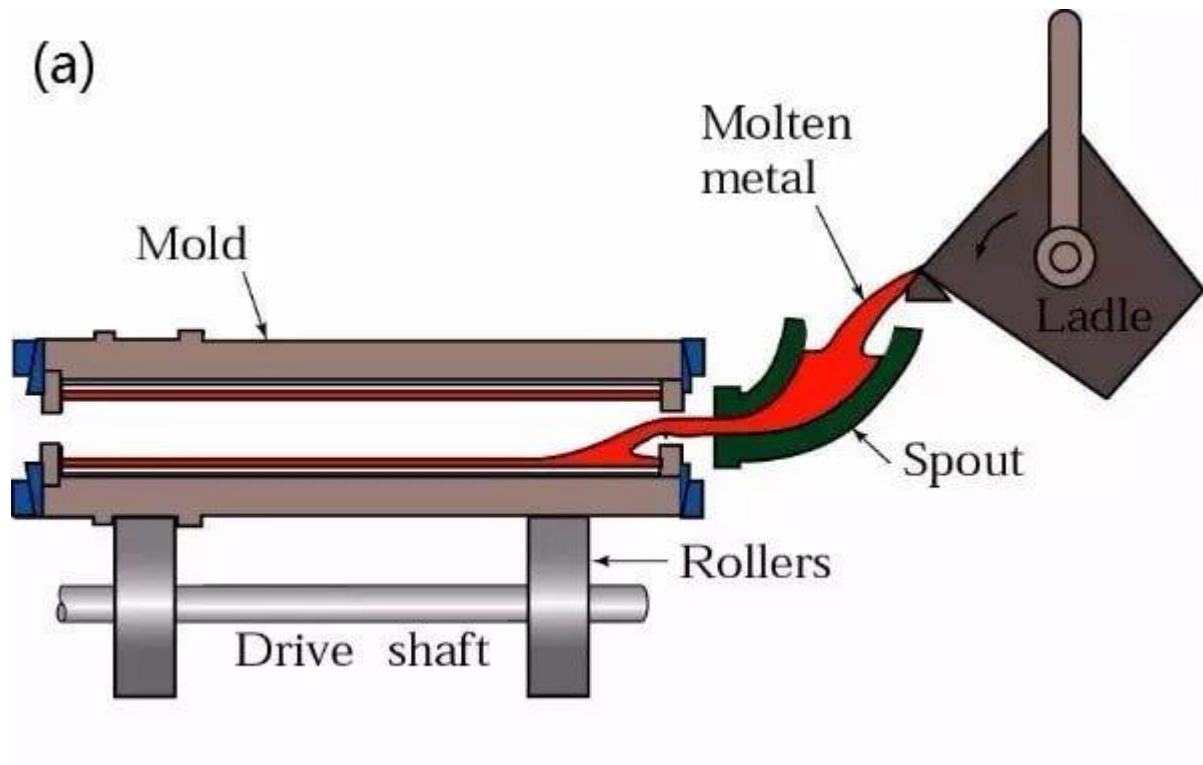
## (5) Centrifugal casting



### What is centrifugal casting

It is a casting method in which molten metal is poured into a rotating mold, and the mold is filled and solidified under the action of centrifugal force.

**Technological process:**



**Advantages:**

1. There is almost no metal consumption in the pouring system and the riser system, which improves the process yield.
2. The core can be omitted when producing hollow castings, so the metal filling ability can be greatly improved when producing long tubular castings.
3. The casting has high density, few defects such as pores and slag inclusion, and high mechanical properties.
4. It is easy to manufacture composite metal castings of barrels and sleeves.

**Disadvantages:**

1. There are certain limitations when used in the production of specialshaped castings.
2. The diameter of the inner hole of the casting is not accurate, the surface of the inner hole is rough, the quality is poor, and the machining allowance is large.
3. The casting is prone to specific gravity segregation.

**Applications:**

Centrifugal casting was first used to produce cast pipes. At home and abroad, metallurgy, mining, transportation, irrigation and drainage machinery, aviation, national defense, automotive and



other industries have used centrifugal casting processes to produce steel, iron and non-ferrous carbon alloy castings. Among them, the production of centrifugal cast iron tubes, internal combustion engine cylinder liners and shaft sleeves is the most common.

