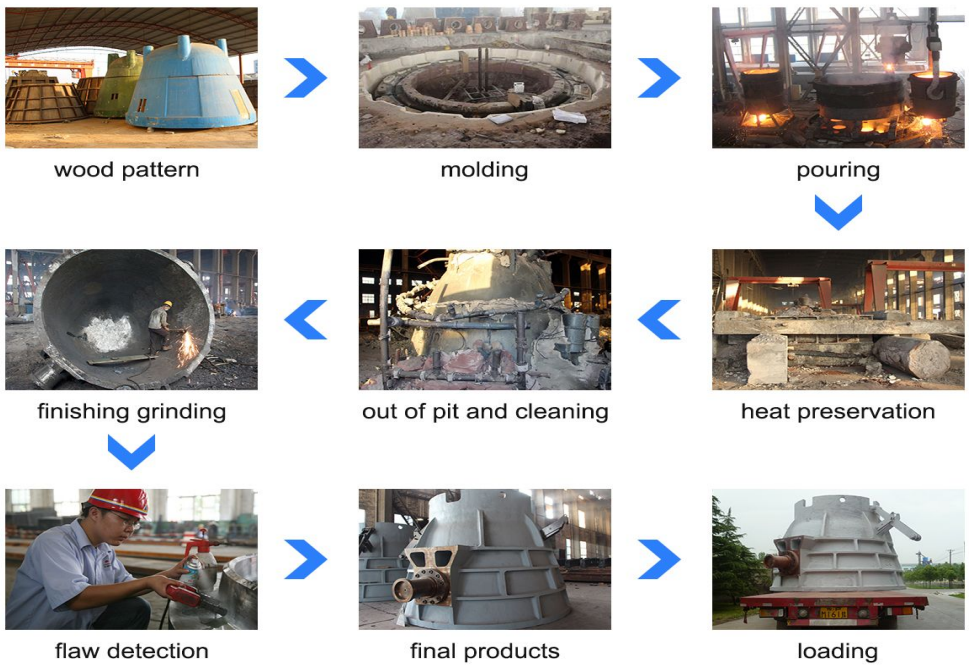
What is steel casting?

A steel casting is the product formed by pouring molten steel into a mold cavity. The liquid steel cools and solidifies in the mold cavity and is then removed for cleaning. Heat treating may be required to meet desired properties.

This process provides the near net shape and mechanical properties required by a purchaser to meet his specifications.

Steel Casting Manufacturing Process



1. Wooden pattern Production

Wood patterns are less costly than other materials, but are suited only for prototypes and limited production. They can easily be converted to plastic if production requirements increase.

2. Molding

Sand molding is the most widely used system and due to mechanization in many green sand foundries, the least expensive process. Water and clay in the sand allows molds to be produced with a high degree of hardness and an accurate mold cavity.

3. Pouring

Several types of melting furnaces are used in the production of steel castings.

Electric arc furnace s (EAF) are responsible for the production of the majority (84%) of steel castings. These units are composed of a steel shell, refractory lining, and a refractory lined roof with three openings for graphite electrodes. Melting is accomplished by the heat from the electric arc.

The EAF is the most flexible unit for melting steel in that the charge material can be varied and the steel can be refined in the furnace before tapping.

Electric induction furnaces are the most common unit for smaller production quantities. The furnace consists of a steel shell with a refractory lining surrounded by a copper coil. Heat is generated by an electric current in the coil.

4. Heat treatment

When a casting has cooled, it is shaken out of the mold. Before it can be shipped, it must be finished or cleaned. The first step is an abrasive blast which cleans the surface of all residue of the mold.Then the extraneous metal of the gating system and fins are removed by torch cutting, sawing or grinding. Welding of discontinuities is a common practice in the steel casting industry.

Heat treatment processes may be used to enhance the properties of specific alloys. The scale formed on casting surfaces during heat treatment is removed by abrasive blasting.

Steel castings can be straightened by pressing if warpage occurs during processing. This operation ensures dimensional accuracy of the finished part.

5. Painting

6. Packing-delivering

Why Use the Steel Casting?

Many of the alloys required for severe applications cannot be wrought and must be cast.All carbon and low alloy steels are readily weldable .Higher alloy grades such as manganese and stainless steels are routinely welded using appropriate techniques.

Steel castings are readily heat treated by normalizing, annealing, quench and tempering, localized or differential hardening, etc., depending on the mechanical properties required.

The corrosion resistance of high alloy cast steels is comparable to wrought 300 series material but the CF grades have a slightly different composition and contain ferrite for improved weldability.The high alloy and nickel-base alloy castings are used in chemical processing plants and corrosive environments.

It varies from a relatively soft medium carbon steel of .25 percent carbon to the extremely hard "work-hardening" manganese grades and the high chrome irons. Cast steels exhibit superior toughness and impact resistance compared to other materials.

Heat resistant alloys are used at temperatures in excess of 1200 °F (649 °C). These materials are usually alloys of iron, chromium, and nickel.

Where Use the Steel Casting?

The generic term "steel" covers a wide range of grades of materials, however, for simplicity two alloy groups are normally considered: Carbon and Low Alloy (C&LA) and High Alloy. High Alloy grades include stainless steels and nickel-base alloys. Austenitic Manganese steels and all other non-stainless steels are usually included in the C&LA group.

Some of the larger users are: Railroad industry which uses 50% of the total production of steel castings. These parts are used in severe applications such as couplers, draft gears, side frames, bolsters, and wheels.

Construction machinery manufacturers use about 15% of the steel castings produced each year. The applications here are as varied as the equipment produced. Parts range from end caps on hydraulic cylinders for a small backhoe to transmission housings on large earth-moving machinery.

Valves and fittings of cast steel account for about 5% of production and are used for the drilling, recovery, transportation, and refining of natural gas and crude oil both on land and offshore. These parts vary in size from a few pounds to many tons. Applications are very severe requiring performance in corrosive liquids at both subzero and elevated temperatures. Operating pressures can reach many thousands of p.s.i. in valves and blowout preventers.

Heavy trucks—both on and off-highway—use about 5% of industry production. Some applications include: axle housings, suspension brackets, wheels, brake parts, axle spindles, differential housings, and fifth wheels.

Mining industry makes extensive use of steel castings for their extreme requirements of toughness and abrasion resistance both for ore recovery equipment and crushing mills. Both high

manganese and other alloy steels are widely used, and these materials can only be produced as castings.

Numerous other industries use steel castings. These range from food processing and electronics to oil and gas, defense and pulp and paper industries. In fact, castings touch every aspect of our lives.