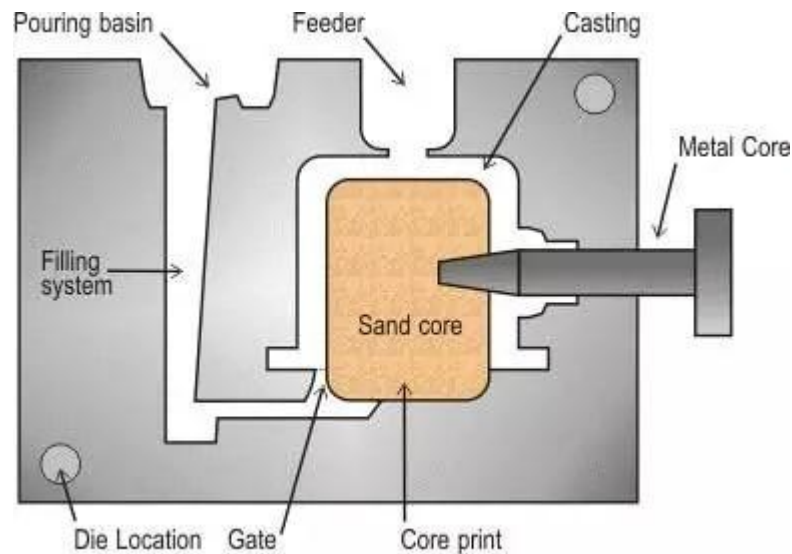
## (6) Gravity die casting



### **What is gravity die casting**

It refers to a molding method in which liquid metal is filled with a metal mold under the action of gravity and cooled and solidified in the mold to obtain a casting.

### Technological process:



### Advantages:

1. The metal mold has large thermal conductivity and heat capacity, fast cooling speed, dense casting structure, and mechanical properties about 15% higher than sand casting.
2. It can obtain castings with higher dimensional accuracy and lower surface roughness, and has good quality stability.
3. Because the sand core is not used and rarely used, the environment is improved, dust and harmful gases are reduced, and labor intensity is reduced.

### Disadvantages:

1. The metal mold itself is non-breathable, and certain measures must be taken to evacuate the air and air generated by the sand core in the cavity.
2. The metal mold has no concession, and cracks are easy to occur when the casting is solidified.
3. Metal molds have a longer manufacturing cycle and higher cost. Therefore, good economic effects can only be shown when mass-produced.

**Applications:**

Metal casting is suitable for large-scale production of non-ferrous alloy castings such as aluminum alloys and magnesium alloys with complex shapes, as well as iron and steel metal castings and ingots.





## (7) Vacuum die casting

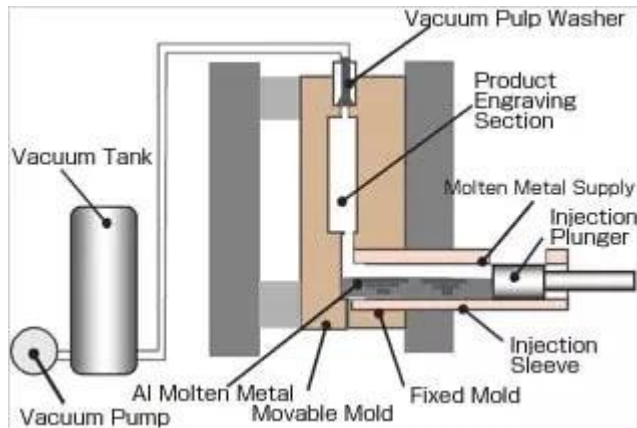


### What is vacuum die casting

An advanced die-casting process that improves the mechanical properties and surface quality of die-casting parts by removing or significantly reducing the pores and dissolved gases in the die-casting part by extracting the gas in the die-casting mold cavity during the die-casting process.

### Technological process:





### Advantages:

1. It can eliminate or reduce the air holes inside the die casting, improve the mechanical properties and surface quality of the die casting as well as the plating performance.
2. To reduce the back pressure of the cavity, lower specific pressure and alloy with poor casting performance can be used. It is possible to die-cast larger castings with small machines.
3. It improved filling conditions, can cast thinner castings.

### Disadvantages:

1. The mold sealing structure is complicated, making and installing is difficult, so the cost is high.
2. If the vacuum die casting method is not properly controlled, the effect will not be very significant.

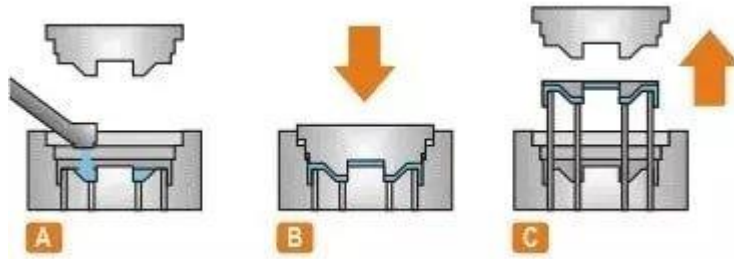
## (8) Squeezing die casting



### What is squeezing die casting

It is a method for solidifying liquid or semi-solid metal under high pressure and flowing forming to directly obtain the product or blank. It has the advantages of high utilization rate of liquid metal, simplified process and stable quality. It is an energy-saving [metal forming](#) technology with potential application prospects.

**Technological process:**



**Direct squeezing die casting:** Spray paint, cast alloy, mold clamping, pressurization, pressure holding, pressure relief, mold separation, blank demolding and resetting.

**Indirect squeezing die casting:** spray coating, mold clamping, feeding, filling, pressurization, pressure holding, pressure relief, parting, blank demolding, resetting.

**Technical characteristics:**

1. It can eliminate the internal pores, shrinkage and other defects.
2. Low surface roughness and high dimensional accuracy.
3. It can prevent the occurrence of casting cracks.
4. Easy to realize mechanization and automation.

**Application:** It can be used to produce various types of alloys, such as aluminum alloy, zinc alloy, copper alloy, nodular cast iron, etc.

## (9) Lost foam casting

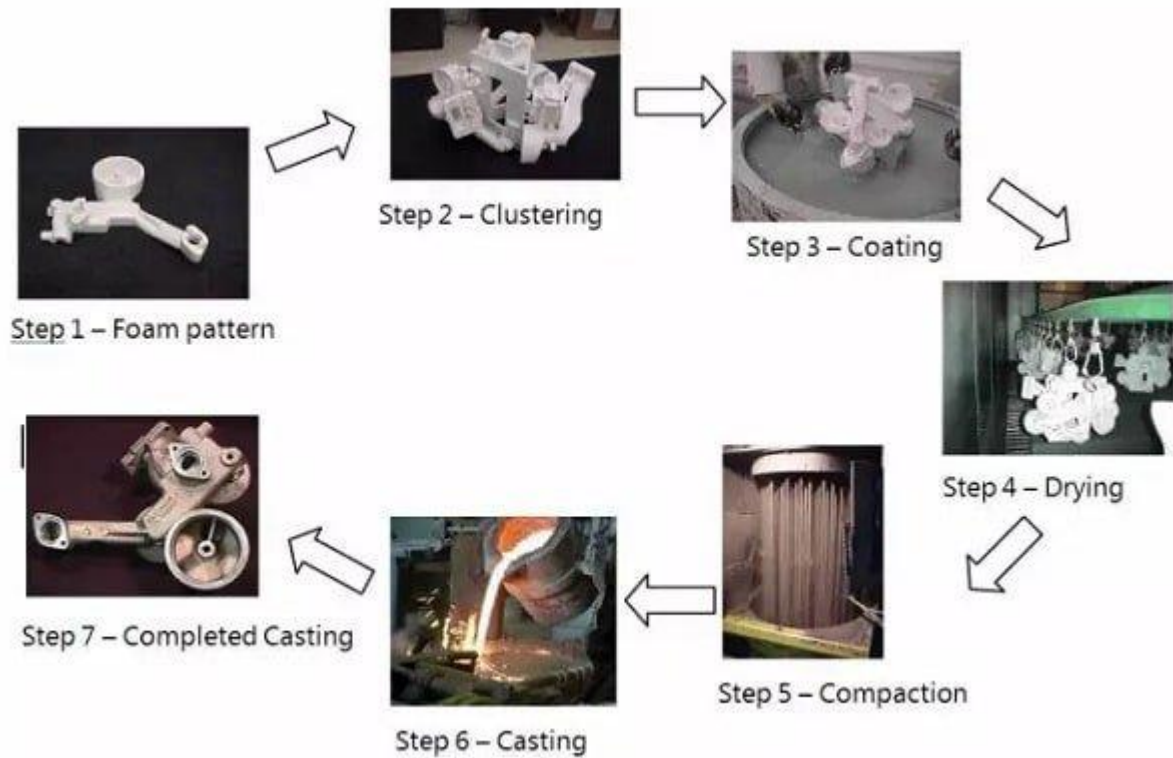


### **What is lost foam casting (also known as solid casting)**

It is a new casting method that a combination of paraffin or foam models similar to the size and shape of the casting to form a model cluster. After brushing and drying the refractory coating, it is buried in dry quartz sand to vibrate. Pouring under negative pressure to vaporize the model, the liquid metal occupies the model position, and is formed after solidification and cooling.

### **Technological process:**

Pre-foaming → Foaming molding → Dip coating → Drying →  
Modeling → Pouring → Falling sand → Cleaning



### Technical characteristics:

1. High precision casting, no sand core, reducing processing time.
2. No parting surface, flexible design and high degree of freedom.
3. Clean production without pollution.
4. Reduce investment and production costs.

### Applications:

It is suitable for the production of various sizes of precision castings with complex structures. There are no restrictions on the types of alloys and the production batches. Such as gray cast iron engine box, high manganese steel elbow and so on.

## (10) Continual casting

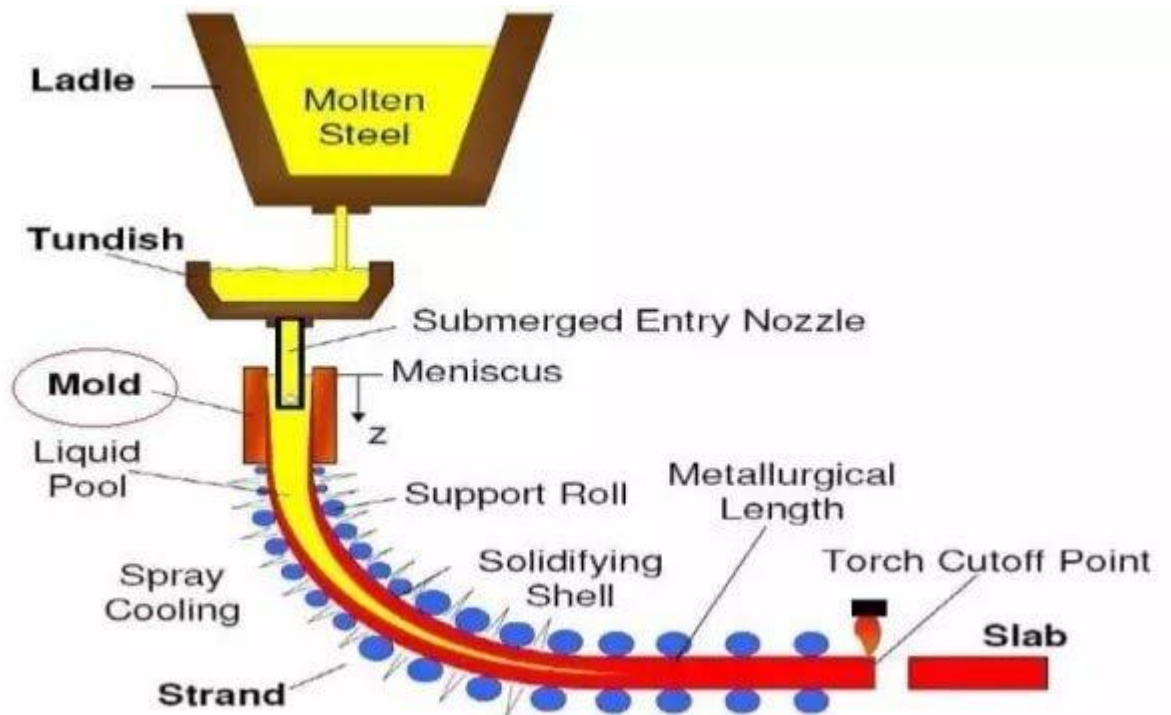


### What is continual casting

It is an advanced casting method. Its principle is to continuously pour molten metal into a special metal mold called a

crystallizer. The solidified (crusted) casting is continuously pulled out from the other end of the mold, and it can obtain any length or specific length of casting.

**Technological process:**



**Technical characteristics:**

1. Because the metal is rapidly cooled, the crystals are dense, the structure is uniform, and the mechanical properties are good.
2. Save metal and improve yield.



3. Simplified procedures, eliminating modeling and other procedures, thus reducing labor intensity and greatly reducing the required production area.
4. Continualcasting production is easy to realize mechanization and automation and improve production efficiency.

**Applications:**

Continual casting can be used to cast steel, iron, copper alloys, aluminum alloys, magnesium alloys and other long castings with constant cross-sectional shapes, such as ingots, slabs, rod billets, pipes, etc.